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Addendum to Biogenic Hydrocarbon Inventories for California:

Generation of Essential Databases

Measurements of Biogenic Hydrocarbons in Ambient Air

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
AIR RESOURCES BOARD
Research Division

MEASUREMENTS OF BIOGENIC HYDROCARBONS IN AMBIENT AIR

Addendum to

BIOGENIC HYDROCARBON INVENTORIES FOR CALIFORNIA: GENERATION OF ESSENTIAL DATABASES
Final Report

Contract No. 95-309

STATE OF CALIFORNIA AIR RESOURCES BOARD

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This addendum includes the data originally presented in Chapter 6.0 "MEASUREMENTS OF ISOPRENE AND ITS ATMOSPHERIC REACTION PRODUCTS METHACROLEIN AND METHYL VINYL KETONE IN AMBIENT AIR" of the Final Report for Contract No. 95-309. Additional data is presented here on ambient measurements of the monoterpenes: α-pinene, camphene, sabinene, β-pinene, limonene, 1,8-cineole and camphor.

DISCLAIMER

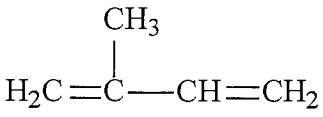
The statement and conclusions in this report are those of the University of California and not necessarily those of the California Air Resources Board. The mention of commercial products, their source, or their use in connection with material reported herein is not to be construed as actual or implied endorsement of such products.

MEASUREMENTS OF BIOGENIC HYDROCARBONS IN AMBIENT AIR

1. Introduction and Background

Volatile organic compounds (VOC) of biogenic origin (BHC, biogenic hydrocarbons) were measured in California's South Coast Air Basin (SoCAB) during the Southern California Ozone Study (SCOS97) conducted in the summer 1997. Anthropogenic hydrocarbons are measured on a routine basis in the SoCAB, but few ambient measurements of biogenic hydrocarbons or their atmospheric reaction products have been conducted in the basin. While on a global scale the dominance of BHC over anthropogenic VOC is estimated to be as much as a factor of 10 (WMO, 1995), U.S. emission inventories put the two sources of VOC at comparable strengths (Guenther et al., 1994) and in urban areas such as the SoCAB anthropogenic VOC clearly dominate (Benjamin et al., 1997). Biogenic hydrocarbons are generally highly reactive in the atmosphere (Carter, 1994; Atkinson, 1997; Atkinson and Arey, 1998) and thus can play an important role in tropospheric chemistry (Trainer et al., 1987; Chameidies et al., 1988). Because of their rapid atmospheric reactions, however, the ambient concentrations of BHC are generally low and additional measurements of their atmospheric reaction products are necessary to understand the full impact of BHC on photochemical processes such as ambient ozone formation (Montzka et al., 1993; 1995). For this reason, measurements of isoprene, the BHC emitted in greatest quantity by vegetation (Guenther et al., 1995), and its principal reaction products, methacrolein (MACR) and methyl vinyl ketone (MVK), were undertaken during the SCOS97 campaign. Additionally, the following monoterpenes were measured: α-pinene, camphene, sabinene, β-pinene, limonene, 1,8-cineole and camphor. Figure 1 shows the structures of these biogenic hydrocarbons.

The SCOS97 campaign took place during June 16 – October 15, 1997, with six intensive sampling periods and a total of 13 days of intensive sampling. Sampling for biogenic VOC was generally conducted simultaneously at three sites chosen as a mid-basin receptor site for anthropogenic VOC (Azusa), a down-wind receptor site (Banning) and a high elevation site impacted by biogenic VOC (Pine Mountain or Mount Baldy). Solid adsorbent tubes with mass flow controllers were utilized for VOC sample collection



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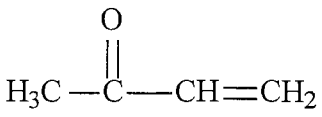

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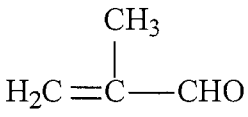

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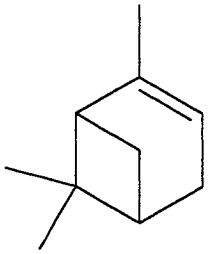
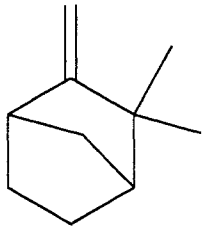
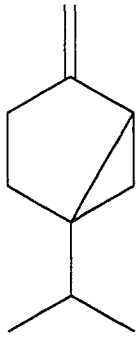


α-Pinene



Camphene



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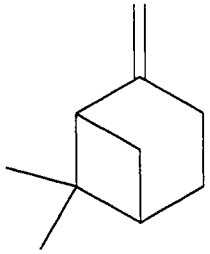

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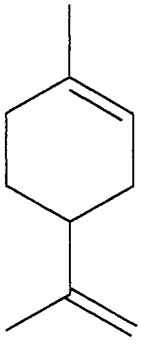
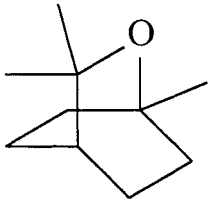
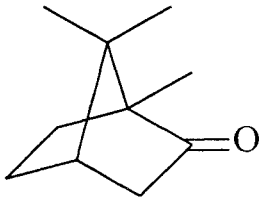


Limonene



1,8-Cineole



Camphor

Figure 1. Structures of biogenic hydrocarbons measured.

and concentration. After sample collection, the adsorbent tubes were cooled and transported to the laboratory where they were analyzed by gas chromatography with mass selective detection (GC-MSD) using a GC-MSD equipped with an Entech thermal desorption/ preconcentrator unit.

Results for ambient diurnal profiles of isoprene and its atmospheric reaction products, methacrolein and methyl vinyl ketone, as well as α-pinene, camphene, sabinene, β-pinene, limonene, 1,8-cineole and camphor for the twelve SCOS97 intensive sampling days between August 4 and October 4 are given in this report.

2. Sampling Sites and Sampling Times

The sampling sites in this study were Azusa, Pine Mountain, Mount Baldy, and Banning. During a single intensive period sampling was also performed at a Los Angeles, North Main Street site. The six intensive sampling periods and sampling sites are presented in Table 1.

Table 1. Intensive sampling periods and sampling sites.

Sampling Period	Sampling Site
July 14	Azusa, Banning
August 4 - 6	Azusa, Banning, Pine Mtn.
August 22 - 23	Azusa, Banning, LA North Main
September 4 - 7	Azusa, Banning, Pine Mtn.
September 28 - 29	Azusa, Mt. Baldy
October 3 - 4	Azusa, Banning, Mt. Baldy

Azusa represents a mid-basin receptor site east of the main source area of downtown Los Angeles, Pine Mtn. is an elevated site (4539 ft) north of Azusa in the San Gabriel Mountains and Mt. Baldy (sampling at 4000 ft) is situated east of Pine Mtn. The Banning site is located approximately 80 miles east of downtown Los Angeles.

The sampling intervals were 3 hours during daytime and 7-9 hours during nighttime. Typically the sampling periods at Azusa, Pine Mtn., and Mt. Baldy were

0300- 0600, 0600-0900, 0900-1200, 1300-1600, 1600-2000, 2000-0300. VOCs were measured at Azusa during the four daytime sampling periods by other investigators participating in SCOS97. At Banning the sampling periods were 0300-0600, 0600-0900, 0900-1200, 1200-1500, 1500-1800, 1800-0300, chosen to coincide with the schedule of the Photochemical Assessment Monitoring Station (PAMS) VOC sampling conducted by the South Coast Air Quality Management District (SCAQMD) at this site. During August 22 - 23 all sites followed the Banning sampling protocol. During September 4 - 7 nighttime sampling was performed more frequently at Azusa and Pine Mtn. with 3 - 4 hour sampling periods (1700-2000, 2000-2400, 2400-0300, 0300-0600).

3. Experimental Methods

3.1 Sampling

Ambient samples were collected on solid adsorbents housed in borosilicate glass tubes (length 130 mm, outer diameter 6 mm, inner diameter 4 mm). For collection of isoprene, methacrolein, methyl vinyl ketone, and the monoterpenes, the tubes were filled with 250 mg of Carbotrap (20/40 mesh, Supelco, Inc.). Prior to packing, tubes were cleaned by sonicating in methanol and annealed at 480°C. The Carbotrap tubes were conditioned by heating overnight at 350 °C with a constant flow of helium through the tubes. After conditioning and while still warm, the adsorbent tubes were capped with brass nuts, caps (Swagelock) and PTFE ferrules (Alltech Associates, Inc.). The tubes were placed in a cleaned glass jar which was sealed with a metal lid lined with Teflon film. A tube containing activated charcoal (MCB Reagents) was kept in the jar during storage of tubes. Blank samples were treated the same way as samples, excluding actual sampling. Two sampling tubes in series were used, with analyses of the second tube serving to verify that no breakthrough occurred. Jars were stored in a refrigerator at 4 °C before transportation to sampling sites. Tubes were freshly desorbed prior to each intensive sampling period.

To prevent ozone from reacting with labile compounds in the adsorbent during sampling, a scrubber housed in a PTFE compression fitting was placed in front of the first sampling tube (Juttner, 1988; Hoffmann, 1994; Helmig, 1997). The scrubber contained eight copper plyes coated with manganese dioxide (Dasibi Corp.). Each scrubber was tested by pumping ozone (250 ppbv) through the scrubber and monitoring the mixing ratio with an

ozone monitor (Model 1003-AH, Dasibi Corp.). The scrubbers were tested before and after each intensive sampling period.

At each site the sampling equipment consisted of a diaphragm pump (Model no. 107CAB 050-TFE, Thomas), mass flow controllers (FC-280SAV and FC-280AV, Tylan General) and a mass flow control unit with four channels (RO-28, Tylan General). The tubes were mounted at a height of 1.8 - 2.0 m (at Azusa the sampling equipment was located on the roof of the SCAQMD station). Each pump, mass flow controller, and control unit was checked for flow rate against a bubble flow meter before and after each intensive sampling period.

Carbotrap samples were collected in duplicate with each sampling tube followed with a back tube. Blank samples transported to the sites were treated the same way as samples, excluding actual sampling. Collected samples were transported to the laboratory as soon as possible for spiking with internal standards, and analysis.

3.2 Analysis

Before analysis the samples were spiked with gaseous internal standards. Isoprene-d_8, fully deuterated isoprene, and tricyclene, a saturated tricyclic compound isomeric with the $C_{10}H_{16}$ monoterpenes, were utilized as internal standards. Known concentrations of isoprene-d_8 and tricyclene were introduced into a Teflon chamber (7900L) from a vacuum rack with an MKS Baratron 1-100 Torr sensor head and a volume-calibrated Pyrex bulb. After ambient sampling each tube was spiked with 100cc of these standards. External calibration samples were prepared by introducing known amounts of isoprene, isoprene-d_8, methacrolein, methyl vinyl ketone, tricyclene, α-pinene, camphene, β-pinene, limonene, 1,8-cineole and camphor into the chamber, sampling known volumes onto adsorbent tubes, and running calibration samples using the identical method as used for the ambient samples. From these calibration samples, response factors for the compounds against the internal standard compounds were determined with isoprene-d_8 serving as the internal standard for isoprene, methacrolein and methyl vinyl ketone, and tricyclene serving as internal standard for α-pinene, camphene, β-pinene, limonene, 1,8-cineole and camphor. An estimated response factor was used for sabinene quantification.

The analyses were performed with a preconcentrator (Entech 7000, Entech Instruments Inc.) connected to a gas chromatograph (Hewlett Packard, 5890) and a mass selective detector (Hewlett Packard, 5971A). The adsorbed compounds were desorbed in a single tube desorber by heating the Carbotrap tube to 325 °C. Concentration prior to injecting the sample into the gas chromatograph was accomplished using a two-step cryofocusing cold trap dehydration method. The analytical column used for separation of compounds was a DB-5 capillary column (length 60 m, diameter 0.32 mm, phase thickness 1 μm, J&W Scientific) and the oven was programmed from 35 °C to 80 °C at the rate of 4 °C/min, then up to 280 °C at 8 °C/min.

The compounds were identified according to their retention times and selected characteristic ions as determined by running pure gaseous standards adsorbed onto sampling tubes. Compound identifications were previously verified by full mass spectra, operating the mass selective detector in the scanning mode (SCAN). The samples were quantified using the selected ion monitoring (SIM) mode monitoring two or more characteristic ions for each compound and using the areas of the ion chromatograms for quantification. The ion 68 m/z was used for quantification of isoprene (confirming ions 67 m/z, 53 m/z), and 76 m/z for isoprene-d_8. The ion 70 m/z was used for quantification of methacrolein (confirming ions 69 m/z, 43 m/z, 41 m/z) and methyl vinyl ketone (confirming ions 69 m/z, 55 m/z). The ion 93 m/z was used for quantification of tricyclene, α-pinene, camphene, sabinene, and β-pinene (confirming ion 136 m/z); ion 68 m/z for limonene (confirming ions 136 m/z, 93 m/z); ion 154 m/z for 1,8-cineole (confirming ion 68 m/z) and 95 m/z for camphor (confirming ion 152 m/z).

3.3 Intercomparison for Isoprene

On August 1, 1997 isoprene sampling was conducted at the University of California, Riverside, Air Pollution Research Center (APRC) between 1430-1815 to allow an intercomparison between the APRC adsorbent tube sampling and canister sampling. Carbotrap tubes were used to collect 5 simultaneous samples for analysis and quantification of isoprene at APRC, as detailed above. Two canister samples (using precleaned canisters supplied by Desert Research Institute and Biospheric Research Corporation) were co-located with the APRC adsorbent samplers. The canisters were

mailed to Desert Research Institute and Biospheric Research Corporation for analysis. The results of the adsorbent tube sampling are provided below.

4. Results

4.1 Isoprene and Its Atmospheric Reaction Products

Tables 2 through 5 give the average mixing ratios of isoprene, methacrolein, and methyl vinyl ketone for the five intensive SCOS97 sampling periods between August and October, 1997. The replicate sample values are given in the Appendix, Tables A-1.1 through A-1.4. The results are reported in ppbv, calculated for 760 Torr and 0°C. Following Table 5 are figures of the isoprene time-concentration profiles for the three (or in one instance two) sampling sites monitored during each intensive sampling period. Azusa was a sampling site during every sampling period and the isoprene values at Azusa are given in the top graph, plotted with a 0.8 ppbv ordinate scale for each intensive (Figures 2 through 6). Pine Mtn. was monitored along with Azusa during Intensives 2 and 4 (Figures 2 and 4), while Mt. Baldy was monitored during Intensives 5 and 6 (Figures 5 and 6). Reflecting the higher ambient isoprene concentrations at these elevated sites, an ordinate scale value of 2.5 ppbv has been utilized for graphing isoprene at these mountain sites. Isoprene was monitored at the down-wind Banning site during Intensives 2, 3, 4, and 6 and is shown as the lower graph with a 0.3 ppbv ordinate scale (Figures 2, 3, 4 and 6). During Intensive 3, Los Angeles at North Main Street was a monitoring site in addition to Azusa and Banning (Figure 3).

4.2 Precision of Sampling and Analysis

Table 6 gives the results for the five replicate isoprene samples taken during the August 1 Intercomparison Sampling. A 6.3% relative standard deviation in the measured isoprene concentration was obtained for these samples.

Table 2. Average mixing ratios for isoprene, methacrolein, and methyl vinyl ketone at Azusa.

AZUSA	Date	Sampling	Isoprene ppbv	MACR ppbv	MVK ppbv
Aug 4-6, 1997	8/4/97	0600-0900	0.23	0.09	0.46
	8/4/97	0907-1206	0.52	0.47	0.77
	8/4/97	1306-1603	0.46	0.51	0.92
	8/4/97	1700-2000	0.75	0.71	1.06
	8/4/97	2006-0300	0.16	0.34	0.59
	8/5/97	0307-0600	0.24	1.01	0.58
	8/5/97	0618-0900	0.47	0.82	1.73
	8/5/97	0907-1202	0.66	0.74	1.61
	8/5/97	1300-1600	0.61	0.70	1.49
	8/5/97	1701-2000	0.73	0.46	0.72
	8/5- 8/6/97	2005-0300	0.44	0.41	1.20
	8/6/97	0306-0600	0.23	0.62	0.90
	8/6/97	0616-0900	0.37	0.60	1.24
	8/6/97	0906-1200	0.51	0.35	0.75
	8/6/97	1300-1600	0.51	0.44	0.81
	8/6/97	1700-2000	0.40	0.15	0.23
Aug 22-23, 1997	8/22/97	0318-0600*	0.24	0.29	0.53
	8/22/97	0610-0900*	0.21	0.45	0.77
	8/22/97	0905-1157	0.41	0.33	0.69
	8/22/97	1210-1500*	0.52	0.44	0.78
	8/22/97	1504-1800	0.45	0.69	1.07
	8/22-23/97	1815-0300	0.30	3.34	1.52
	8/23/97	0304-0600	0.25	0.55	0.98
	8/23/97	0615-0900*	0.26	0.70	0.94
	8/23/97	0903-1200	0.51	0.53	0.74
	8/23/97	1208-1500	0.31	0.49	0.82
	8/23/97	1505-1800*	0.37	0.46	0.70
Sep 4-7, 1997	9/4/97	0300-0600	0.28	0.89	1.29
	9/4/97	0606-0900	0.22	0.55	0.56
	9/4/97	0904-1200	0.57	0.46	1.54
	9/4/97	1300-1600	0.35	0.62	1.00
	9/4/97	1700-2000	0.61	0.40	0.50
	9/4/97	2014-2400	0.13	0.26	0.25
	9/5/97	0006-0300	0.06	0.17	0.26
	9/5/97	0305-0600	0.06	0.16	0.25
	9/5/97	0615-0900*	0.17	0.48	0.38
	9/5/97	0903-1200	0.43	0.31	0.68
	9/5/97	1300-1600	0.31	0.39	1.01
	9/5/97	1700-2000	0.37	0.32	0.41
	9/5/97	2006-2400	0.18	0.58	0.57
	9/6/97	0008-0300	0.11	0.22	0.28
	9/6/97	0306-0600	0.09	0.30	0.36

Table 2. Average mixing ratios for isoprene, methacrolein, and methyl vinyl ketone at Azusa (continued).

AZUSA	Date	Sampling	Isoprene ppbv	MACR ppbv	MVK ppbv
	9/6/97	0615-0900	0.15	0.33	0.27
	9/6/97	0903-1200	0.35	0.50	0.65
	9/6/97	1300-1600	0.29	0.44	0.88
	9/6/97	1700-1959	0.29	0.32	0.50
	9/6/97	2010-2400	0.08	0.16	0.18
	9/7/97	0005-0300	0.11	0.21	0.23
	9/7/97	0306-0600	0.11	0.30	0.52
	9/7/97	0604-0900	0.13	0.35	0.31
Sep 28-29, 1997	9/28/97	0301-0600	0.15	0.28	2.31
	9/28/97	0609-0900	0.23	0.31	0.53
	9/28/97	0904-1200	0.50	0.37	0.83
	9/28/97	1300-1600	0.42	0.41	0.68
	9/28/97	1700-2000*	0.34	0.25	0.31
	9/28-29/97	2015-0300	0.07	0.19	0.23
	9/29/97	0310-0600	0.13	0.36	0.29
	9/29/97	0616-0858	0.30	0.44	0.65
	9/29/97	0900-1200	0.37	0.30	0.46
	9/29/97	1300-1600	0.38	0.61	0.74
	9/29/97	1700-2000	0.44	0.22	0.40
Oct 3-4, 1997	10/3/97	0301-0600	0.06	0.13	0.26
	10/3/97	0614-0900	0.06	0.07	0.12
	10/3/97	0904-1200	0.12	0.10	0.22
	10/3/97	1300-1600	0.21	0.19	0.38
	10/3/97	1700-2000	0.15	0.15	0.44
	10/3-4/97	2011-0300	0.06	0.19	0.50
	10/4/97	0304-0600	0.12	0.18	0.99
	10/4/97	0612-0900	0.07	0.08	0.26
	10/4/97	0901-1200	0.16	0.16	0.36
	10/4/97	1300-1600*	0.24	0.29	0.64
	10/4/97	1700-2000	0.14	0.11	0.22

*Single sample value reported. See Appendix for details.

Table 3. Average mixing ratios for isoprene, methacrolein, and methyl vinyl ketone at Pine Mtn. and Mt. Baldy.

PINE MTN.	Date	Sampling	Isoprene ppbv	MACR ppbv	MVK ppbv
Aug 4-6, 1997	8/4/97	1710-2000	2.21	0.91	1.58
	08/4-08/5/97	2025-0259	0.03	0.58	1.11
	8/5/97	0314-0559	0.04	0.14	0.25
	8/5/97	0617-0858	1.96	0.09	0.16
	8/5/97	0911-1200	1.00	0.33	0.83
	8/5/97	1302-1600*	0.59	0.46	0.71
	8/5/97	1700-2000	1.09	0.44	0.72
	8/5/97	2015-0255	0.08	0.08	0.19
	8/6/97	0310-0600	0.03	0.03	0.07
	8/6/97	0615-0900	0.80	0.07	0.14
	8/6/97	0915-1200	0.41	0.19	0.36
	8/6/97	1300-1600	0.62	0.59	1.03
Sep 4-7, 1997	9/4/97	1702-2000	0.41	0.52	0.72
	9/4/97	2008-2400	0.03	0.33	0.54
	9/5/97	0010-0338	0.02	0.10	0.16
	9/5/97	0349-0600	0.02	0.09	0.18
	9/5/97	0615-0900	0.63	0.10	0.20
	9/5/97	0908-1200	0.93	0.21	0.38
	9/5/97	1300-1600	1.71	1.07	1.38
	9/5/97	1700-2000	0.59	0.30	0.49
	9/5/97	2007-2355	0.03	0.26	0.39
	9/6/97	0000-0255	0.02	0.10	0.17
	9/6/97	0301-0600	0.03	0.10	0.14
	9/6/97	0610-0900	0.48	0.08	0.16
	9/6/97	0905-1200	0.60	0.17	0.17
	9/6/97	1300-1600	1.58	0.25	0.35
	9/6/97	1700-2000	0.55	0.33	0.54
	9/6/97	2007-2355	0.05	0.18	0.26
	9/7/97	0000-0255	0.03	0.16	0.24
	9/7/97	0300-0555	0.05	0.10	0.15
	9/7/97	0600-0900	1.88	0.10	0.21

Table 3. Average mixing ratios for isoprene, methacrolein, and methyl vinyl ketone at Pine Mtn. and Mt. Baldy (continued).

MT. BALDY	Date	Sampling	Isoprene ppbv	MACR ppbv	MVK ppbv
Sep 28-29, 1997	9/28/97	0904-1200	1.90	0.23	0.40
	9/28/97	1300-1600	1.17	0.37	0.93
	9/28/97	1700-2000	2.27	0.40	0.85
	9/28-29/97	2005-0300	0.08	0.24	0.47
	9/29/97	0307-0600	0.06	0.06	0.17
	9/29/97	0606-0900	0.65	0.06	0.15
	9/29/97	0903-1200	1.84	0.27	0.63
	9/29/97	1300-1600	1.07	0.29	0.61
	9/29/97	1700-2000	1.92	0.39	0.79
Oct 3-4, 1997	10/3/97	0619-0900	0.42	0.02	0.12
	10/3/97	0903-1200	1.38	0.13	0.28
	10/3/97	1301-1600	1.23	0.48	1.01
	10/3/97	1703-2003*	1.29	0.37	0.72
	10/3-4/97	2010-0302	0.05	0.13	0.26
	10/4/97	0310-0601	0.04	0.06	0.11
	10/4/97	0612-0900	0.26	0.04	0.10
	10/4/97	0903-1200	1.53	0.12	0.25
	10/4/97	1300-1600	0.88	0.32	0.75
	10/4/97	1700-2000	1.29	0.36	0.66

*Single sample value reported. See Appendix for details.

Table 4. Average mixing ratios for isoprene, methacrolein, and methyl vinyl ketone at Banning.

BANNING	Date	Sampling	Isoprene ppbv	MACR ppbv	MVK ppbv
Aug 4-6, 1997	8/4/97	0600-0855	0.25	0.14	0.33
	8/4/97	0902-1157	0.06	0.09	0.19
	8/4/97	no sample	-	-	-
	8/4/97	1504-1800	0.21	0.12	0.28
	8/4-5/1997	1807-0255	0.08	0.35	0.68
	8/5/97	0303-0550	0.02	0.16	0.26
	8/5/97	0604-0855	0.33	0.20	0.31
	8/5/97	0901-1153	0.08	0.07	0.15
	8/5/97	1159-1452	0.10	0.04	0.11
	8/5/97	1458-1800	0.13	0.07	0.13
	8/5- 8/6/97	1816-0255	0.07	0.22	0.39
	8/6/97	0301-0550	0.01	0.04	0.10
	8/6/97	0605-0855	0.02	0.02	0.04
	8/6/97	0901-1150	0.02	0.02	0.05
	8/6/97	1155-1455	0.03	0.02	0.06
	8/6/97	1500-1800	0.18	0.05	0.16
Aug 22-23, 1997	8/22/97	0600-0855	0.12	0.07	0.36
	8/22/97	0900-1155	0.27	0.10	0.26
	8/22/97	1200-1455	0.20	0.09	0.23
	8/22/97	1500-1800	0.28	0.14	0.32
	8/22-23/97	1813-0300	0.08	2.37	2.93
	8/23/97	0303-0555	0.01	0.16	0.42
	8/23/97	0603-0900	0.14	0.12	0.27
	8/23/97	0903-1200	0.22	0.07	0.18
	8/23/97	1202-1500	0.20	0.05	0.12
	8/23/97	1502-1800	0.22	0.07	0.25
Sep 5-6, 1997	9/5/97	0600-0855	0.12	0.21	0.39
	9/5/97	0900-1155	0.19	0.09	0.21
	9/5/97	1158-1458	0.17	0.03	0.11
	9/5/97	1501-1800	0.17	0.18	0.59
	9/5-6/97	1824-0257	0.05	0.45	0.53
	9/6/97	0308-0550*	0.01	0.29	0.29
	9/6/97	0610-0855*	0.10	0.33	0.44
	9/6/97	0900-1158	0.03	0.05	0.14
	9/6/97	1202-1458	0.12	0.04	0.11
	9/6/97	1502-1800*	0.21	0.06	0.18

Table 4. Average mixing ratios for isoprene, methacrolein, and methyl vinyl ketone at Banning (continued).

BANNING	Date	Sampling	Isoprene ppbv	MACR ppbv	MVK ppbv
Oct 3-4, 1997	10/3/97	0600-0858	0.05	0.08	0.25
	10/3/97	0900-1158	0.06	0.07	0.14
	10/3/97	1200-1458	0.03	0.03	0.08
	10/3/97	1500-1800	0.19	0.15	0.36
	10/3-4/97	1807-0258	0.04	0.14	0.18
	10/4/97	0300-0553	0.04	0.18	0.32
	10/4/97	0601-0858	0.10	0.16	0.29
	10/4/97	0900-1158	0.14	0.10	0.30
	10/4/97	1200-1458	0.12	0.10	0.28
	10/4/97	1500-1800	0.11	0.16	0.46

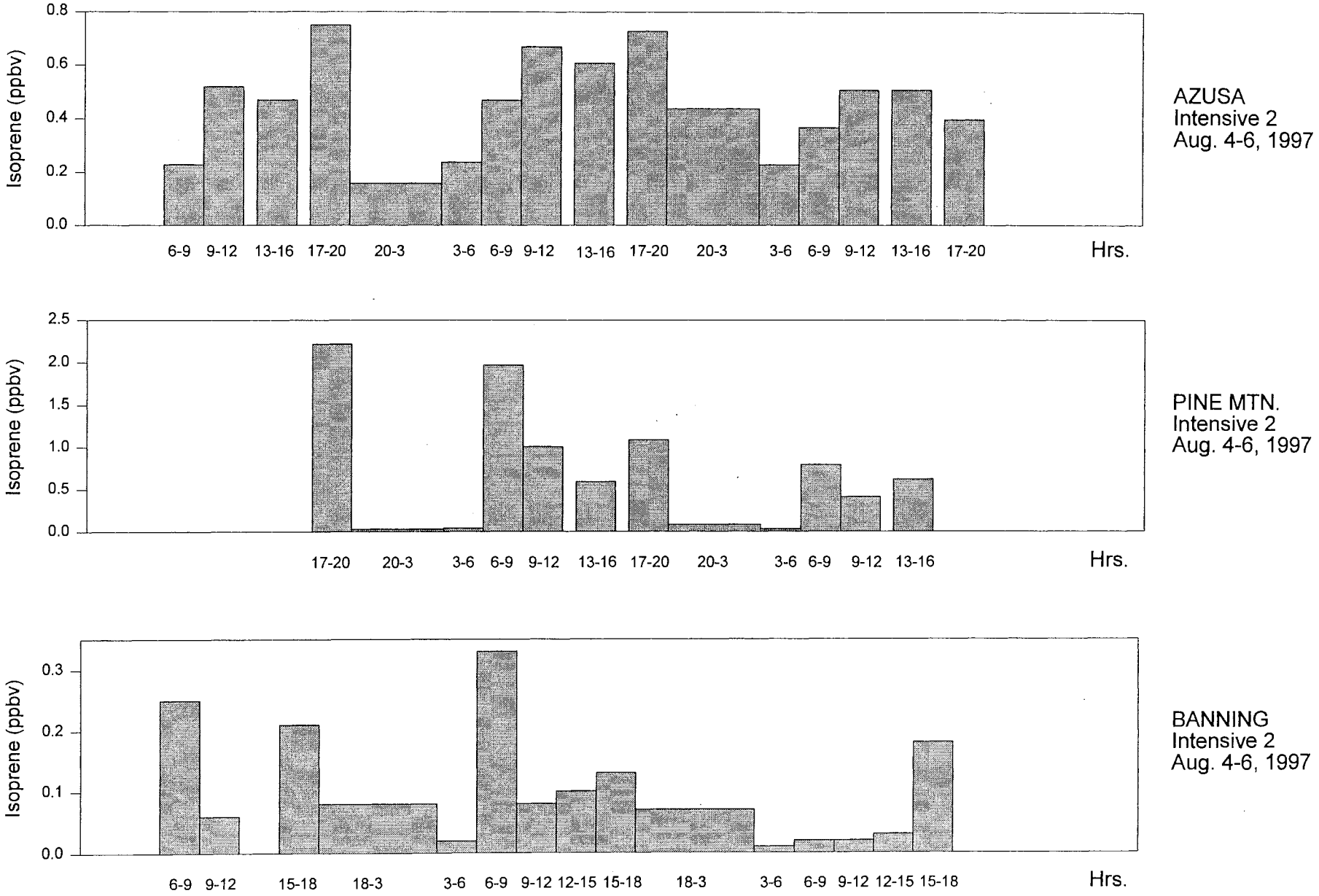
*Single sample value reported. See Appendix for details.

Table 5. Average mixing ratios for isoprene, methacrolein, and methyl vinyl ketone at Los Angeles, North Main Street.

LOS ANGELES N. MAIN ST.	Date	Sampling	Isoprene ppbv	MACR ppbv	MVK ppbv
Aug 22-23, 1997	8/22/97	0558-0855	0.37	0.77	0.50
	8/22/97	0900-1155	0.11	1.26	0.98
	8/22/97	1202-1457	0.21	0.49	0.67
	8/22/97	1500-1755	0.17	0.27	0.47
	8/22-23/97	1806-0556	0.23	0.28	0.41
	8/23/97	0605-0857	0.21	0.44	0.44
	8/23/97	0900-1156	0.12	0.33	0.73
	8/23/97	1202-1458	0.15	0.39	0.82
	8/23/97	1500-1800	0.21	0.27	0.50

Table 6. Isoprene intercomparison sample results.

Sample no.	mg/m^3	ppbv
1	15.77	5.19
2	14.83	4.88
3	16.70	5.49
4	16.57	5.45
5	17.54	5.77
Average	16.3	5.4
Standard dev. (1s)	1.0	0.3
Relative st. dev. (%)	6.3	6.3



'igure 2. Isoprene values during Intensive 2, Aug. 4-6, 199'.

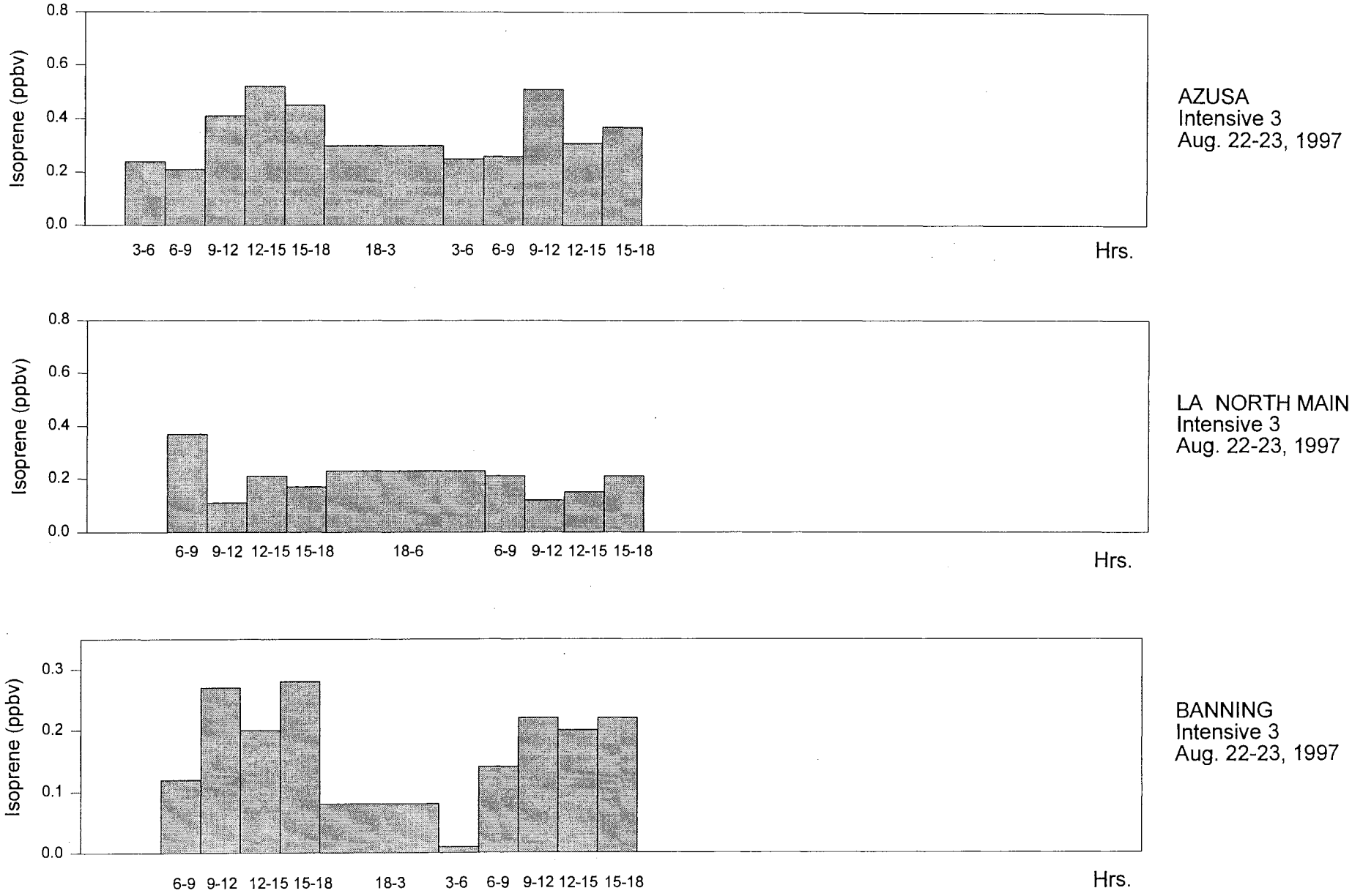
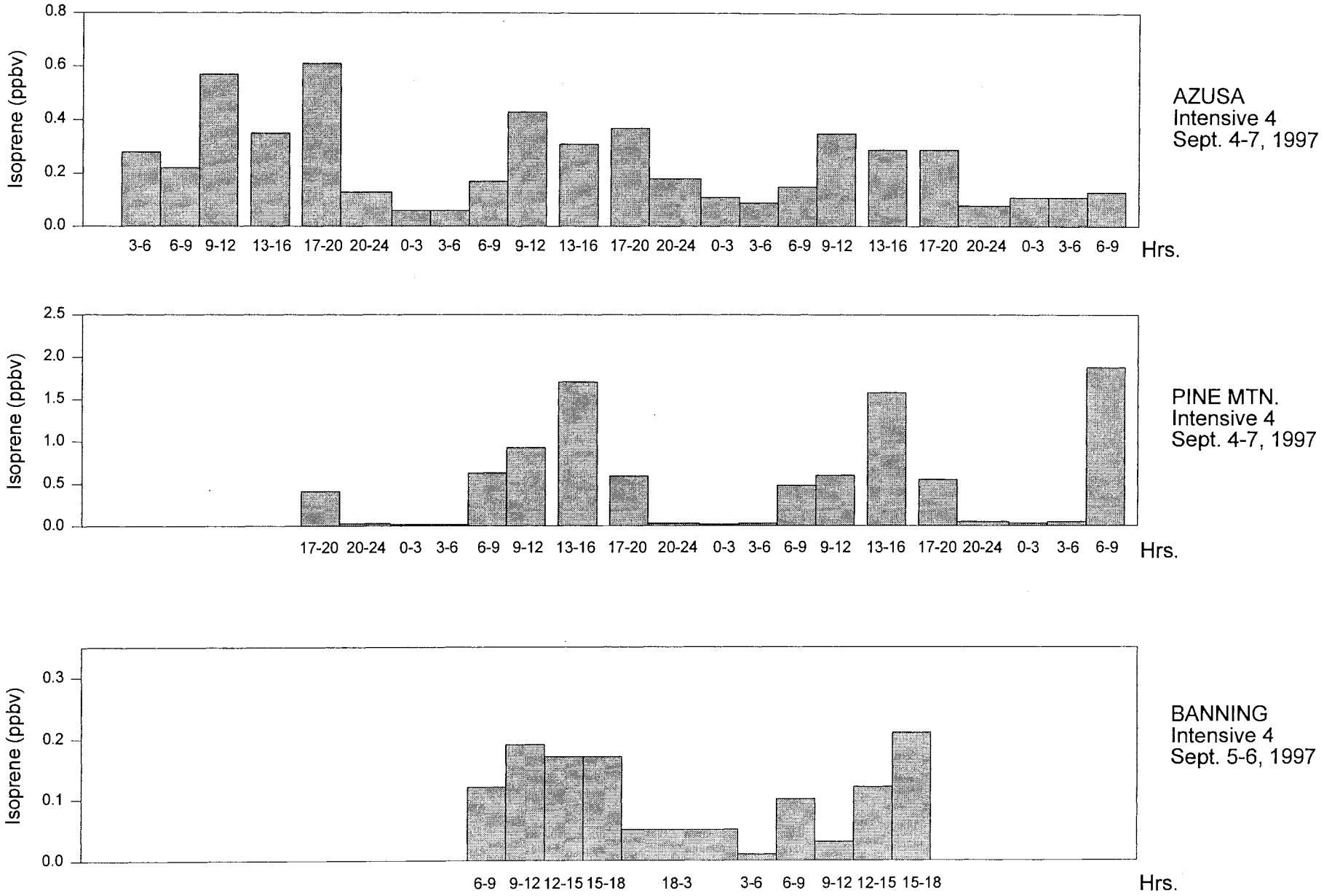


Figure 3. Isoprene values during Intensive 3, Aug. 22-23, 1997.



'gure 4. Isoprene values during Intensive 4, Sept. 4-7, 1997

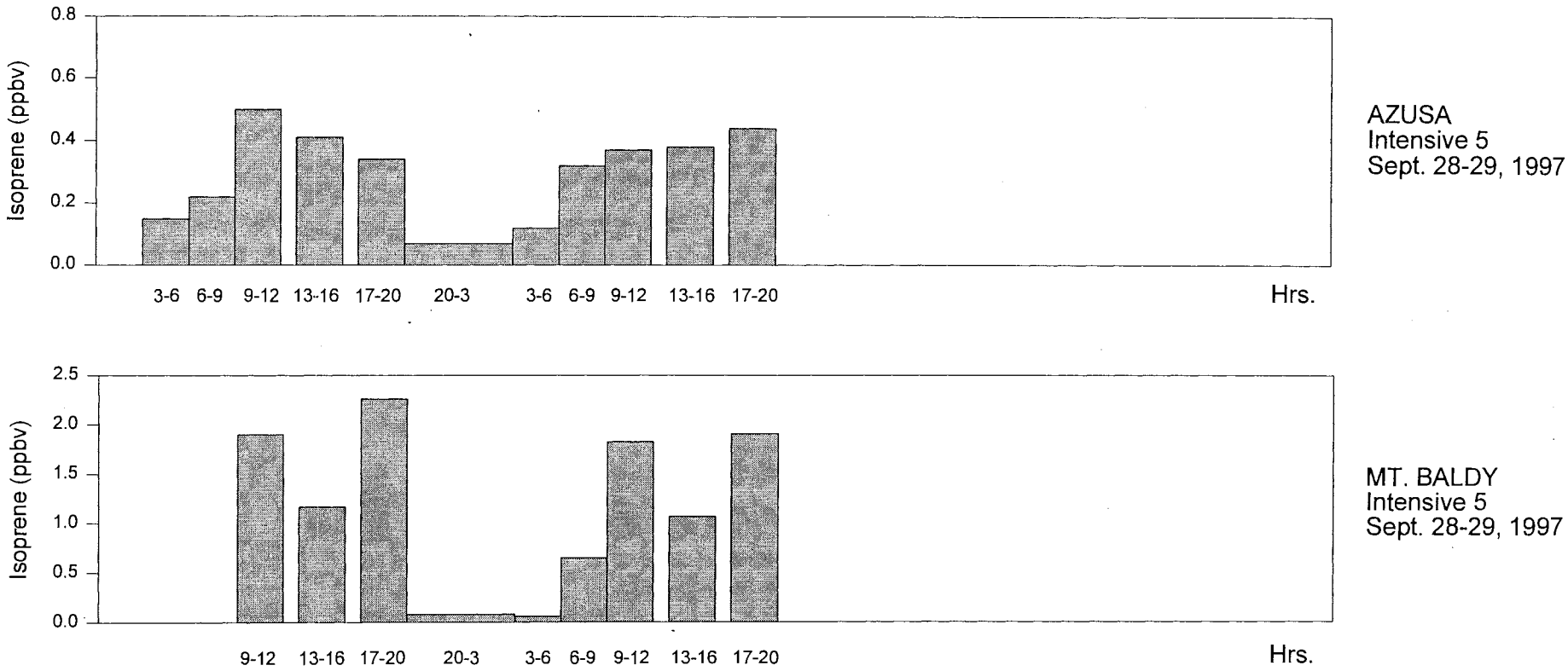


Figure 5. Isoprene values during Intensive 5, Sept. 28-29, 1997.

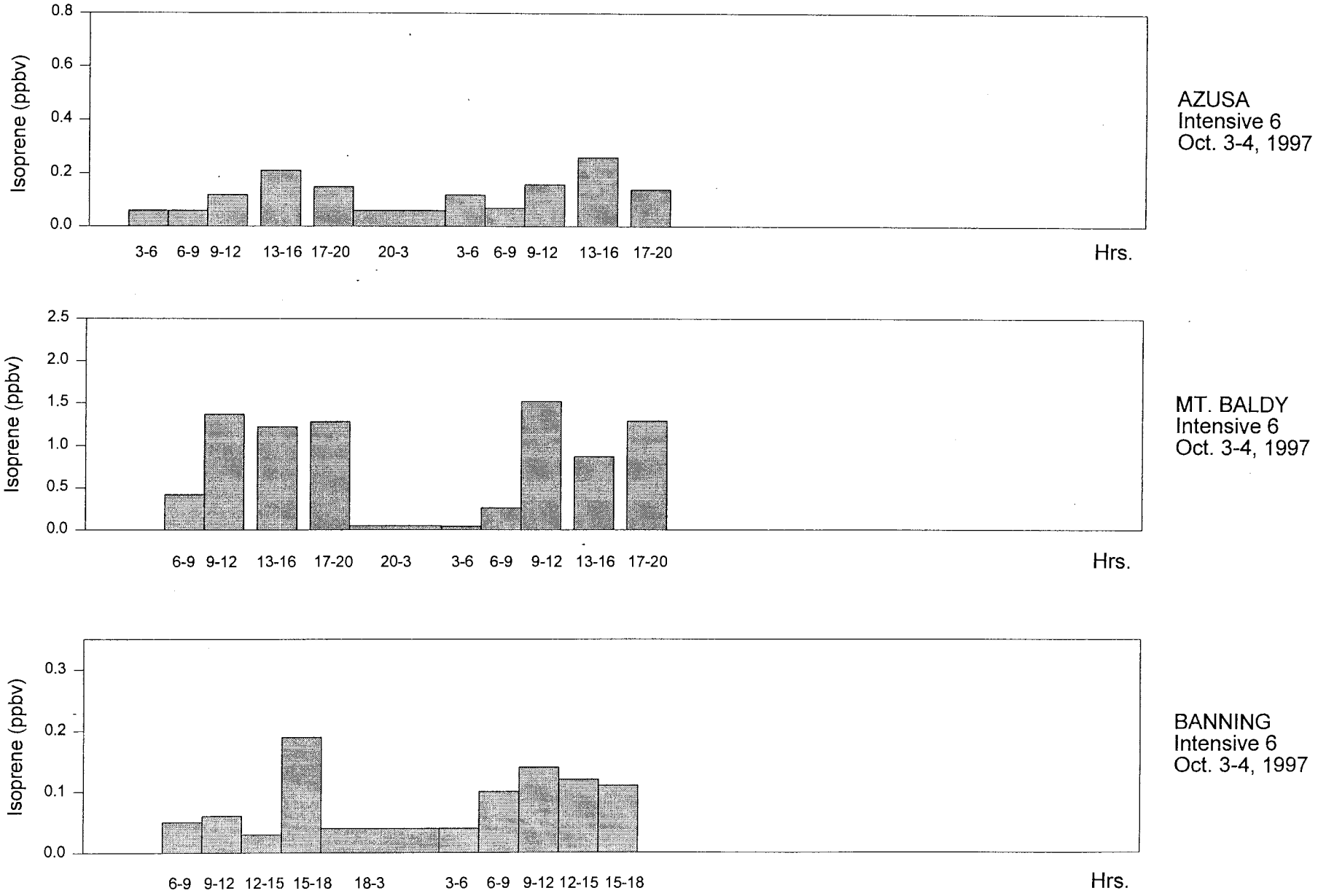


Figure 6. Isoprene values during Intensive 6, Oct. 3-4, 1997.

4.3 Monoterpenes

Average mixing ratios for α-pinene, camphene, sabinene, β-pinene, limonene, 1,8-cineole and camphor for the five intensive SCOS97 sampling periods are given in Tables 7 through 10. The replicate sample values are given in the Appendix, Tables B-1.1 through B-1.4 and C-1.1 through C-1.4. The results are reported in ppbv, calculated for 760 Torr and 0°C. The isoprene and monoterpene concentrations measured at Azusa for each of the five intensive sampling periods are shown in Figures 7 through 11 with isoprene, α-pinene and limonene shown individually and the remaining biogenic hydrocarbons shown as their sum. The sum of the BHC at Azusa reached almost 5 ppbv during the 0600-0900 sampling period on Sept. 28, 1997. As may be seen from Figure 10, this high BHC concentration was largely due to limonene which reached 3.8 ppbv during this sampling period. During the early morning hours on Aug. 22 (0300-0900), high limonene concentrations were also observed (Figure 8), suggesting a potential anthropogenic source for this BHC at Azusa. In general, during the evening and early morning hours at Azusa, the monoterpene concentrations equalled or exceeded the isoprene concentrations observed.

At the Los Angeles North Main St. site, monitored only during the Aug. 22-23 intensive (Figure 12), the monoterpenes again dominated over isoprene during the nighttime and early morning sampling periods. The BHC concentrations measured at Banning were lower than at the other sampling sites. The data for Intensive 4 (Sept. 5-6) are shown in Figure 13. Unlike at Azusa and LA North Main, limonene never was the most abundant BHC at Banning.

Representative BHC data for the mountain sites are shown in Figures 14 (Pine Mountain) and 15 (Mt. Baldy). At both mountain sites isoprene clearly dominates the BHC profile and consequently during the nighttime the total BHC concentrations are substantially lower than the daytime values.

Table 7. Average mixing ratios for α-pinene, camphene, sabinene, β-pinene, limonene, 1,8-cineole and camphor at Azusa.

AZUSA	Date	Sampling	α-Pinene ppbv	Camphene ppbv	Sabinene ppbv	β-Pinene ppbv	Limonene ppbv	1,8-Cineole ppbv	Camphor ppbv
Aug 4-6, 1997	8/4/97	0600-0900	0.320	0.011	0.345	0.045	0.188	0.043	0.022
	8/4/97	0907-1206	0.111	0.005	0.103	0.016	0.092	0.041	0.018
	8/4/97	1306-1603	0.028	0.003	0.016	0.008	0.080	0.022	0.011
	8/4/97	1700-2000	0.045	0.004	0.028	0.015	0.095	0.033	0.007
	8/4/97	2006-0300	0.180	0.008	0.153	0.037	0.190	0.037	0.013
	8/5/97	0307-0600	0.377	0.021	0.168	0.102	0.568	0.076	0.032
	8/5/97	0618-0900	0.221	0.014	0.090	0.062	0.278	0.100	0.058
	8/5/97	0907-1202	0.122	0.006	0.112	0.020	0.100	0.053	0.031
	8/5/97	1300-1600	0.033	0.004	0.019	0.011	0.081	0.031	0.019
	8/5/97	1701-2000	0.047	0.004	0.028	0.016	0.074	0.026	0.017
	8/5- 8/6/97	2005-0300	0.298	0.013	0.262	0.050	0.251	0.053	0.022
	8/6/97	0306-0600	0.453	0.016	0.376	0.068	0.372	0.072	0.024
	8/6/97	0616-0900	0.349	0.017	0.206	0.063	0.455	0.077	0.035
	8/6/97	0906-1200	0.081	0.007	0.037	0.016	0.128	0.047	0.027
	8/6/97	1300-1600	0.030	0.003	0.016	0.009	0.094	0.026	0.017
	8/6/97	1700-2000	0.032	0.002	0.015	0.010	0.054	0.016	0.006
Aug 22-23, 1997	8/22/97	0318-0600*	0.167	0.140	0.018	0.007	2.297	0.044	0.038
	8/22/97	0610-0900*	0.374	0.008	0.256	0.060	0.693	0.064	0.030
	8/22/97	0905-1157	0.105	0.013	0.016	0.017	0.148	0.046	0.021
	8/22/97	1210-1500*	0.039	0.007	0.002	0.003	0.121	0.024	0.012
	8/22/97	1504-1800	0.034	0.005	0.005	0.008	0.165	0.027	0.010
	8/22-23/97	1815-0300	0.143	0.009	0.050	0.025	0.199	0.030	0.012
	8/23/97	0304-0600*	0.437	0.011	0.261	0.067	0.475	0.051	0.019
	8/23/97	0615-0900*	0.388	0.013	0.140	0.043	0.465	0.041	0.024
	8/23/97	0903-1200*	0.093	0.004	0.032	0.011	0.080	0.032	0.016
	8/23/97	1208-1500	0.016	0.005	0.003	0.002	0.043	0.020	0.010
	8/23/97	1505-1800*	0.004	0.019	0.001	-**	0.030	0.011	0.005

Table 7. Average mixing ratios for α-pinene, camphene, sabinene, β-pinene, limonene, 1,8-cineole and camphor at Azusa (continued).

AZUSA	Date	Sampling	α-Pinene ppbv	Camphene ppbv	Sabinene ppbv	β-Pinene ppbv	Limonene ppbv	1,8-Cineole ppbv	Camphor ppbv
Sep 4-7, 1997	9/4/97	0300-0600	0.527	0.011	0.261	0.074	0.636	0.026	0.017
	9/4/97	0606-0900	0.214	0.006	0.034	0.023	0.291	0.031	0.036
	9/4/97	0904-1200	0.091	0.003	0.022	0.011	0.122	0.030	0.028
	9/4/97	1300-1600	0.021	0.006	0.006	0.006	0.107	0.035	0.021
	9/4/97	1700-2000	0.042	0.012	0.009	0.010	0.278	0.032	0.011
	9/4/97	2014-2400	0.129	0.004	0.035	0.011	0.153	0.015	0.009
	9/5/97	0006-0300	0.115	0.010	0.010	0.008	0.113	0.021	0.010
	9/5/97	0305-0600	0.284	0.005	0.152	0.030	0.285	0.029	0.019
	9/5/97	0615-0900*	0.392	0.010	0.108	0.039	0.498	0.034	0.023
	9/5/97	0903-1200	0.125	0.006	0.029	0.016	0.163	0.031	0.023
	9/5/97	1300-1600	0.018	0.002	0.003	0.003	0.129	0.016	0.007
	9/5/97	1700-2000	0.036	0.003	0.003	0.006	0.059	0.010	0.004
	9/5/97	2006-2400	0.100	0.004	0.031	0.015	0.180	0.015	0.007
	9/6/97	0008-0300	0.282	0.007	0.169	0.021	0.283	0.019	0.013
	9/6/97	0306-0600	0.251	0.007	0.031	0.030	0.253	0.019	0.016
	9/6/97	0615-0900	0.329	0.011	0.010	0.036	0.274	0.035	0.026
	9/6/97	0903-1200	0.101	0.004	0.024	0.013	0.064	0.033	0.023
	9/6/97	1300-1600	0.019	0.004	0.002	0.003	0.104	0.013	0.007
	9/6/97	1700-1959	0.022	0.003	0.007	0.005	0.097	0.008	0.002
	9/6/97	2010-2400	0.042	0.003	0.015	0.007	0.097	0.010	0.007
	9/7/97	0005-0300*	0.287	0.009	0.036	0.015	0.274	0.020	0.015
	9/7/97	0306-0600	0.465	0.010	0.305	0.043	0.637	0.036	0.031
	9/7/97	0604-0900	0.385	0.010	0.138	0.033	0.672	0.045	0.038

Table 7. Average mixing ratios for α-pinene, camphene, sabinene, β-pinene, limonene, 1,8-cineole and camphor at Azusa (continued).

AZUSA	Date	Sampling	α-Pinene ppbv	Camphene ppbv	Sabinene ppbv	β-Pinene ppbv	Limonene ppbv	1,8-Cineole ppbv	Camphor ppbv
Sep 28-29, 1997	9/28/97	0301-0600	0.252	0.024	0.026	0.054	0.402	0.077	0.037
	9/28/97	0609-0900	0.274	0.010	0.230	0.073	3.798	0.063	0.035
	9/28/97	0904-1200	0.069	0.005	0.023	0.012	0.081	0.042	0.033
	9/28/97	1300-1600	0.024	0.002	0.015	0.008	0.061	0.038	0.026
	9/28/97	1700-2000	0.016	0.004	0.007	0.007	0.056	0.027	0.016
	9/28-29/97	2015-0300	0.097	0.006	0.061	0.017	0.123	0.028	0.014
	9/29/97	0310-0600	0.222	0.011	0.189	0.051	0.599	0.063	0.042
	9/29/97	0616-0858	0.178	0.044	0.012	0.015	0.669	0.044	0.030
	9/29/97	0900-1200	0.096	0.004	0.086	0.020	0.115	0.058	0.030
	9/29/97	1300-1600	0.026	0.002	0.021	0.009	0.195	0.042	0.026
	9/29/97	1700-2000	0.009	0.026	0.004	0.003	0.195	0.029	0.021
Oct 3-4, 1997	10/3/97	0301-0600	0.041	0.006	0.016	0.007	0.105	0.022	0.012
	10/3/97	0614-0900	0.058	0.005	0.042	0.013	0.153	0.056	0.034
	10/3/97	0904-1200	0.033	0.005	0.012	0.007	0.098	0.038	0.041
	10/3/97	1300-1600	0.022	0.005	0.006	0.006	0.091	0.042	0.031
	10/3/97	1700-2000	0.016	0.004	0.010	0.010	0.105	0.025	0.013
	10/3-4/97	2011-0300	0.093	0.004	0.045	0.010	0.067	0.021	0.012
	10/4/97	0304-0600	0.023	0.131	0.006	0.006	0.122	0.025	0.041
	10/4/97	0612-0900	0.080	0.007	0.021	0.018	0.137	0.061	0.052
	10/4/97	0901-1200	0.011	0.053	0.006	0.006	0.125	0.039	0.051
	10/4/97	1300-1600	0.014	0.010	0.010	0.006	0.049	0.021	0.018
	10/4/97	1700-2000	0.014	0.004	0.007	0.006	0.087	0.016	0.012

*Single sample value reported. See Appendix for details.
**Not detected.

Table 8. Average mixing ratios for α-pinene, camphene, sabinene, β-pinene, limonene, 1,8-cineole and camphor at Pine Mtn. and Mt. Baldy.

PINE MTN.	Date	Sampling	α-Pinene ppbv	Camphene ppbv	Sabinene ppbv	β-Pinene ppbv	Limonene ppbv	1,8-Cineole ppbv	Camphor ppbv
Aug 4-6, 1997	8/4/97	1710-2000	0.021	0.007	0.011	0.005	0.011	0.024	0.025
	08/4-08/5/97	2025-0259	0.001	0.005	0.001	0.0003	0.005	0.015	0.021
	8/5/97	0314-0559	0.001	0.001	0.001	0.0003	0.002	0.006	0.008
	8/5/97	0617-0858	0.016	0.002	0.003	0.005	0.011	0.005	0.004
	8/5/97	0911-1200	0.053	0.008	0.031	0.007	0.012	0.031	0.030
	8/5/97	1302-1600*	0.038	0.011	0.009	0.007	0.012	0.047	0.055
	8/5/97	1700-2000	0.028	0.008	0.016	0.006	0.008	0.033	0.048
	8/5/97	2015-0255	0.003	0.001	0.001	0.001	0.003	0.016	0.029
	8/6/97	0310-0600	0.005	0.001	0.001	0.002	0.004	0.004	0.006
	8/6/97	0615-0900	0.016	0.006	0.002	0.004	0.008	0.007	0.010
	8/6/97	0915-1200	0.031	0.005	0.018	0.004	0.009	0.023	0.028
	8/6/97	1300-1600	0.040	0.011	0.015	0.007	0.011	0.056	0.058
Sep 4-7, 1997	9/4/97	1702-2000	0.014	0.007	0.014	0.003	0.012	0.009	0.011
	9/4/97	2008-2400	0.001	0.001	0.001	0.001	0.003	0.008	0.008
	9/5/97	0010-0338	0.001	0.008	0.001	0.002	0.004	-**	0.003
	9/5/97	0349-0600	0.001	0.005	0.002	0.001	0.006	0.006	0.004
	9/5/97	0615-0900	0.005	0.014	0.002	0.002	0.005	-**	0.005
	9/5/97	0908-1200	0.029	0.003	0.013	0.002	0.008	0.009	0.013
	9/5/97	1300-1600	0.029	0.005	0.005	0.003	0.008	0.012	0.015
	9/5/97	1700-2000	0.028	0.004	0.013	0.004	0.009	0.009	0.010
	9/5/97	2007-2355	0.001	-**	0.001	-**	-**	0.006	0.007
	9/6/97	0000-0255	0.001	-**	0.001	0.001	0.003	0.005	0.005
	9/6/97	0301-0600	0.001	0.001	0.001	0.001	0.002	-**	0.004
	9/6/97	0610-0900	0.004	0.002	0.001	0.001	0.003	0.006	0.006
	9/6/97	0905-1200	0.015	0.004	0.004	0.002	0.006	0.009	0.011
	9/6/97	1300-1600	0.015	0.004	0.005	0.002	0.005	0.011	0.011
	9/6/97	1700-2000	0.018	0.005	0.005	0.003	0.006	0.009	0.010
	9/6/97	2007-2355	0.001	0.001	0.001	0.001	0.003	0.004	0.005
	9/7/97	0000-0255	0.001	0.009	0.002	0.002	0.003	-**	0.004
	9/7/97	0300-0555	0.001	0.001	0.002	0.002	0.003	0.009	0.003
	9/7/97	0600-0900	0.006	0.002	0.003	0.002	0.004	-**	0.001

Table 8. Average mixing ratios for α-pinene, camphene, sabinene, β-pinene, limonene, 1,8-cineole and camphor at Pine Mtn. and Mt. Baldy (continued).

MT. BALDY	Date	Sampling	α-Pinene ppbv	Camphene ppbv	Sabinene ppbv	β-Pinene ppbv	Limonene ppbv	1,8-Cineole ppbv	Camphor ppbv
Sep 28-29, 1997	9/28/97	0904-1200	0.208	0.008	0.023	0.060	0.056	0.014	0.013
	9/28/97	1300-1600	0.101	0.005	0.016	0.024	0.021	0.022	0.016
	9/28/97	1700-2000	0.132	0.014	0.007	0.040	0.030	0.022	0.012
	9/28-29/97	2005-0300	0.052	0.006	0.005	0.035	0.011	0.019	0.010
	9/29/97	0307-0600	0.058	0.005	0.006	0.038	0.012	0.014	0.008
	9/29/97	0606-0900	0.076	0.006	0.009	0.043	0.017	0.016	0.007
	9/29/97	0903-1200	0.083	0.012	0.004	0.015	0.030	0.020	0.011
	9/29/97	1300-1600	0.053	0.007	0.009	0.010	0.016	0.012	0.008
	9/29/97	1700-2000	0.084	0.010	0.007	0.031	0.022	0.019	0.009
Oct 3-4, 1997	10/3/97	0619-0900	0.040	0.006	0.009	0.022	0.023	0.018	0.026
	10/3/97	0903-1200	0.050	0.008	0.007	0.017	0.034	0.031	0.041
	10/3/97	1301-1600*	0.050	0.007	0.011	0.010	0.010	0.023	0.019
	10/3/97	1703-2003	0.035	0.008	0.008	0.014	0.019	0.043	0.025
	10/3-4/97	2010-0302	0.020	0.003	0.003	0.015	0.005	0.012	0.011
	10/4/97	0310-0601	0.025	0.005	0.003	0.020	0.007	0.013	0.007
	10/4/97	0612-0900*	0.046	0.005	0.008	0.033	0.019	0.016	0.007
	10/4/97	0903-1200	0.063	0.009	0.003	0.011	0.020	0.015	0.008
	10/4/97	1300-1600	0.046	0.006	0.010	0.011	0.011	0.027	0.021
	10/4/97	1700-2000	0.039	0.007	0.006	0.013	0.018	0.035	0.024

*Single sample value reported. See Appendix for details
**Not detected.

Table 9. Average mixing ratios for α-pinene, camphene, sabinene, β-pinene, limonene, 1,8-cineole and camphor at Banning.

BANNING	Date	Sampling	α-Pinene ppbv	Camphene ppbv	Sabinene ppbv	β-Pinene ppbv	Limonene ppbv	1,8-Cineole ppbv	Camphor ppbv
Aug 4-6, 1997	8/4/97	0600-0855	0.035	0.003	0.010	0.006	0.011	0.020	0.015
	8/4/97	0902-1157	0.014	0.001	0.007	0.004	0.004	0.005	0.004
	8/4/97	no sample	-	-	-	-	-	-	-
	8/4/97	1504-1800	0.011	0.002	0.004	0.003	0.007	0.015	0.018
	8/4-5/1997	1807-0255	0.008	0.001	0.002	0.003	0.006	0.022	0.009
	8/5/97	0303-0550	0.021	0.002	0.002	0.005	0.027	0.018	0.010
	8/5/97	0604-0855	0.060	0.005	0.007	0.012	0.023	0.020	0.013
	8/5/97	0901-1153	0.032	0.001	0.002	0.010	0.005	0.005	0.007
	8/5/97	1159-1452	0.031	0.002	0.006	0.005	0.006	0.003	0.003
	8/5/97	1458-1800	0.019	0.001	0.002	0.006	0.006	0.005	0.004
	8/5- 8/6/97	1816-0255	0.008	0.002	0.001	0.002	0.007	0.035	0.025
	8/6/97	0301-0550	0.004	0.001	0.003	0.002	0.003	0.010	0.010
	8/6/97	0605-0855	0.033	0.001	0.004	0.012	0.004	0.003	0.002
	8/6/97	0901-1150	0.044	0.002	0.003	0.012	0.005	0.003	0.002
	8/6/97	1155-1455	0.047	0.001	0.005	0.017	0.005	0.003	0.002
	8/6/97	1500-1800	0.024	0.002	0.003	0.007	0.004	0.012	0.012
Aug 22-23, 1997	8/22/97	0600-0855	0.039	0.003	0.004	0.005	0.027	0.012	0.007
	8/22/97	0900-1155	0.019	0.002	0.002	0.002	0.008	0.012	0.007
	8/22/97	1200-1455	0.009	0.002	0.001	0.001	0.003	0.024	0.031
	8/22/97	1500-1800	0.010	0.002	0.001	0.002	0.004	0.014	0.013
	8/22-23/97	1813-0300	0.005	0.002	0.001	0.001	0.008	0.030	0.019
	8/23/97	0303-0555	0.001	0.002	0.002	-**	0.003	0.017	0.015
	8/23/97	0603-0900	0.014	0.002	0.002	0.002	0.003	0.012	0.011
	8/23/97	0903-1200	0.007	0.001	0.001	0.001	0.002	0.006	0.006
	8/23/97	1202-1500	0.004	0.004	0.001	0.0005	0.002	0.007	0.005
	8/23/97	1502-1800	0.005	0.001	0.0005	0.001	0.002	0.009	0.012

Table 9. Average mixing ratios for α-pinene, camphene, sabinene, β-pinene, limonene, 1,8-cineole and camphor at Banning (continued).

BANNING	Date	Sampling	α-Pinene ppbv	Camphene ppbv	Sabinene ppbv	β-Pinene ppbv	Limonene ppbv	1,8-Cineole ppbv	Camphor ppbv
Sep 5-6, 1997	9/5/97	0600-0855	0.064	0.005	0.004	0.007	0.016	0.038	0.013
	9/5/97	0900-1155	0.010	0.002	0.002	0.001	0.003	0.013	0.005
	9/5/97	1158-1458	0.009	0.001	0.001	0.001	0.003	0.007	0.006
	9/5/97	1501-1800	0.007	0.001	0.001	0.001	0.003	0.009	0.008
	9/5-6/97	1824-0257*	0.010	0.001	0.001	0.002	0.008	0.018	0.013
	9/6/97	0308-0550*	0.017	0.002	0.002	0.003	0.010	0.023	0.010
	9/6/97	0610-0855*	0.012	0.010	0.002	0.002	0.021	0.033	0.007
	9/6/97	0900-1158	0.016	0.003	0.001	0.005	0.014	-**	0.002
	9/6/97	1202-1458	0.007	0.001	0.001	0.001	0.003	0.009	0.008
	9/6/97	1502-1800*	0.007	0.001	0.001	0.001	0.004	0.011	0.010
Oct 3-4, 1997	10/3/97	0600-0858*	0.014	0.023	0.001	0.002	0.028	0.024	0.023
	10/3/97	0900-1158	0.003	0.073	-**	-**	0.021	0.010	0.013
	10/3/97	1200-1458	0.003	0.049	0.001	-**	0.016	-**	0.004
	10/3/97	1500-1800*	0.007	0.004	0.001	0.002	0.007	0.016	0.008
	10/3-4/97	1807-0258*	0.009	0.010	0.001	0.002	0.032	0.032	0.024
	10/4/97	0300-0553	0.192	0.009	0.004	0.024	0.058	0.077	0.033
	10/4/97	0601-0858	0.336	0.012	0.006	0.035	0.044	0.057	0.018
	10/4/97	0900-1158	0.018	0.003	0.001	0.003	0.009	0.026	0.013
	10/4/97	1200-1458	0.007	0.002	0.002	0.001	0.005	0.017	0.011
	10/4/97	1500-1800	0.006	0.003	0.001	0.001	0.016	0.013	0.008

*Single sample value reported. See Appendix for details.
**Not detected.

Table 10. Average mixing ratios for α-pinene, camphene, sabinene, β-pinene, limonene, 1,8-cineole and camphor at Los Angeles, North Main Street.

LOS ANGELES N. MAIN ST.	Date	Sampling	α-Pinene ppbv	Camphene ppbv	Sabinene ppbv	β-Pinene ppbv	Limonene ppbv	1,8-Cineole ppbv	Camphor ppbv
Aug 22-23, 1997	8/22/97	0558-0855	0.292	0.022	0.050	0.032	0.338	0.120	0.047
	8/22/97	0900-1155	0.036	0.027	0.004	0.003	0.120	0.053	0.045
	8/22/97	1202-1457	0.005	0.008	0.002	0.002	0.036	0.018	0.014
	8/22/97	1500-1755	0.004	0.001	0.001	0.002	0.025	0.007	0.005
	8/22-23/97	1806-0556	0.122	0.008	0.004	0.032	0.230	0.039	0.019
	8/23/97	0605-0857	0.172	0.013	0.004	0.020	0.255	0.051	0.027
	8/23/97	0900-1156	0.020	0.004	0.001	0.005	0.032	0.025	0.015
	8/23/97	1202-1458	0.002	0.016	0.0003	0.001	0.010	0.013	0.009
	8/23/97	1500-1800	0.001	0.001	0.0004	0.0004	0.006	-*	0.004

*Not detected.

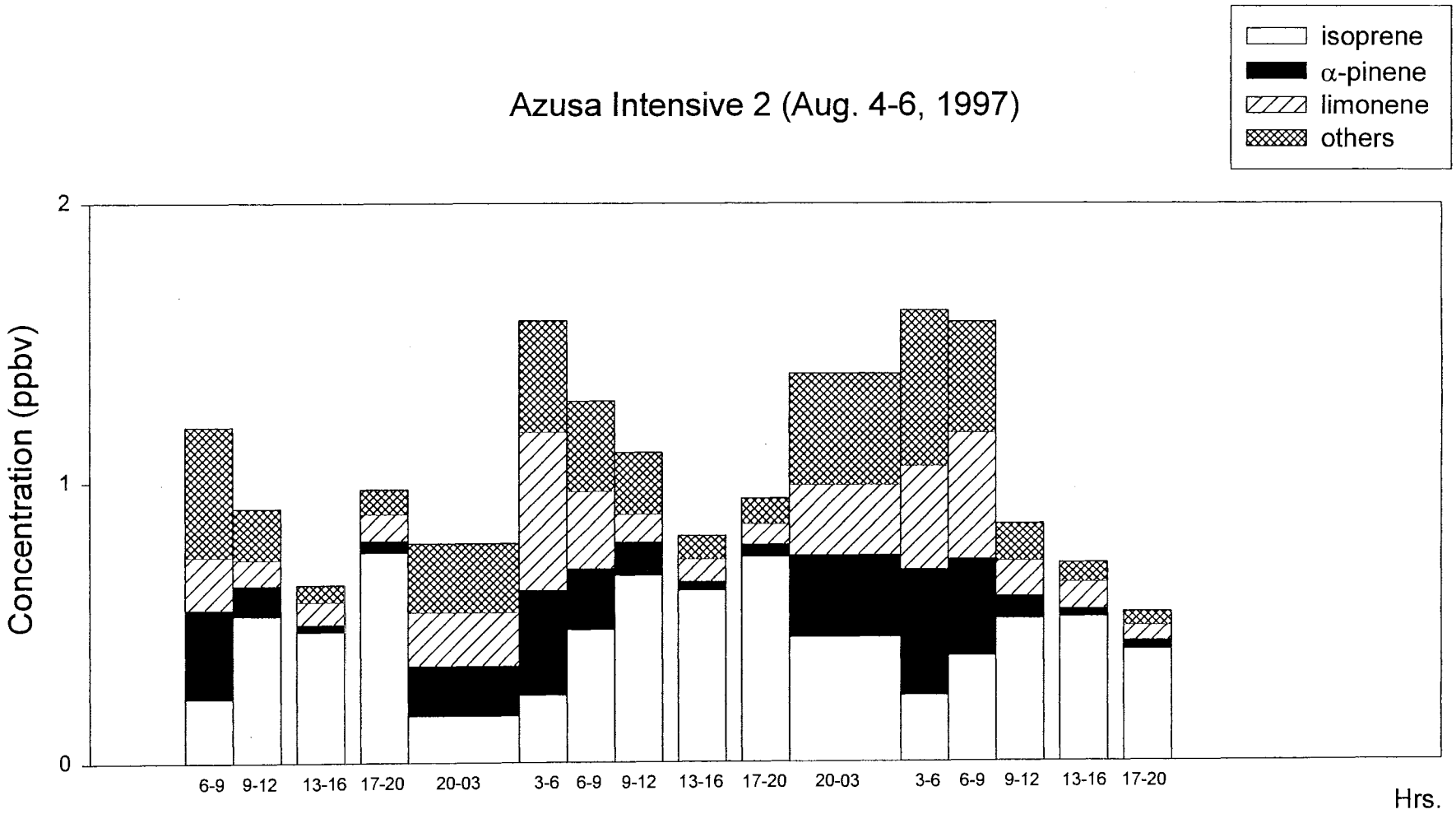


Figure 7. Biogenic hydrocarbons at Azusa during Intensive 2, Aug. 4-6, 1997. Ambient concentrations of isoprene, α-pinene, limonene and the sum of the remaining monoterpenes analyzed (others = camphene + sabinene + β-pinene + cineole + camphor) are shown.

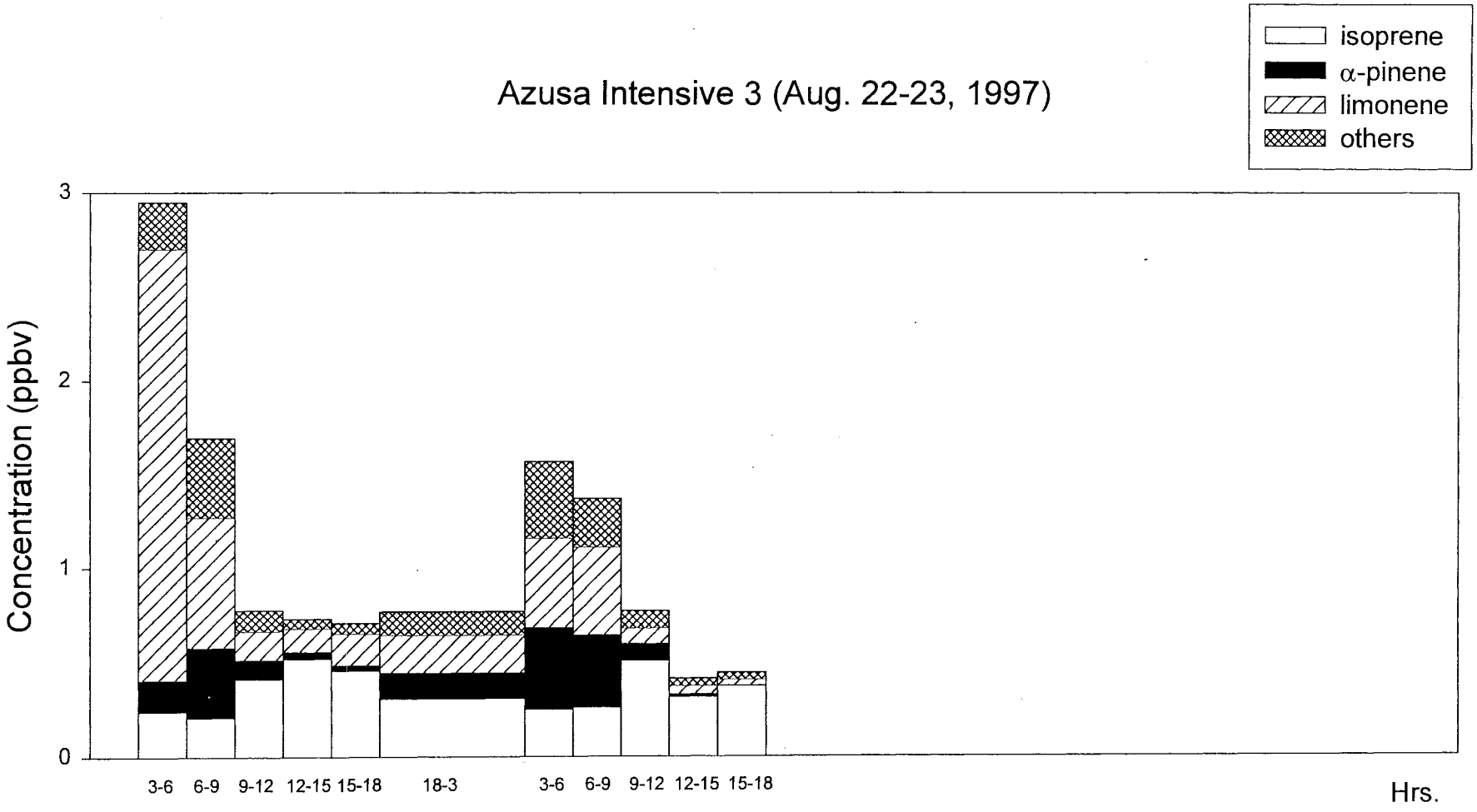


Figure 8. Biogenic hydrocarbons at Azusa during Intensive 3, Aug. 22-23, 1997. Ambient concentrations of isoprene, α-pinene, limonene and the sum of the remaining monoterpenes analyzed (others = camphene + sabinene + β-pinene + cineole + camphor) are shown.

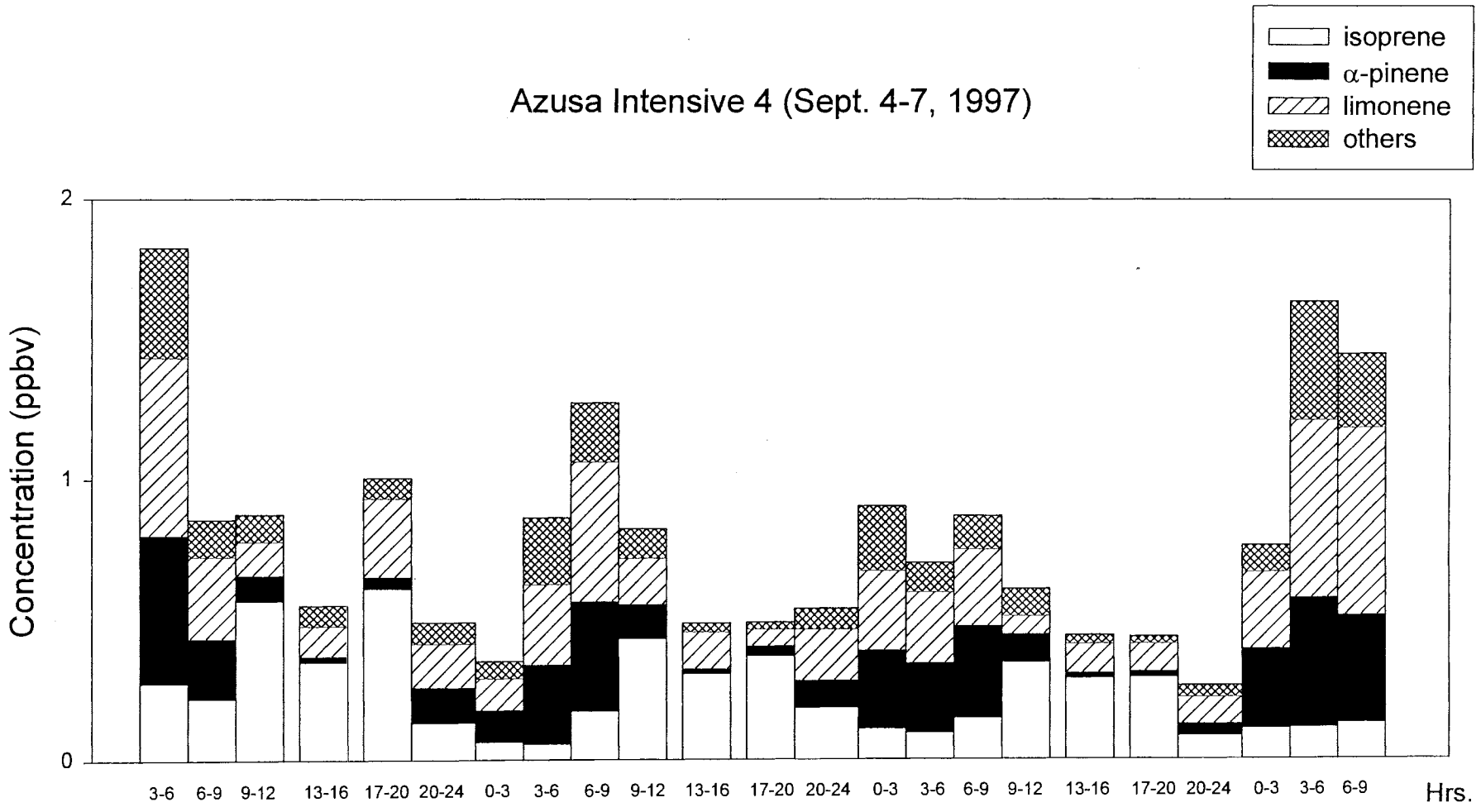


Figure 9. Biogenic hydrocarbons at Azusa during Intensive 4, Sept. 4-7, 1997. Ambient concentrations of isoprene, α-pinene, limonene and the sum of the remaining monoterpenes analyzed (others = camphene + sabinene + β-pinene + cineole + camphor) are shown.

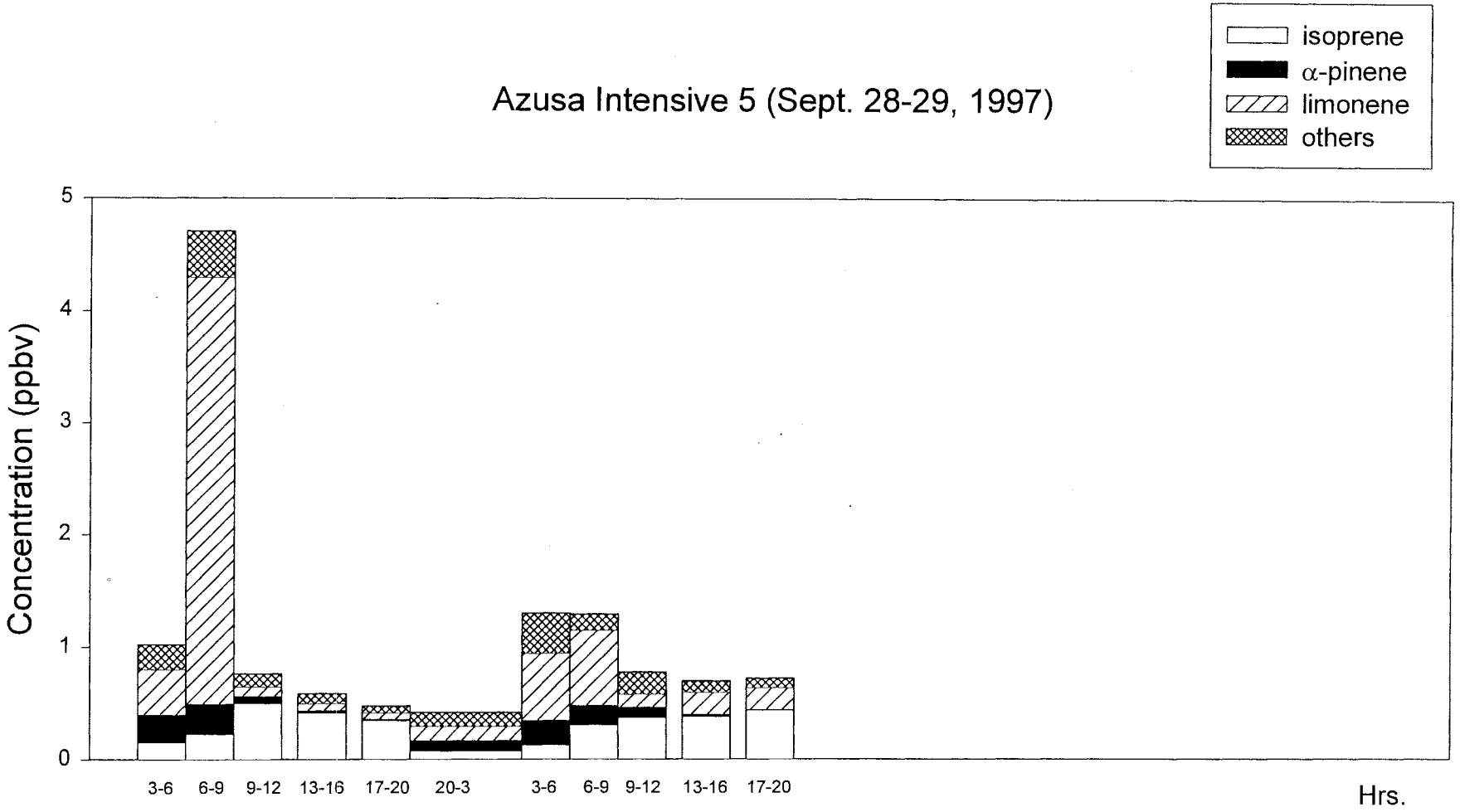


Figure 10. Biogenic hydrocarbons at Azusa during Intensive 5, Sept. 28-29, 1997. Ambient concentrations of isoprene, α-pinene, limonene and the sum of the remaining monoterpenes analyzed (others = camphene + sabinene + β-pinene + cineole + camphor) are shown.

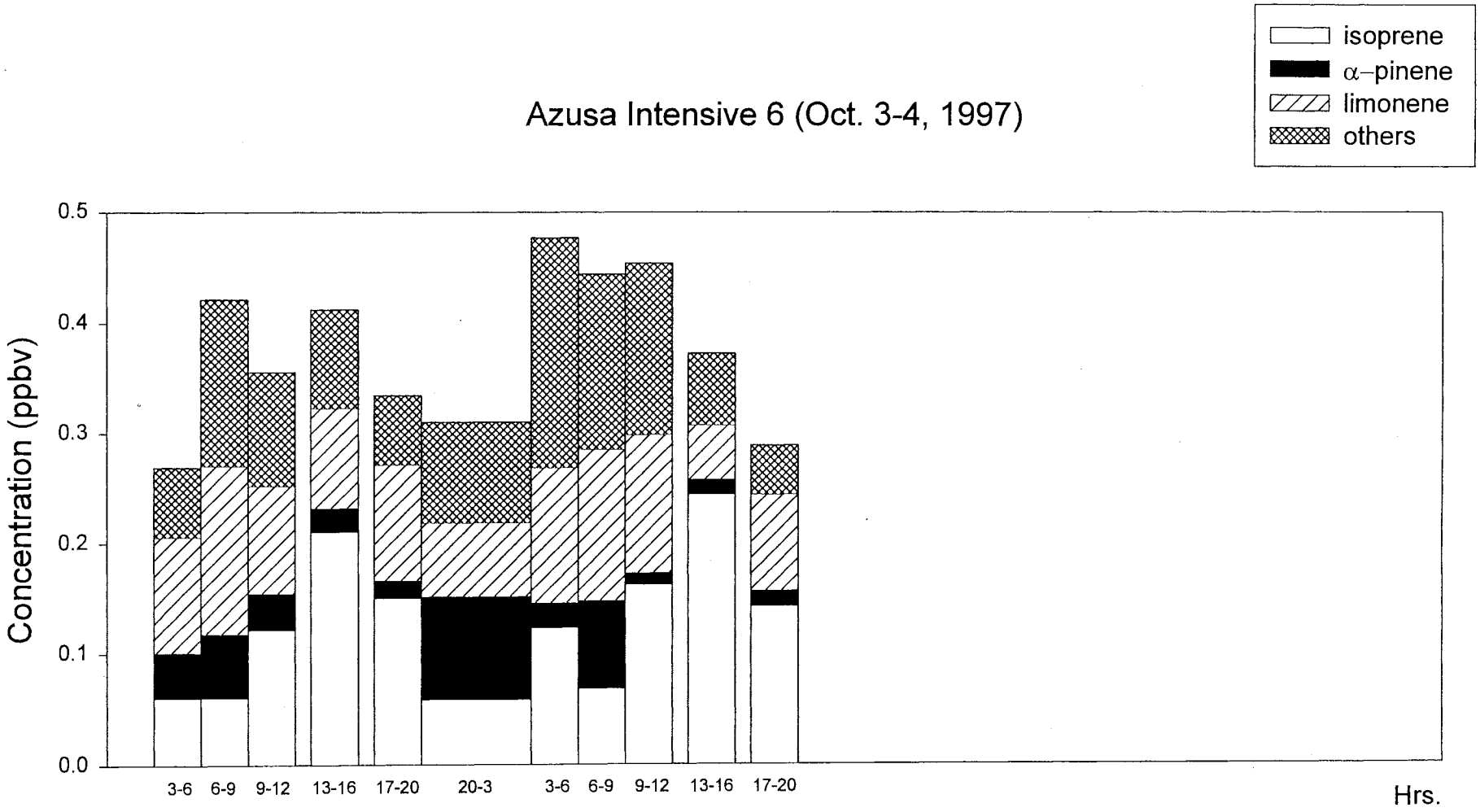


Figure 11. Biogenic hydrocarbons at Azusa during Intensive 6, Oct. 3-4, 1997. Ambient concentrations of isoprene, α-pinene, limonene and the sum of the remaining monoterpenes analyzed (others = camphene + sabinene + β-pinene + cineole + camphor) are shown.

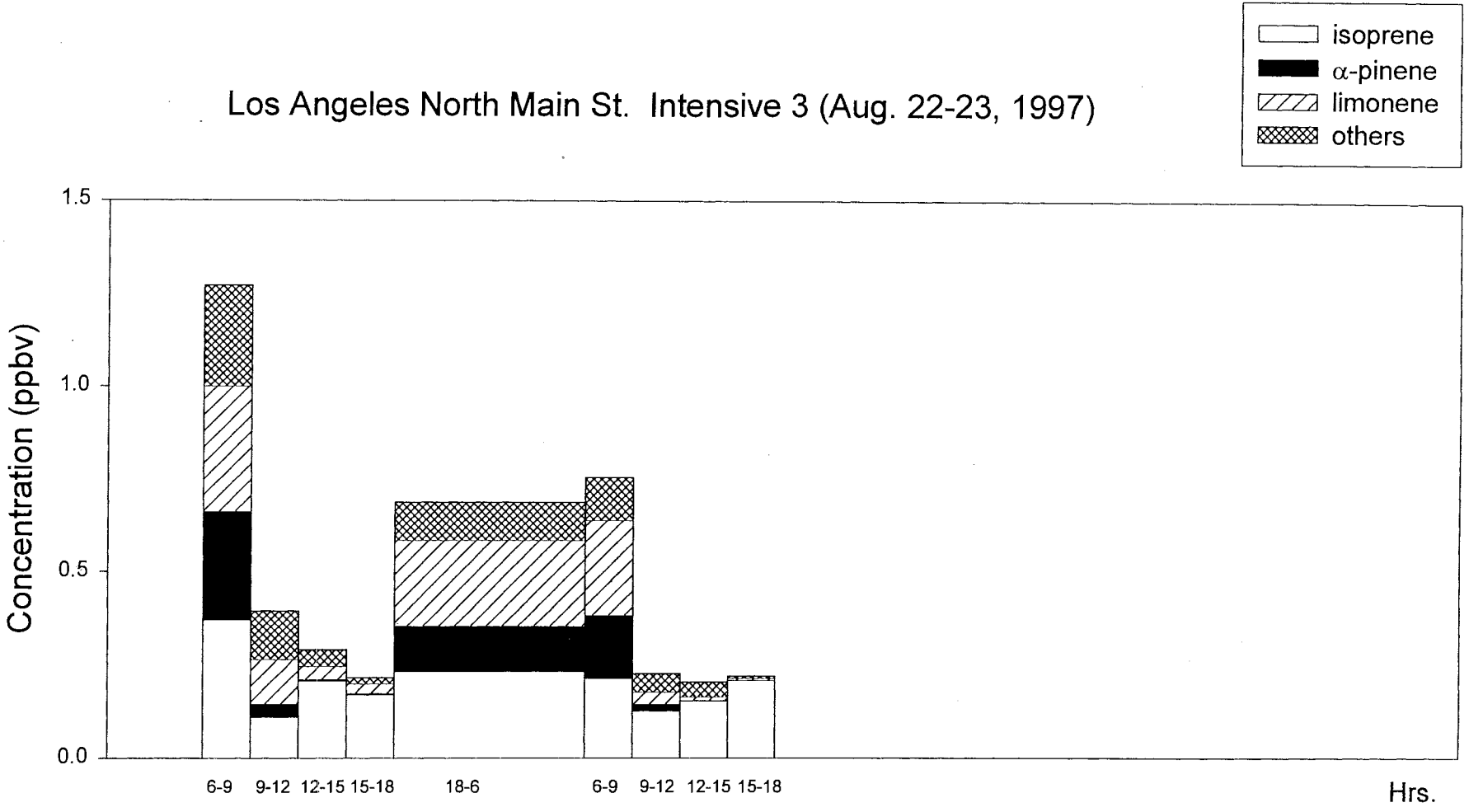


Figure 12. Biogenic hydrocarbons at Los Angeles, North Main St. during Intensive 3, Aug. 22-23, 1997. Ambient concentrations of isoprene, α-pinene, limonene and the sum of the remaining monoterpenes analyzed (others = camphene + sabinene + β-pinene + cineole + camphor) are shown.

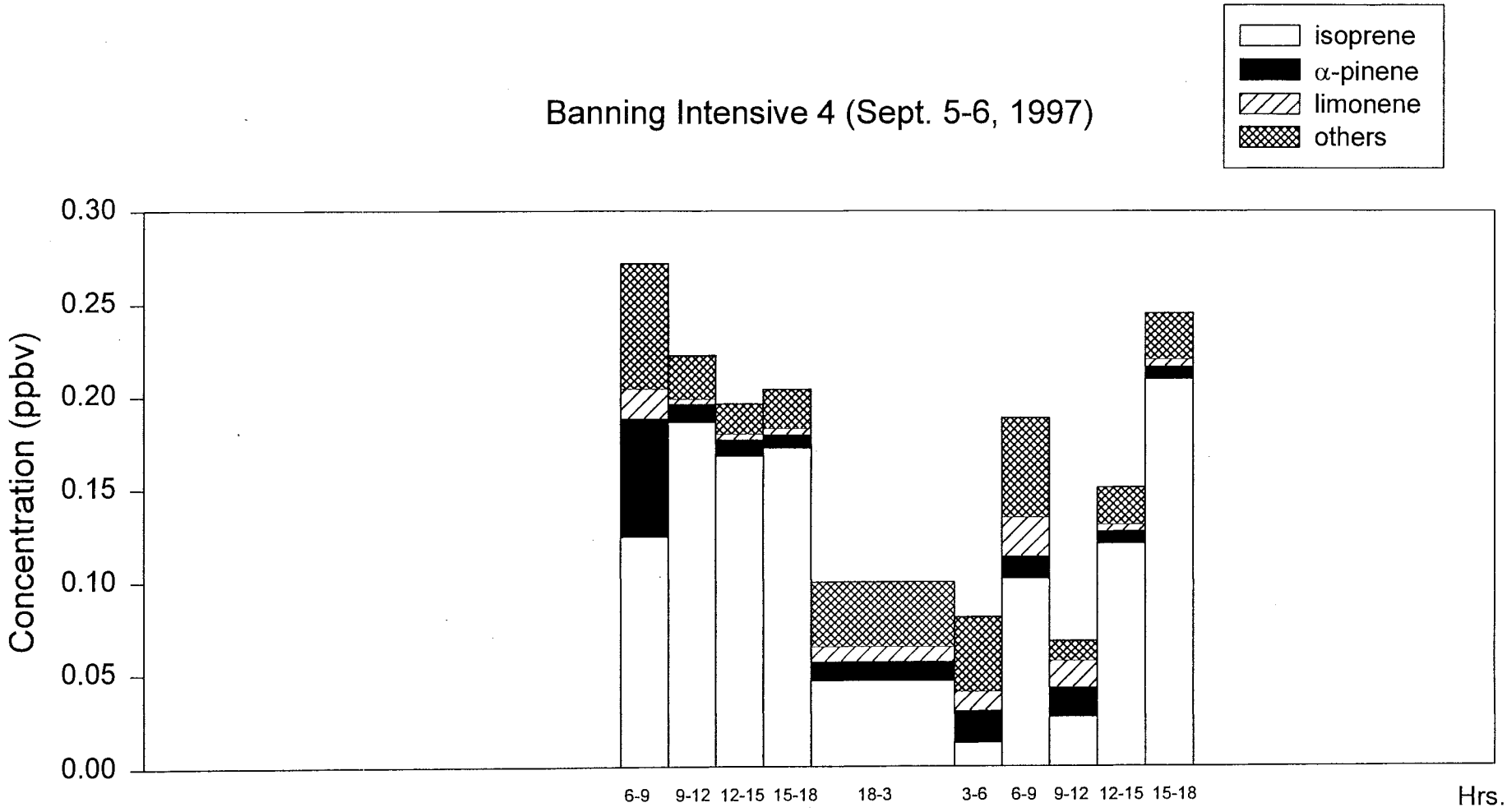


Figure 13. Biogenic hydrocarbons at Banning during Intensive 4, Sept. 5-6, 1997. Ambient concentrations of isoprene, α-pinene, limonene and the sum of the remaining monoterpenes analyzed (others = camphene, sabinene + β-pinene + cineole + camphor) are shown.

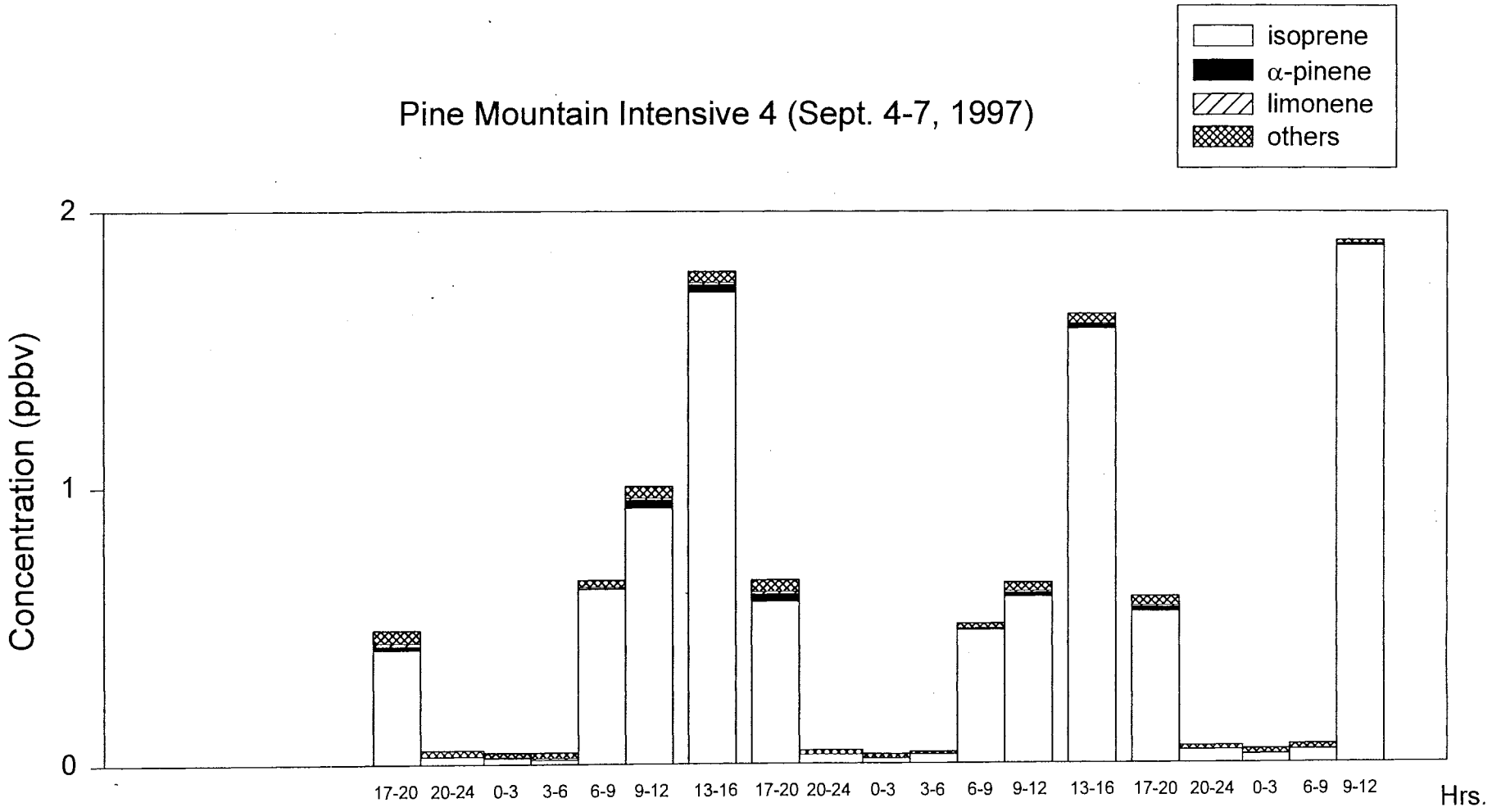


Figure 14. Biogenic hydrocarbons at Pine Mountain during Intensive 4, Sept. 4-7, 1997. Ambient concentrations of isoprene, α-pinene, limonene and the sum of the remaining monoterpenes analyzed (others = camphene + sabinene + β-pinene + cineole + camphor) are shown.

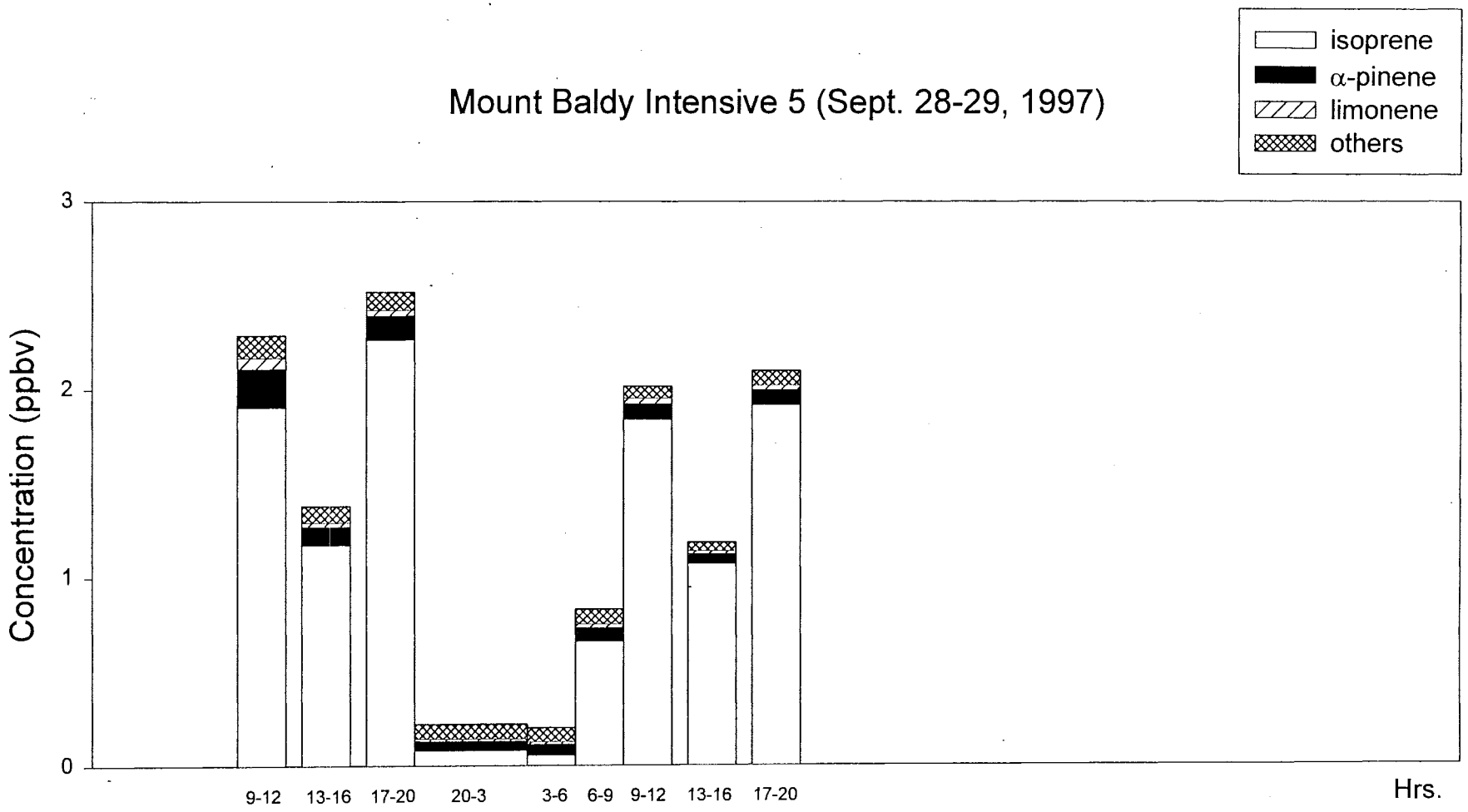


Figure 15. Biogenic hydrocarbons at Mount Baldy during Intensive 5, Sept. 28-29, 1997. Ambient concentrations of isoprene, α–pinene, limonene and the sum of the remaining monoterpenes analyzed (others = camphene + sabinene + β–pinene + cineole + camphor) are shown.

5. Discussion

5.1 Biogenic Hydrocarbon Emissions

Elucidation of the mechanisms by which plants emit BHC has recently received increased attention (Turlings and Tumlinson, 1992; Monson et al., 1995; Nemecek-Marshall et al., 1995; Wildermuth and Fall, 1996; Sharkey, 1996; Lerdau et al., 1997). Isoprene is formed in plants via the mevalonic acid pathway (Sharkey et al., 1991) and its emission rate is species-specific and related to the photosynthetic rate (Loreto and Sharkey, 1993; Monson et al., 1995; Wildermuth and Fall, 1996; Sharkey, 1996; Lerdau et al., 1997). It has been proposed that the production of isoprene aids in thermal protection of plant leaves (Sharkey, 1996; Lerdau et al., 1997), but questions remain regarding why some plants, even within the same genus (e.g., oak trees) contain isoprene-emitting and nonemitting species (Fall, 1999). Isoprene does not build-up in plant tissues; its production represents a loss of fixed carbon from the plant and isoprene emission rates decline immediately when photosynthetic light is removed (Monson et al., 1991). The isoprene emission rate of a plant is a function of light intensity and temperature (Lerdau et al., 1997; Tingey et al., 1979; Guenther et al., 1991; 1993). Generally, the isoprene emission rate increases with light intensity up to a photosynthetically active radiation intensity of ~1000 μmol m^{-2} s^{-1}, above which the emission rate becomes constant, and increases with temperature up to a value of ~40 °C, above which the emission rate is reported to decrease rapidly due to denaturing of the biosynthetic enzymes (Lerdau et al., 1997; Tingey et al., 1979; Guenther et al., 1991; 1993).

Monoterpenes serve a variety of functions in plants, including a protective antiherbivore role, indirect defense by attraction of enemies of herbivores, attraction of pollinators, and allelopathic effects on competing plants (Lerdau et al., 1997; Fall, 1999). Most monoterpene-emitting plant species have a monoterpene reservoir pool and emissions are controlled by the temperature and the resulting leaf-air flux (Guenther et al., 1991; 1993; Tingey et al., 1980; Juuti et al., 1990). The temperature dependence of the emission rate is similar to the temperature dependence of the vapor pressure of the

monoterpene, increasing by a factor of ~2.5 for a 10°C temperature increase (Guenther et al., 1991; 1993; Tingey et al., 1980; Juuti et al., 1990). Monoterpene emissions from plants have generally not been found to be light dependent, with the most notable exception being *Quercus ilex* L., the Mediterranean Holm Oak (Staudt and Seufert, 1995; Kesselmeier et al., 1996; Loreto et al., 1996). Therefore, unlike the isoprene emissions, monoterpene emissions would be expected to continue throughout the night, however, generally at reduced levels, reflecting decreased nighttime temperatures.

5.2 Isoprene and Its Reaction Products

The highest isoprene mixing ratios were found in samples from the two mountain sites, Pine Mtn. and Mt. Baldy. Both were late afternoon/early evening samples with sampling times of 1700-2000. The highest value observed at Pine Mtn. was 2.2 ppbv on August 4, and the maximum isoprene value for Mt. Baldy was 2.3 pbbv observed on September 28. At Azusa the highest mixing ratios for isoprene were in the range 0.5 – 0.8 ppbv during all sampling intensives, except the final one on October 3-4, when the highest values were only about 0.2 ppbv. Thus, the highest values at the mountain sites were three to four times higher than the maximum mixing ratios observed at the urban valley site. The maximum isoprene values at the Banning site in the eastern portion of the air basin were 0.2 – 0.3 ppbv, consistently lower than at the other sites.

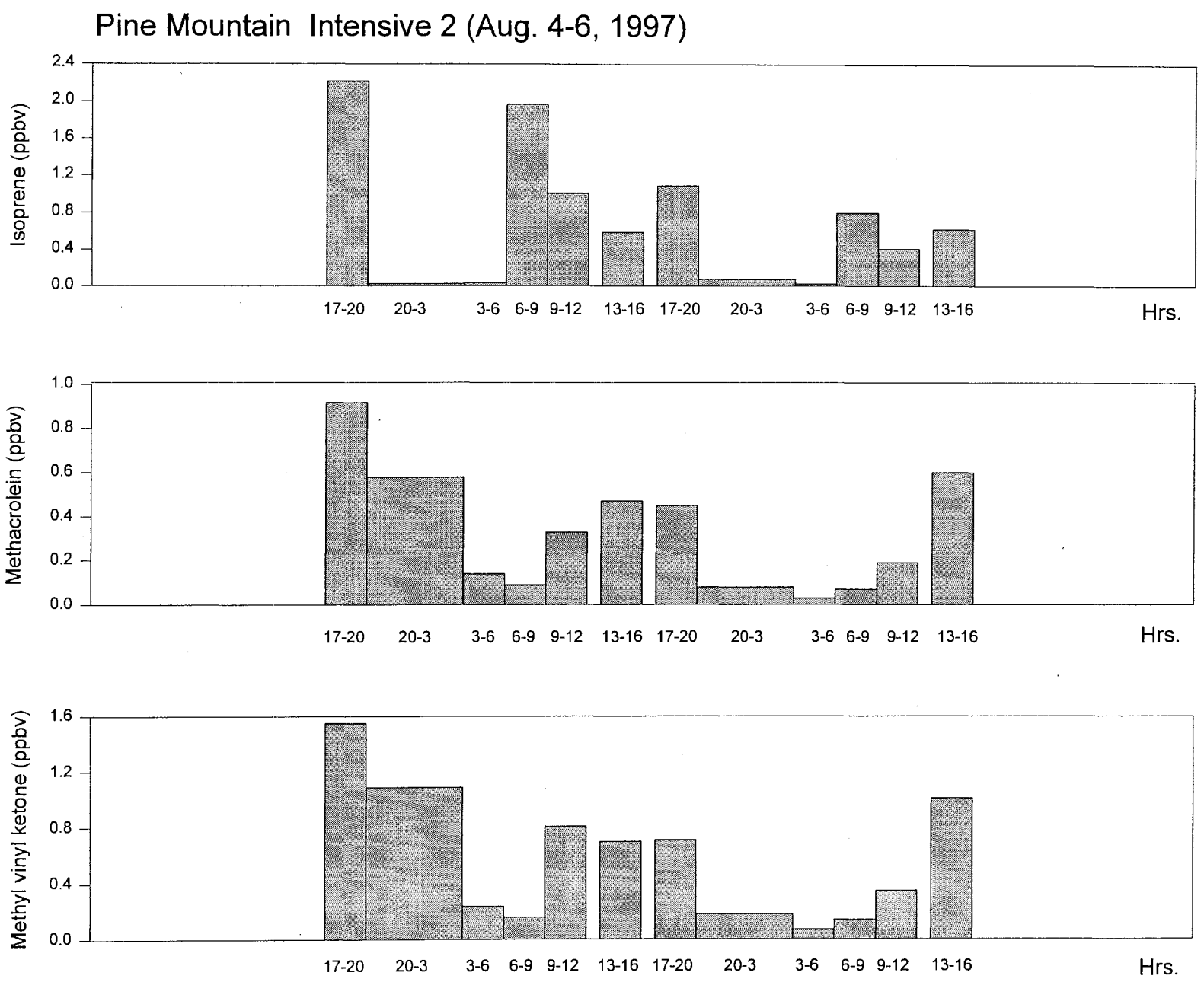
Consistent with light-dependent biogenic sources, the lowest values for isoprene were usually measured during nighttime. The diurnal variation of isoprene at the different sites generally followed a similar pattern: higher mixing ratios during the daylight hours, lower during nighttime. However, as may be seen from Figures 2, 4, 5 and 6, the difference between day and night was most apparent at the mountain sites, where the daytime values ranged between 0.4 – 2.3 ppbv and the nighttime values did not exceed 0.1 ppbv. At Azusa and Banning the day-night variation was much less pronounced and sampling at the Los Angeles North Main site gave low isoprene concentrations with little decrease during the single night sampled (see Figure 3).

5.2.1 Methacrolein and Methyl vinyl ketone

As will be discussed in more detail below, the hydroxyl (OH) radical-initiated reaction of isoprene is the major daytime loss process for isoprene and leads to an estimated atmospheric lifetime (an atmospheric lifetime is the time required for the concentration of the compound to decrease by reaction to $1/e$ of the amount initially present in the atmosphere) for isoprene of 1.4 hr (Atkinson and Arey, 1998). Methyl vinyl ketone and methacrolein are products of this rapid isoprene photooxidation reaction with yields of 0.32 and 0.22, respectively (Atkinson, 1997). Because isoprene degrades so quickly in the atmosphere, an accurate accounting of its importance in O_3 formation requires ambient measurements of its reaction products, MACR and MVK, as well as of isoprene.

For methacrolein and methyl vinyl ketone the highest mixing ratios during the SCOS97 intensive sampling periods were observed at Azusa. On August 22-23 for the 1800-0300 sampling interval the methacrolein mixing ratio was 3.3 ppbv, and on September 28 between 0300-0600 the methyl vinyl ketone mixing ratio was 2.3 ppbv. At Banning on August 22-23 at 1800-0300 mixing ratios for both MACR and MVK were high, being 2.4 ppbv and 2.9 ppbv, respectively. At Pine Mtn. and Mt. Baldy the highest values for MACR were measured in the afternoon/early evening reaching 1.1 ppbv and 0.5 ppbv, respectively, and the highest values for MVK were 1.6 and 1.0 ppbv, respectively.

At the mountain sites during the daytime, the isoprene values generally exceeded the MACR and MVK concentrations, while during nighttime the isoprene values were <0.1 ppbv and the combined MACR and MVK levels reached 1.7 ppbv. The isoprene, MACR and MVK concentrations at the mountain sites are shown in Figures 16 through 19. Note that the isoprene begins to increase early in the morning (0600-0900) with increases in MACR and MVK generally lagging behind temporally. The highest MACR and MVK levels observed at the mountain sites occurred at Pine Mtn. during Intensives 2 and 4 (see Figures 16 and 17) when the MVK + MACR reached 2.5 ppbv. The ratio MVK/MACR during the daytime (0600-2000 hr) was relatively constant at the mountain


Pine Mountain Intensive 2 (Aug. 4-6, 1997)
Isoprene (ppbv)
2.4
2.0
1.6
1.2
0.8
0.4
0.0
17-20
20-3
3-6
6-9
9-12
13-16
17-20
20-3
3-6
6-9
9-12
13-16
Hrs.
Methacrolein (ppbv)
1.0
0.8
0.6
0.4
0.2
0.0
17-20
20-3
3-6
6-9
9-12
13-16
17-20
20-3
3-6
6-9
9-12
13-16
Hrs.
Methyl vinyl ketone (ppbv)
1.6
1.2
0.8
0.4
0.0
17-20
20-3
3-6
6-9
9-12
13-16
17-20
20-3
3-6
6-9
9-12
13-16
Hrs.

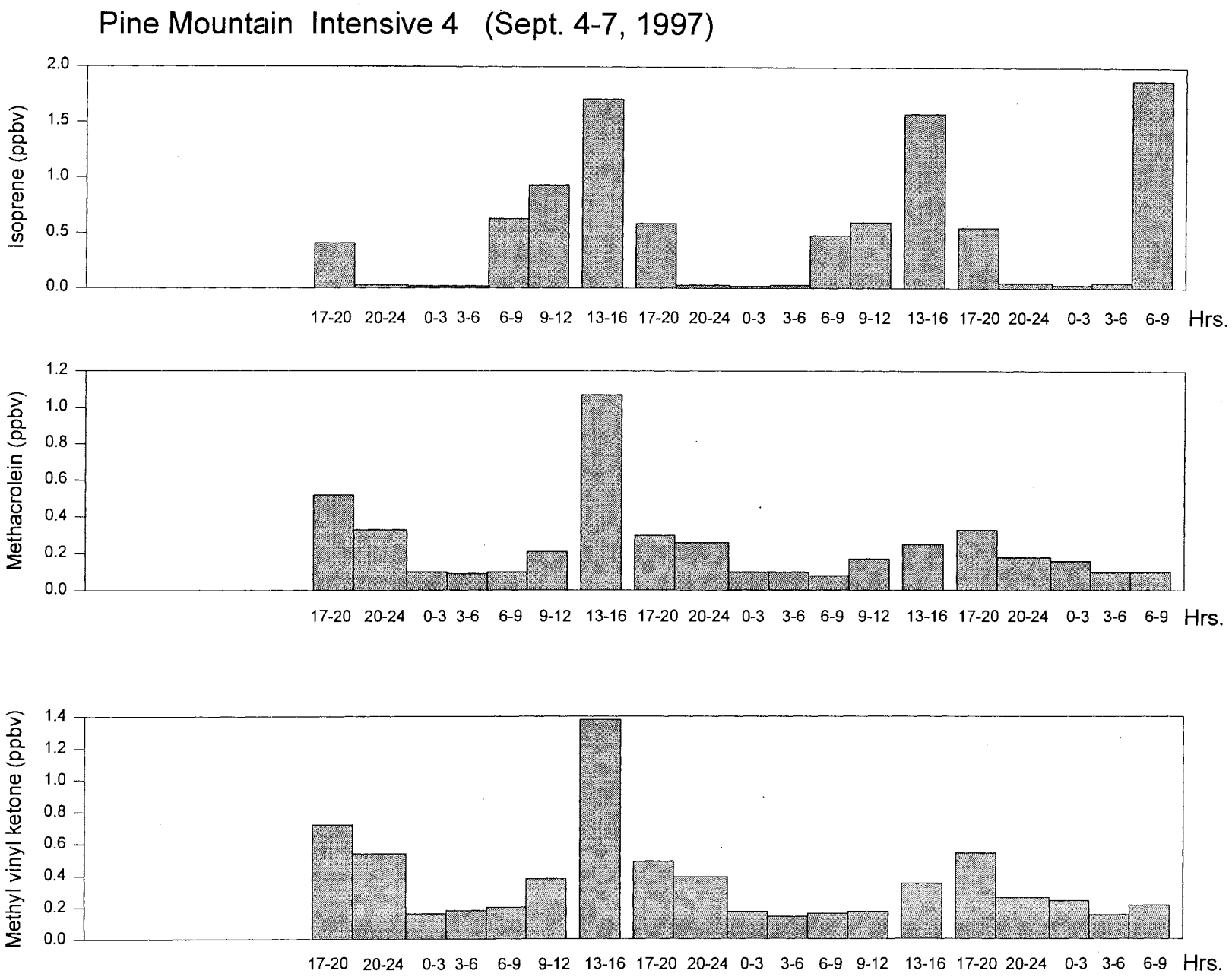
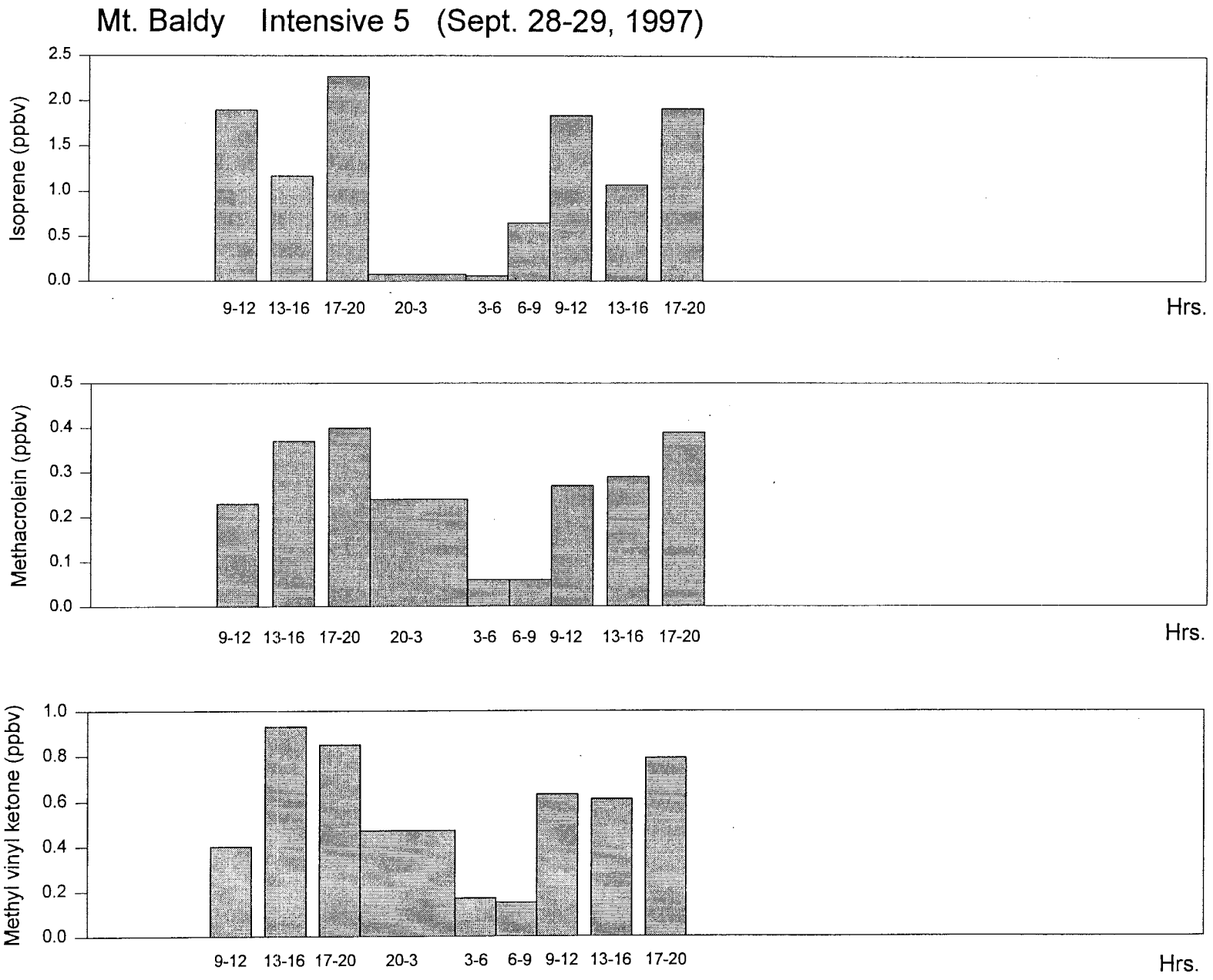


Figure 17. Isoprene, methacrolein and methyl vinyl ketone values at Pine Mtn. during Intensive 4, Sept. 4-7, 1997.


Mt. Baldy Intensive 5 (Sept. 28-29, 1997)
Isoprene (ppbv)
2.5
2.0
1.5
1.0
0.5
0.0
9-12 13-16 17-20 20-3 3-6 6-9 9-12 13-16 17-20
Hrs.
Methacrolein (ppbv)
0.5
0.4
0.3
0.2
0.1
0.0
9-12 13-16 17-20 20-3 3-6 6-9 9-12 13-16 17-20
Hrs.
Methyl vinyl ketone (ppbv)
1.0
0.8
0.6
0.4
0.2
0.0
9-12 13-16 17-20 20-3 3-6 6-9 9-12 13-16 17-20
Hrs.

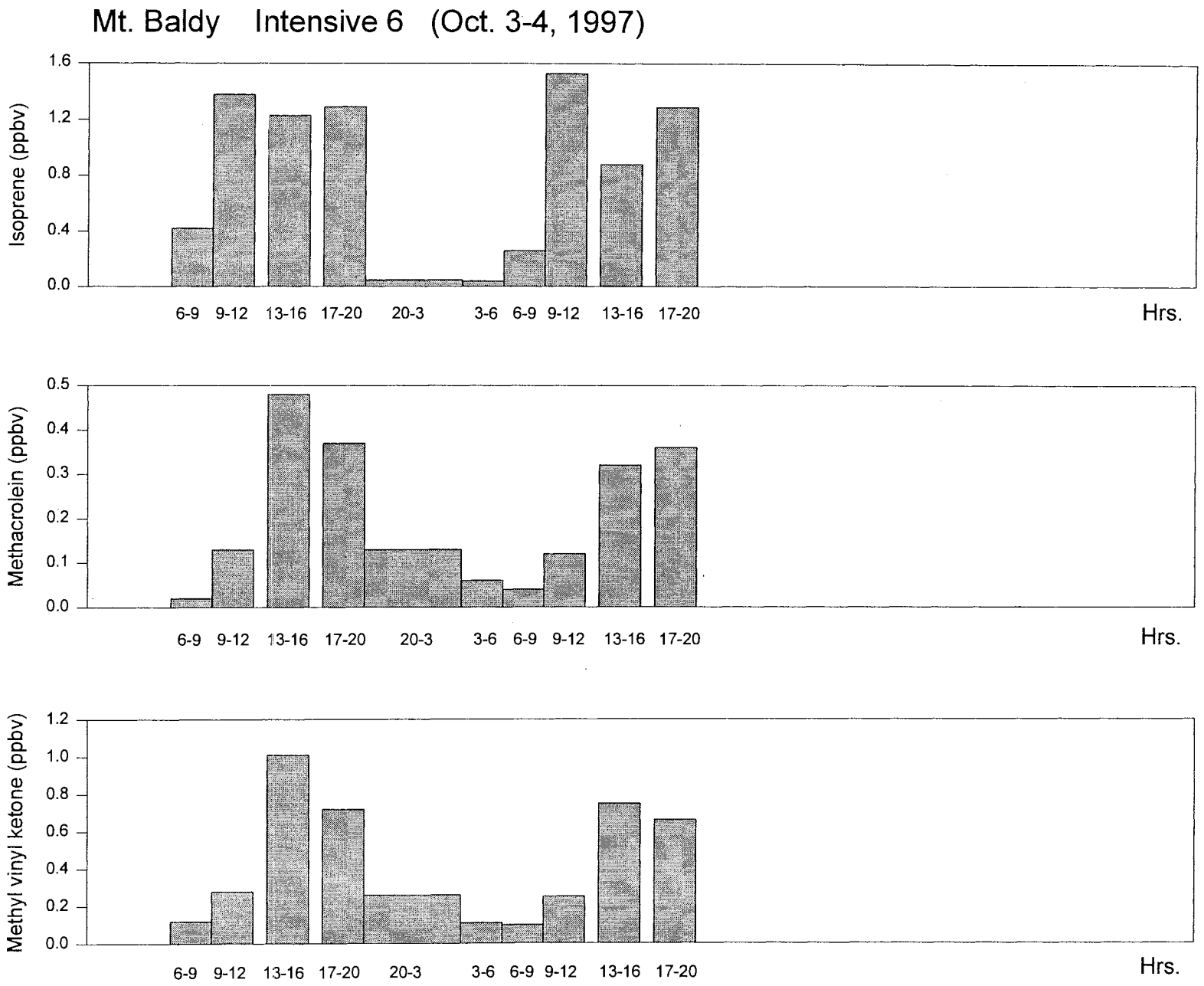


Figure 19. Isoprene, methacrolein and methyl vinyl ketone at Mt. Baldy during Intensive 6, Oct. 3-4, 1997.

sites, with average daytime values for this ratio ranging from 1.6 to 2.2. A ratio of 1.45 for MVK/MACR would be expected from the OH radical-initiated reaction of isoprene if negligible further reaction of MVK and MACR occurred, while at steady-state this ratio would be expected to increase to 2.4 (Atkinson, 1997). Thus the daytime MVK/MACR ratio at the mountain sites is consistent with the source of MACR and MVK being photooxidation of isoprene (Montzka et al. 1993, 1995; Biesenthal et al., 1997).

In contrast to the mountain sites, at Azusa, Banning, and LA North Main the MACR and MVK levels generally exceeded those of isoprene. The isoprene, MACR and MVK values for the Sept. 4-7 intensive are shown in Figures 20 and 21 for measurements taken at Azusa and Banning, respectively. The ratios of MVK/MACR were generally similar at Azusa during Intensives 2 and 4, but unusual ratios occurred during Intensives 3,5 and 6. For example, high MVK values at Azusa producing high MVK/MACR ratios were observed on Sept. 28 and Oct. 4 both for the 0300-0600 sampling period. These data suggest that a source other than the photooxidation of isoprene may exist for some of the MVK (and possibly MACR) observed at Azusa, at least during certain sampling periods. Biesenthal and co-investigators suggested that a significant non-photochemical source, possibly automotive in origin, of MVK and MACR was present in an urban area of British Columbia (Biesenthal et al., 1997). The MVK/MACR ratios observed in the early mornings of Sept. 28 and Oct. 4, however, are much higher than ratios observed in emissions from several types of vehicles (Jonsson et al., 1985) and also higher than the ratio observed in Toronto, Canada in the winter, where the lack of isoprene emissions from plant species and a correlation of the MVK and MACR with CO implicated automotive sources (Biesenthal and Shepson, 1997). If automobiles are a source of MVK and MACR they can be expected to make a contribution to the levels of these species measured at Azusa, a heavily traffic-impacted site. Further interpretation of the MVK and MACR data may be possible when the anthropogenic VOC data and gaseous co-pollutant data (CO, NO, O_3, etc.) for Azusa and Banning become available.

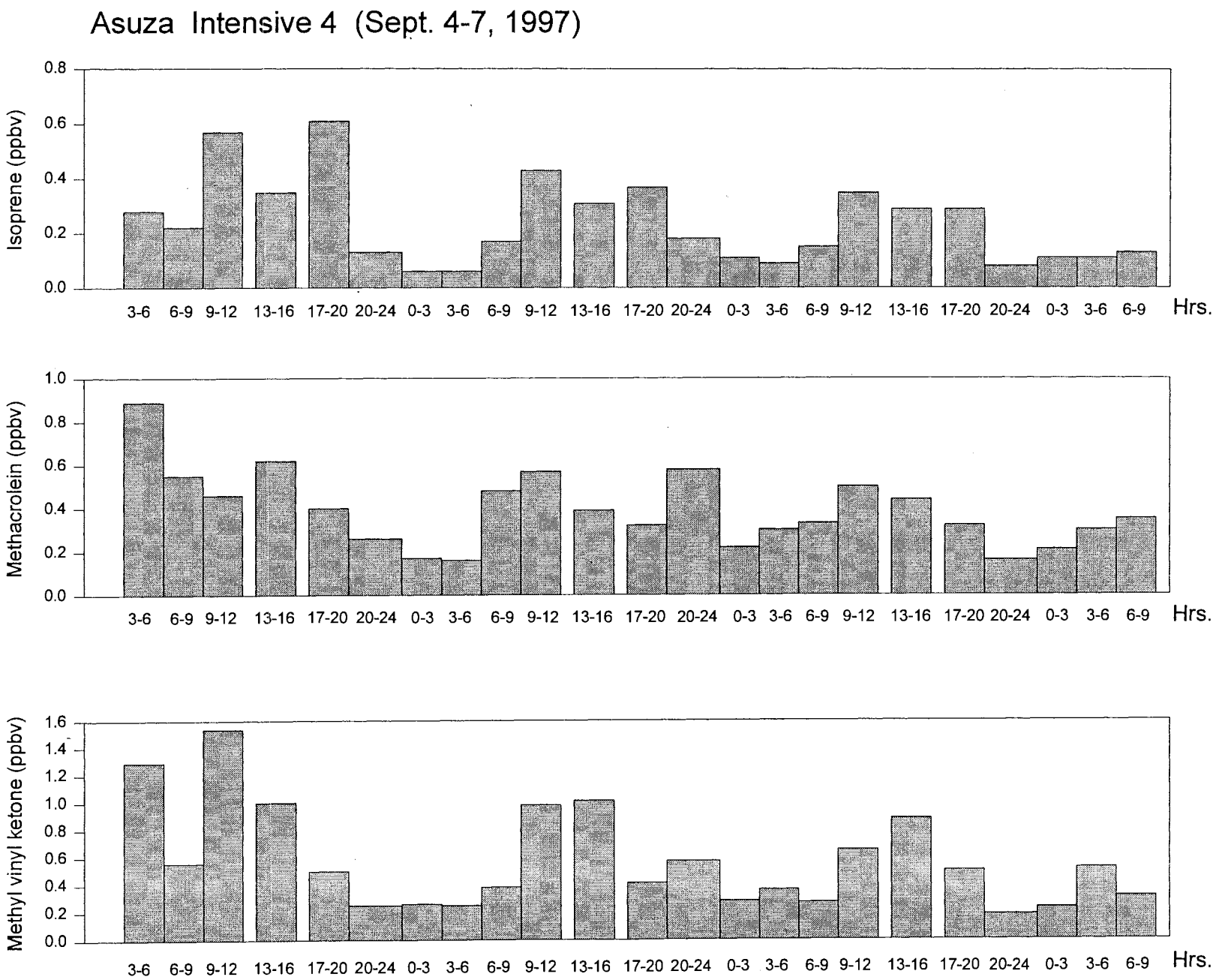
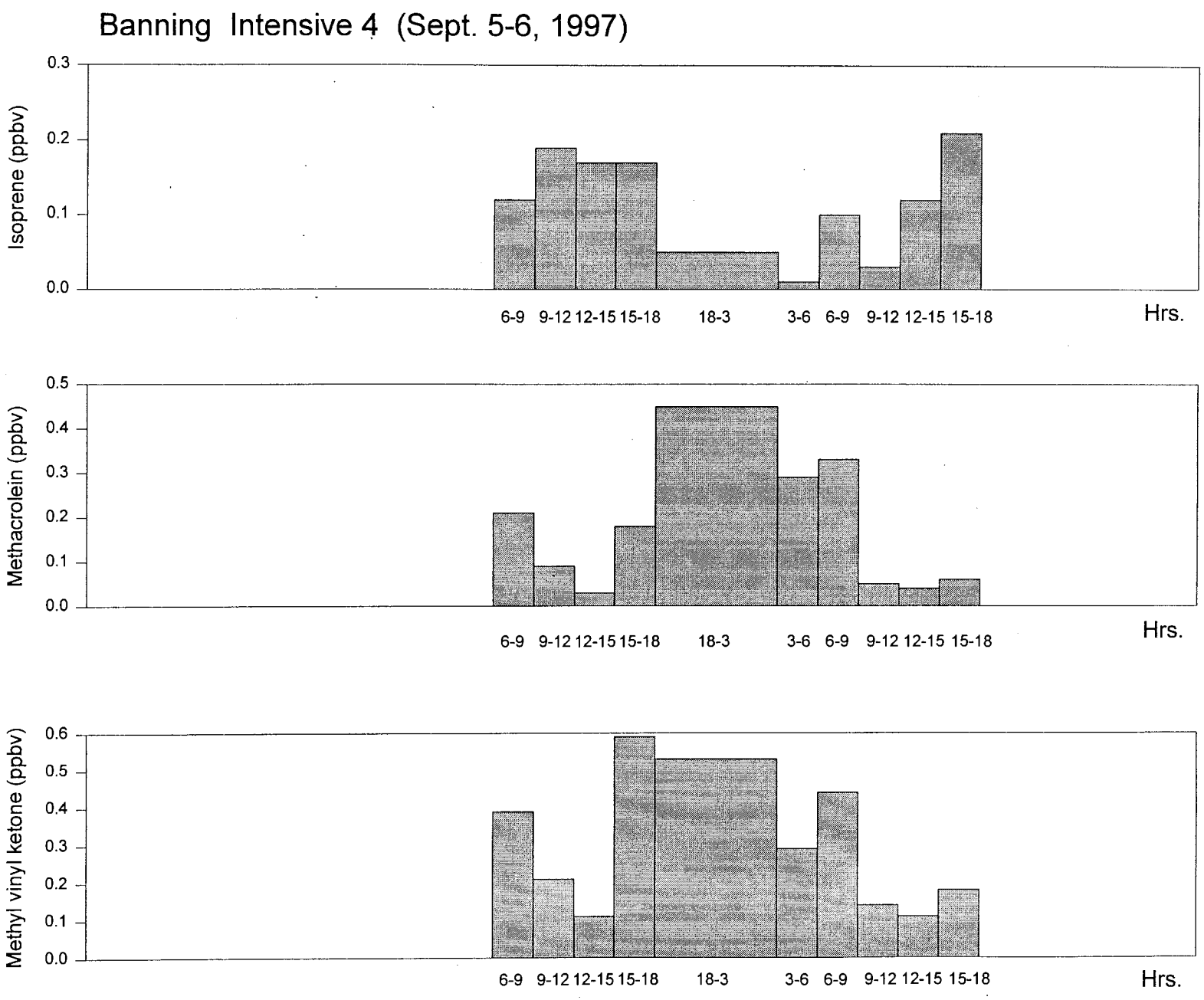


Figure 20. Isoprene, methacrolein and methyl vinyl ketone at Azusa during Intensive 4, Sept. 4-7, 1997.


Banning Intensive 4 (Sept. 5-6, 1997)
Isoprene (ppbv)
0.3
0.2
0.1
0.0
6-9 9-12 12-15 15-18 18-3 3-6 6-9 9-12 12-15 15-18
Hrs.
Methacrolein (ppbv)
0.5
0.4
0.3
0.2
0.1
0.0
6-9 9-12 12-15 15-18 18-3 3-6 6-9 9-12 12-15 15-18
Hrs.
Methyl vinyl ketone (ppbv)
0.6
0.5
0.4
0.3
0.2
0.1
0.0
6-9 9-12 12-15 15-18 18-3 3-6 6-9 9-12 12-15 15-18
Hrs.

5.3 Monoterpenes

As noted above, most monoterpene-emitting plants have a reservoir pool of these compounds and their emissions increase with increasing ambient temperatures. Therefore, the highest monoterpene emissions from plants would be expected in the afternoon when the ambient temperatures are highest. The term monoterpenes as used here, designates not only the $C_{10}H_{16}$ alkenes, but also the oxygenated species such as 1,8-cineole and camphor which are emitted by vegetation (see Figure 1 for structures). As will be discussed in more detail below, the atmospheric lifetimes of $C_{10}H_{16}$ alkenes are generally a few hours or less. The ambient concentrations of the monoterpenes, therefore, will reflect their emission profiles, meteorology, including inversion heights and transport, as well as atmospheric reactions.

The highest monoterpene mixing ratios measured were 3.8 ppbv and 2.3 ppbv for limonene at Azusa 0600-0900 hr. on Sept. 28 and 0300-0600 hr. on Aug. 23, respectively. The average mixing ratios for limonene at Azusa ranged from 0.1 to 0.57 ppbv for Intensives 2-6. While, the average mixing ratios for α-pinene at Azusa ranged from 0.04 to 0.19, and α-pinene reached a maximum of only 0.5 ppbv, the α-pinene and limonene levels were often very comparable (see Figures 7-11), suggesting that the emission "signature" of the Azusa vegetation could have comparable levels of these monoterpenes. It seems unlikely that the very high early-morning limonene mixing ratio peaks could be the result of a biogenic emission, but rather suggest an anthropogenic source for this limonene.

For camphene, sabinene, β-pinene, cineole and camphor the mixing ratio maxima at Azusa were (in ppbv): 0.14, 0.38, 0.10, 0.10 and 0.06, respectively. Thus, the limonene maximum was nearly an order of magnitude higher than any of the other monoterpenes analyzed. As may be seen from examining Figures 7 through 11, the mixing ratios of isoprene, α-pinene, limonene and other monoterpenes will all need to be considered when determining the contribution of BHC to O_3 formation at Azusa. At the downwind Banning site (see Figure 13), isoprene and the monoterpenes are again observed in comparable levels, although isoprene is generally the highest single BHC.

At the mountain sites (see Figures 14 and 15), the BHC profiles are clearly dominated by isoprene. The mixing ratio maximum at Pine Mountain for each BHC was [compound (maximum in ppbv)]: isoprene (2.2), α-pinene (0.05), camphene (0.01), sabinene (0.03), β-pinene (0.01), limonene (0.01), cineole (0.06) and camphor (0.06). Thus, α-pinene, cineole and camphor are prominent in the monoterpene profile observed at Pine Mountain. The mixing ratio maximum at Mt. Baldy for each BHC was [compound (maximum in ppbv)]: isoprene (2.3), α-pinene (0.2), camphene (0.01), sabinene (0.02), β-pinene (0.06), limonene (0.06), cineole (0.04) and camphor (0.04). The presence of numerous coniferous trees at the Mt. Baldy site explains the slight dominance of α- and β-pinene in the monoterpene profile at this site.

5.4 Atmospheric Reactions

As noted above, many of the BHC are highly reactive in the atmosphere. Table 11 gives the rate constants for the reactions of the BHC reported on here (including the isoprene products, MACR and MVK) with the hydroxyl (OH) radical, with the nitrate (NO_3) radical, and with ozone (O_3). No kinetic data are available for camphor. Table 12 shows the calculated lifetimes for each of these BHC, including photolysis lifetimes for the carbonyls, MACR and MVK, the only compounds measured that are likely to absorb actinic radiation. To calculate these lifetimes, reasonable values for ambient OH, NO_3 and O_3 concentrations have been assumed. A 12-hr daytime average for OH of 2.0×10^6 molecules cm^{-3} was chosen based on a diurnally, seasonally, and annually averaged global tropospheric OH concentration (Prinn et al., 1995) and assuming the presence of the photolytically-formed OH only during daylight hours. Because the NO_3 radical rapidly photolyzes during the day, a 12-hr nighttime value for NO_3 of 5×10^8 molecule cm^{-3} is used (Atkinson, 1991). The lifetimes due to reaction with O_3 are calculated for ~30 ppbv of O_3, a typical background clean troposphere value (Logan, 1985). If data become available, for example, if ambient O_3 concentration profiles are known, site- and time-specific calculations of the lifetimes can be made. It should be noted that both NO_3 and O_3 react rapidly with NO and these reactions may keep their concentrations low in urban areas where vehicles are emitting significant amounts of NO.

Table 11. Rate constants k at 298 K and 760 Torr total pressure of air for the reaction of selected biogenic hydrocarbons with the OH radical, the NO_3 radical, and O_3 (data from Atkinson, 1997 unless noted otherwise).

	k (cm^3 $molecule^{-1}$ s^{-1}) for reaction with		
	OH	NO_3	O_3
Biogenic Hydrocarbon	(10^{12} x k_{OH})	(10^{14} x k_{NO3})	(10^{18} x k_{O3})
Isoprene	101	67.8	12.8
Methacrolein	28.6[a]	0.33[b]	1.14[d]
Methyl vinyl ketone	20.2[a]	<0.012[c]	4.56[d]
α-Pinene	53.7	616	86.6
Camphene	53	66	0.90
Sabinene	117	1000	86
β-Pinene	78.9	251	15
Limonene	171	1220	200
1,8-Cineole	11.1[e]	0.017[e]	<0.15[d]

[a]Data from Atkinson et al., 1983 and Gierczak et al., 1997.

[b]Data from Chew et al., 1998.

[c]Data from Rudich et al., 1996.

[d]Data from Atkinson, 1994.

[e]Data from Corchnoy and Atkinson, 1990.

Table 12. Calculated lifetimes[a] for selected biogenic hydrocarbons with respect to photolysis, reaction with the OH radical, reaction with the NO_3 radical, and reaction with O_3.

	Lifetime due to			
Biogenic Hydrocarbon	OH[b]	NO_3[c]	O_3[d]	Photolysis
Isoprene	1.4 hr	49 min	1.3 day	
Methacrolein	4.9 hr	14 day	15 day	~1 day[e]
Methyl vinyl ketone	6.9 hr	>385 day	3.6 day	~2 day[e]
α-Pinene	2.6 hr	5 min	4.6 hr	
Camphene	2.6 hr	50 min	18 day	
Sabinene	1.2 hr	3 min	4.6 hr	
β-Pinene	1.8 hr	13 min	1.1 day	
Limonene	49 min	3 min	2.0 hr	
1,8-Cineole	12.5 hr	270 day	>110 day	

[a]An atmospheric lifetime is defined as the time required for the compound concentration to degrade to a value of $1/e$ of its initial concentration.

[b]For a 12-hr daytime average OH radical concentration of 2.0×10^6 molecule cm^{-3}.

[c]For a 12-hr nighttime average NO_3 radical concentration of 5×10^8 molecule cm^{-3}.

[d]For a 24-hr average O_3 concentration of 7×10^{11} molecule cm^{-3} (~30 ppbv).

[e]For overhead sun (Atkinson, 1999).

Although Table 12 gives "typical or average" lifetimes it will allow the identification of the likely most important loss processes for a given BHC. For example, isoprene loss during the daytime will be from the OH radical-initiated reaction. If NO_3 radicals are present at night, a rapid loss of isoprene can be expected. Additionally, Table 12 can be used to compare the effect of a given loss process on different BHC. For example, high O_3 levels will have the greatest effect on the lifetime of limonene, the most reactive of the BHC shown with O_3, but will have essentially no effect on the mixing ratios of 1,8-cineole.

As noted above, the isoprene concentrations at the mountain sites decreased rapidly during the nighttime. Both isoprene emissions and isoprene reaction with the OH radical will essentially stop after sunset. Potential nighttime OH sources, such as monoterpene-O_3 reactions (Atkinson et al., 1992; Paulson and Orlando, 1996) are expected to be insignificant. As noted above (see Figures 16-19), the MACR and MVK mixing ratios at the mountain sites did not decrease as much as the isoprene mixing ratios during the nighttime. Reaction of isoprene with O_3 would also produce MACR and MVK as products, in yields of 0.39 and 0.16, respectively (Atkinson, 1997), but the rate of the isoprene-O_3 reaction is not rapid enough (see Tables 11 and 12) to result in the <0.1 ppbv isoprene mixing ratios seen during the 2000-0300 sampling periods at Pine Mtn. and Mt. Baldy. For example, if the O_3 mixing ratio were 120 ppbv, the lifetime of isoprene due to reaction with O_3 would be ~7 hours. However, the rapid reaction of NO_3 with isoprene could explain the low isoprene mixing ratios during the 2000-0300 sampling periods, which then remained low until the daytime emission of isoprene began after sunrise. [It should be noted that the NO_3–isoprene reaction gives formation yields of MACR and MVK of only 0.035 each (Atkinson, 1997)]. Examing the profiles of other BHC measured at these sites provides additional evidence for the occurrence of nighttime NO_3 chemistry at the mountain sites.

Figures 22 and 23 show the mixing ratios of isoprene, α-pinene, 1,8-cineole and camphor at Pine Mountain. As may be seen from Table 12, α-pinene will react rapidly with the NO_3 radical, while 1,8-cineole will not. Although data are not available for

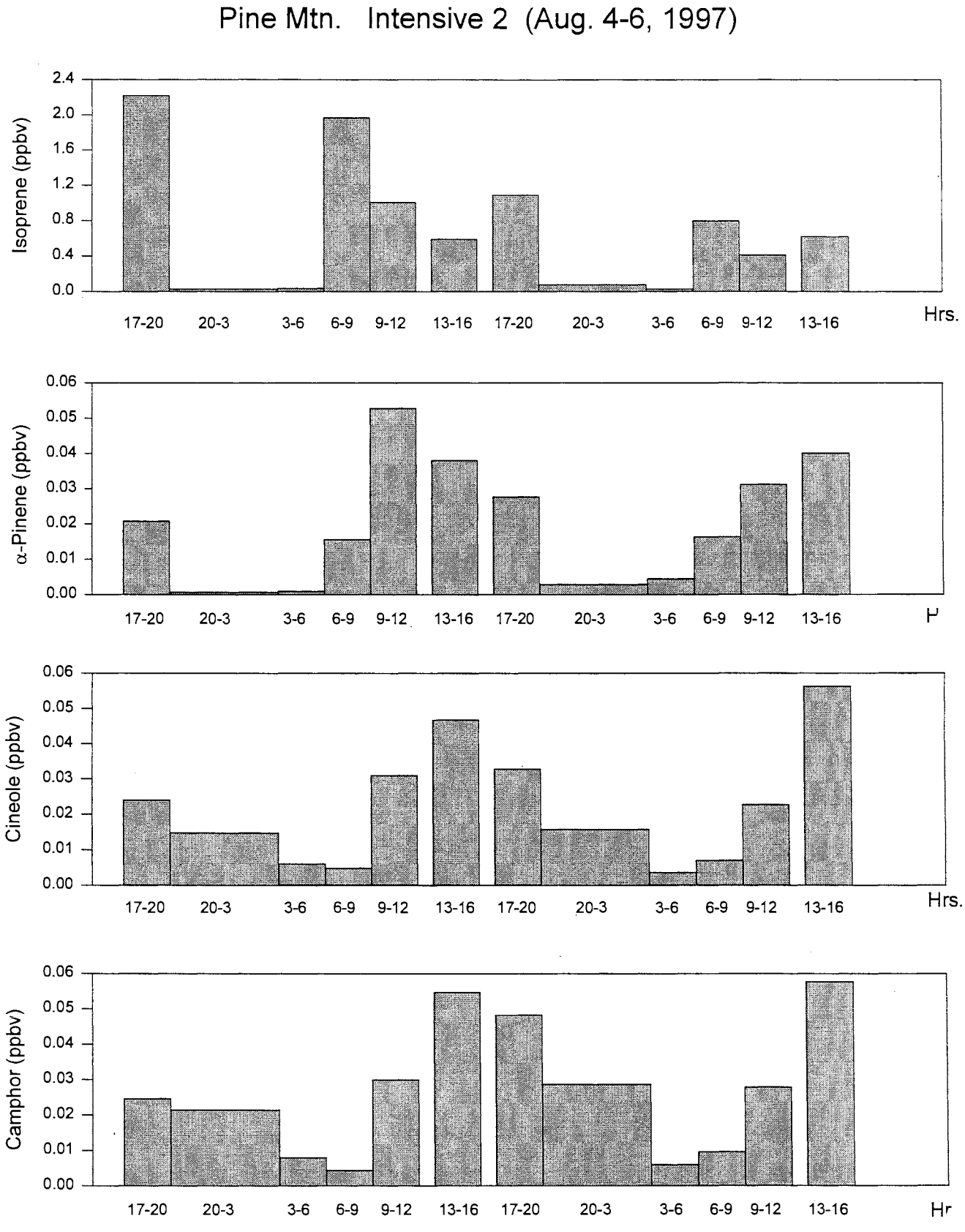


Figure 22. Isoprene, α-pinene, cineole and camphor values at Pine Mtn. during Intensive 2, Aug. 4-6, 1997.

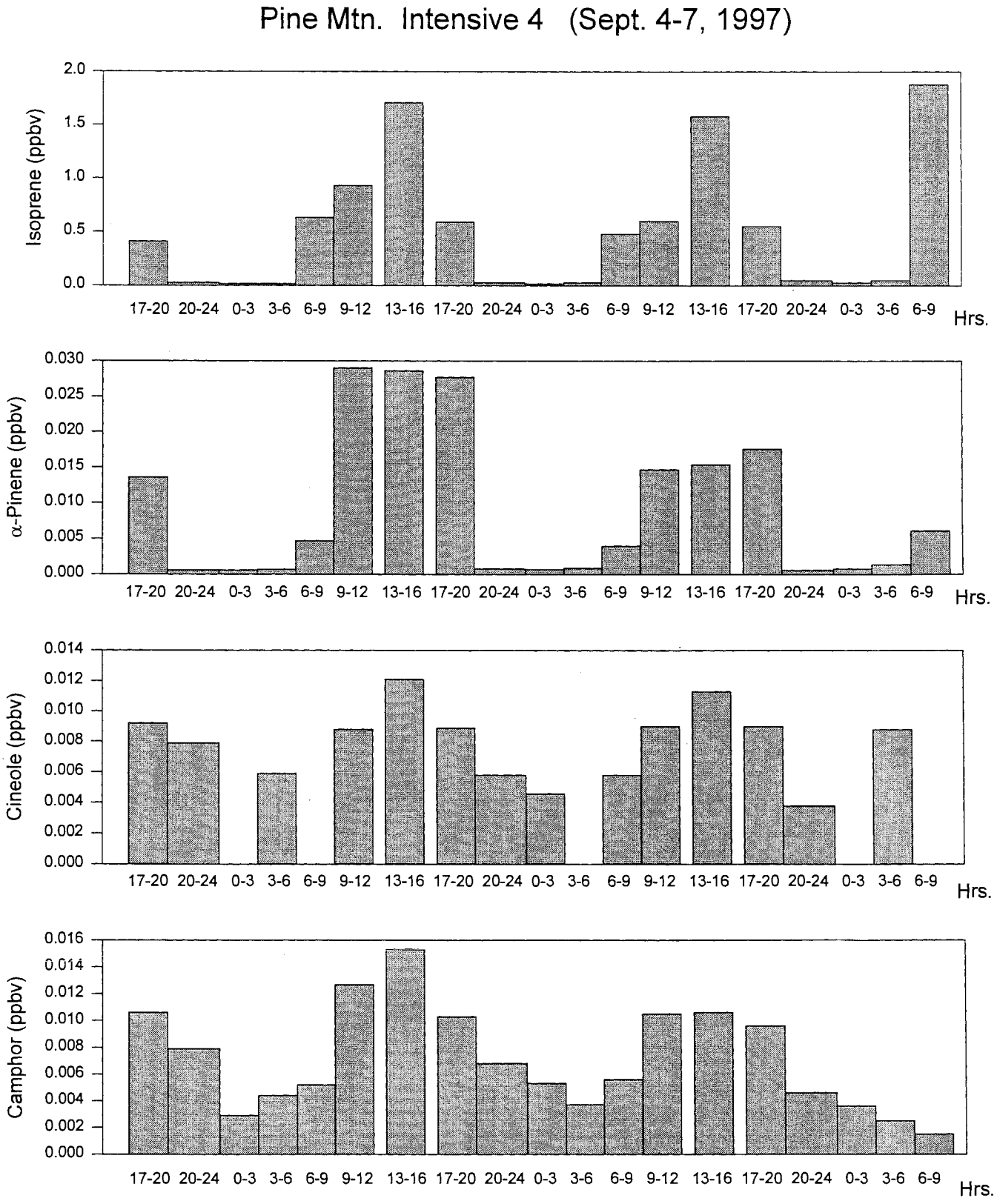


Figure 23. Isoprene, α-pinene, cineole and camphor values at Pine Mtn. during Intensive 4, Sept. 4-7, 1997.

camphor, it is estimated that the reactions of camphor with NO_3 and with O_3 will be slower than those of 1,8-cineole (R. Atkinson, personal communication). Thus, the rapid decrease in isoprene and α-pinene mixing ratios during the 2000-0300 hr. sampling time, seen twice during Intensive 2 (Figure 22) and three times during Intensive 4 (Figure 23) is consistent with NO_3 radical reaction with isoprene and α-pinene. The fact that the 1,8-cineole and camphor mixing ratios, and, as mentioned earlier, the MACR and MVK mixing ratios, did not decrease to the same extent as the isoprene and α-pinene mixing ratios, rules out a meteorological explanation (such as the inversion lowering and Pine Mtn. being in the "free troposphere" during the nighttime) for the isoprene and α-pinene decreases.

Shown in Figures 24 and 25 are the isoprene, α-pinene, limonene and 1,8-cineole mixing ratios from Mt. Baldy during Intensives 5 and 6. Again, the isoprene mixing ratio decreases dramatically between the 1700-2000 hr. sample and the nighttime samples. At Mt. Baldy during Intensive 5, the α-pinene and limonene mixing ratios decreased more than the 1,8-cineole mixing ratio, but not as much as that of isoprene (Figure 24). While the emissions of isoprene will stop at night, the monoterpenes will continue to be emitted, and fresh emissions of α–pinene and limonene at Mt. Baldy may explain why the mixing ratios of these monoterpenes measured at night did not decrease proportionally as much as those of isoprene. As mentioned previously, the Mt. Baldy site had significantly more coniferous trees than the Pine Mtn. site, and this is reflected in the higher α-pinene/isoprene ratio at Mt. Baldy during Intensive 5 relative to Pine Mtn.

6. Conclusions and Implications

Detectable levels of the biogenic hydrocarbons, isoprene, α-pinene, camphene, sabinene, β-pinene, limonene, 1,8-cineole and camphor were observed in downtown Los Angeles (L.A. North Main St.), at a mid-basin receptor site (Azusa), at mountain locations (Pine Mtn. and Mt. Baldy) and at a far downwind receptor site (Banning) during the SCOS97 study. Isoprene concentrations were highest at the two mountain sites, Pine

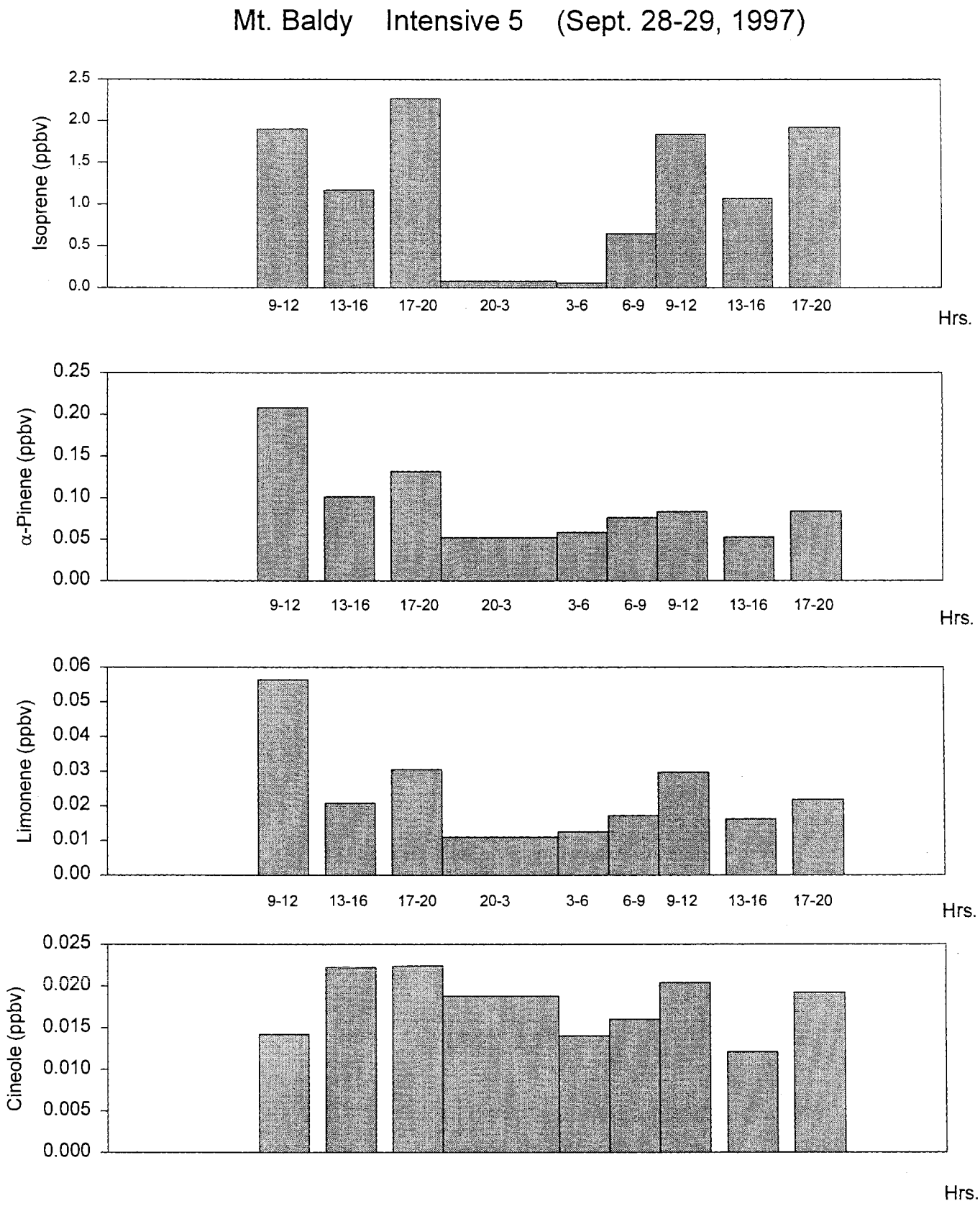


Figure 24. Isoprene, α-pinene, limonene and cineole values at Mt. Baldy during Intensive 5, Sept 28-29, 1997.

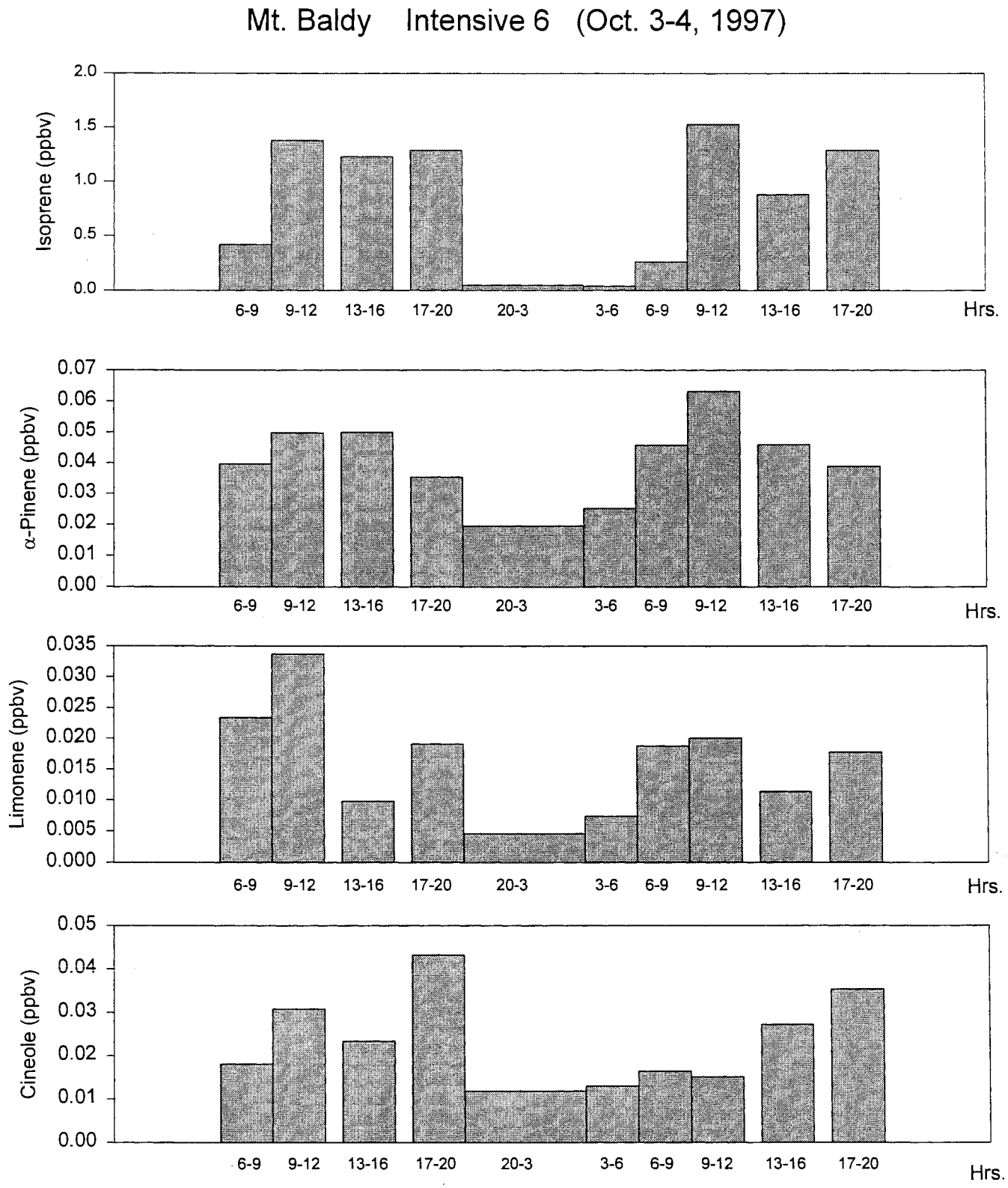


Figure 25. Isoprene, α-pinene, limonene and cineole values at Mt. Baldy during Intensive 6, Oct. 3-4, 1997.

Mtn. and Mt. Baldy, and showed very pronounced diurnal profiles consistent with light-dependent biogenic emission sources. The maximum isoprene concentrations observed at these sites were 2.2 and 2.3 ppbv, respectively, both during the 1700-2000 hr. sampling period. At the mountain site during the daytime, the isoprene values generally exceeded the MACR and MVK concentrations and the MVK/MACR ratios were consistent with their source being photooxidation of isoprene. The rate constants for atmospheric reactions with the OH radical, the NO_3 radical and O_3 of the BHC measured were examined to explore the effect of atmospheric chemistry on the diurnal profiles measured. The rapid decreases at the Pine Mountain site in the isoprene and α-pinene mixing ratios between the 1700-2000 hr. sampling period and the nighttime sampling period (2000-0300) which were not mirrored in mixing ratio changes for 1,8-cineole and camphor suggest that NO_3 was present during the night at this mountain site causing rapid reaction of isoprene and α-pinene.

In contrast to the mountain sites, at Azusa, Banning, and LA North Main the MACR and MVK levels generally exceeded those of isoprene, reaching combined MACR + MVK values of 4.9, 5.3 and 2.2 ppbv, respectively. The isoprene concentrations were generally highest during daytime at these sites, but did not decrease at night as much as at the mountain sites. Occasional, unusual MVK/MACR ratios at Azusa and Banning suggest potential anthropogenic sources for these compounds, and the anthropogenic VOC data from these sites should facilitate further interpretation of the data for isoprene and its atmospheric reaction products.

The monoterpene observed in highest concentration was limonene, which reached 3.8 ppbv at Azusa during the early morning (0600-0900) of Sept. 28. During the early morning hours (0300-0900) on Aug. 22, high limonene mixing ratios were also observed at Azusa. The dominance of this single monoterpene, during time periods when low ambient temperatures would not result in enhanced biogenic emissions, suggests that limonene at Azusa has an occasional strong anthropogenic source, as well as biogenic sources. During the daytime, the mountain sites were characterized by isoprene as the dominant BHC. In contrast, at Azusa and Banning, the monoterpenes made a significant contribution to the daytime BHC total.

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Table A-1.1. Detailed Data from Measurements of Isoprene and its Atmospheric Reaction Products in Ambient Air at Azusa.

Date	Sampling	Isoprene ppbv	Isoprene av, ppbv	MACR ppbv	MACR av, ppbv	MVK ppbv	MVK av, ppbv	Reason for discarding data
AZUSA	**Aug 4-6, 1997**							
8/4/97	0600-0900	0.23	0.23	0.11	0.09	0.41	0.46	
8/4/97	0600-0900	0.23		0.08		0.52		
8/4/97	0907-1206	0.51	0.52	0.48	0.47	0.76	0.77	
8/4/97	0907-1206	0.53		0.46		0.78		
8/4/97	1306-1603	0.46	0.46	0.65	0.51	1.06	0.92	
8/4/97	1306-1603	0.47		0.36		0.78		
8/4/97	1700-2000	0.74	0.75	0.56	0.71	0.79	1.06	
8/4/97	1700-2000	0.76		0.86		1.33		
8/4/97	2006-0300	0.14	0.16	0.33	0.34	0.50	0.59	
8/4/97	2006-0300	0.18		0.34		0.69		
8/5/97	0307-0600	0.23	0.24	1.01	1.01	0.57	0.58	
8/5/97	0307-0600	0.24		1.02		0.58		
8/5/97	0618-0900	0.46	0.47	0.72	0.82	1.46	1.73	
8/5/97	0618-0900	0.48		0.92		2.00		
8/5/97	0907-1202	0.63	0.66	0.72	0.74	1.55	1.61	
8/5/97	0907-1202	0.70		0.75		1.68		
8/5/97	1300-1600	0.59	0.61	0.61	0.70	1.29	1.49	
8/5/97	1300-1600	0.62		0.78		1.70		
8/5/97	1701-2000	0.74	0.73	0.45	0.46	0.70	0.72	
8/5/97	1701-2000	0.72		0.48		0.75		
8/5- 8/6/97	2005-0300	0.47	0.44	0.42	0.41	1.22	1.20	
8/5-8/6/97	2005-0300	0.41		0.41		1.19		
8/6/97	0306-0600	0.23	0.23	0.60	0.62	0.90	0.90	
8/6/97	0306-0600	0.23		0.64		0.89		
8/6/97	0616-0900	0.37	0.37	0.65	0.60	1.26	1.24	
8/6/97	0616-0900	0.38		0.55		1.23		

Table A-1.1. Detailed Data from Measurements of Isoprene and its Atmospheric Reaction Products in Ambient Air at Azusa (continued).

Date	Sampling	Isoprene ppbv	Isoprene av, ppbv	MACR ppbv	MACR av, ppbv	MVK ppbv	MVK av, ppbv	Reason for discarding data
8/6/97	0906-1200	0.50	0.51	0.37	0.35	0.74	0.75	
8/6/97	0906-1200	0.52		0.33		0.75		
8/6/97	1300-1600	0.51	0.51	0.45	0.44	0.83	0.81	
8/6/97	1300-1600	0.51		0.43		0.79		
8/6/97	1700-2000	0.40	0.40	0.11	0.15	0.17	0.23	
8/6/97	1700-2000	0.40		0.18		0.29		
AZUSA	**Aug 22-23, 1997**							
8/22/97	0318-0600	0.24	0.24*	0.29	0.29*	0.53	0.53*	
8/22/97	0318-0600	0.67		1.15		2.04		Sampling tube contents transferred from broken tube
8/22/97	0610-0900	0.02	0.21*	0.09	0.45*	0.08	0.77*	All results low, seems like a back sampling tube
8/22/97	0610-0900	0.21		0.45		0.77		
8/22/97	0905-1157	0.39	0.41	0.34	0.33	0.66	0.69	
8/22/97	0905-1157	0.44		0.32		0.71		
8/22/97	1210-1500	0.61	0.52*	1.33	0.44*	1.50	0.78*	Sampling tube contents transferred from broken tube
8/22/97	1210-1500	0.52		0.44		0.78		
8/22/97	1504-1800	0.47	0.45	0.79	0.69	1.17	1.07	
8/22/97	1504-1800	0.44		0.59		0.97		
8/22-23/97	1815-0300	0.28	0.30	2.82	3.34	1.01	1.52	
8/22-23/97	1815-0300	0.32		3.87		2.03		
8/23/97	0304-0600	0.27	0.25	0.45	0.55	1.16	0.98	
8/23/97	0304-0600	0.22		0.65		0.80		
8/23/97	0615-0900	0.26	0.26*	0.70	0.70*	0.94	0.94*	
8/23/97	0615-0900	-		-		-		(Mass detector stopped during analysis, sample destroyed)

Table A-1.1. Detailed Data from Measurements of Isoprene and its Atmospheric Reaction Products in Ambient Air at Azusa (continued).

Date	Sampling	Isoprene ppbv	Isoprene av, ppbv	MACR ppbv	MACR av, ppbv	MVK ppbv	MVK av, ppbv	Reason for discarding data
8/23/97	0903-1200	0.53	0.51	0.57	0.53	0.61	0.74	
8/23/97	0903-1200	0.48		0.49		0.88		
8/23/97	1208-1500	0.34	0.31	0.56	0.49	0.72	0.82	
8/23/97	1208-1500	0.29		0.41		0.92		
8/23/97	1505-1800	0.37	0.37*	0.46	0.46*	0.70	0.70*	
8/23/97	1505-1800	0.42		0.55		0.98		Sampling tube contents transferred from broken tube
AZUSA	**Sep 4-7, 1997**							
9/4/97	0300-0600	0.27	0.28	0.88	0.89	1.43	1.29	
9/4/97	0300-0600	0.28		0.89		1.15		
9/4/97	0606-0900	0.22	0.22	0.55	0.55	0.63	0.56	
9/4/97	0606-0900	0.22		0.55		0.50		
9/4/97	0904-1200	0.58	0.57	0.49	0.46	1.77	1.54	
9/4/97	0904-1200	0.56		0.44		1.31		
9/4/97	1300-1600	0.35	0.35	0.38	0.62	0.75	1.00	
9/4/97	1300-1600	0.35		0.86		1.25		
9/4/97	1700-2000	0.59	0.61	0.34	0.40	0.63	0.50	
9/4/97	1700-2000	0.63		0.47		0.36		
9/4/97	2014-2400	0.14	0.13	0.29	0.26	0.28	0.25	
9/4/97	2014-2400	0.12		0.23		0.22		
9/5/97	0006-0300	0.07	0.06	0.15	0.17	0.32	0.26	
9/5/97	0006-0300	0.06		0.20		0.20		
9/5/97	0305-0600	0.06	0.06	0.15	0.16	0.30	0.25	
9/5/97	0305-0600	0.06		0.16		0.19		
9/5/97	0615-0900	-	0.17*	-	0.48*	-	0.38*	High toluene, analysis in the SCAN mode
9/5/97	0615-0900	0.17		0.48		0.38		
9/5/97	0903-1200	0.40	0.43	0.57	0.57*	0.98	0.98*	
9/5/97	0903-1200	0.46		0.05		0.38		Analyzed much later than other samples

Table A-1.1. Detailed Data from Measurements of Isoprene and its Atmospheric Reaction Products in Ambient Air at Azusa (continued).

Date	Sampling	Isoprene ppbv	Isoprene av, ppbv	MACR ppbv	MACR av, ppbv	MVK ppbv	MVK av, ppbv	Reason for discarding data
9/5/97	1300-1600	0.32	0.31	0.41	0.39	1.08	1.01	
9/5/97	1300-1600	0.30		0.37		0.94		
9/5/97	1700-2000	0.36	0.37	0.27	0.32	0.33	0.41	
9/5/97	1700-2000	0.38		0.37		0.48		
9/5/97	2006-2400	0.19	0.18	0.37	0.58	0.42	0.57	
9/5/97	2006-2400	0.18		0.78		0.73		
9/6/97	0008-0300	0.11	0.11	0.22	0.22	0.33	0.28	
9/6/97	0008-0300	0.10		0.23		0.24		
9/6/97	0306-0600	0.09	0.09	0.23	0.30	0.36	0.36	
9/6/97	0306-0600	0.10		0.37		0.37		
9/6/97	0615-0900	0.14	0.15	0.30	0.33	0.27	0.27	
9/6/97	0615-0900	0.15		0.35		0.27		
9/6/97	0903-1200	0.34	0.35	0.48	0.50	0.54	0.65	
9/6/97	0903-1200	0.35		0.53		0.76		
9/6/97	1300-1600	0.30	0.29	0.43	0.44	0.89	0.88	
9/6/97	1300-1600	0.28		0.45		0.86		
9/6/97	1700-1959	0.29	0.29	0.31	0.32	0.44	0.50	
9/6/97	1700-1959	0.30		0.32		0.56		
9/6/97	2010-2400	0.09	0.08	0.18	0.16	0.17	0.18	
9/6/97	2010-2400	0.08		0.13		0.18		
9/7/97	0005-0300	0.10	0.11	0.20	0.21	0.22	0.23	
9/7/97	0005-0300	0.11		0.22		0.23		
9/7/97	0306-0600	0.11	0.11	0.29	0.30	0.47	0.52	
9/7/97	0306-0600	0.12		0.31		0.57		
9/7/97	0604-0900	0.12	0.13	0.31	0.35	0.37	0.31	
9/7/97	0604-0900	0.13		0.39		0.25		

Table A-1.1. Detailed Data from Measurements of Isoprene and its Atmospheric Reaction Products in Ambient Air at Azusa (continued).

Date	Sampling	Isoprene ppbv	Isoprene av, ppbv	MACR ppbv	MACR av, ppbv	MVK ppbv	MVK av, ppbv	Reason for discarding data
AZUSA	**Sep 28-29, 1997**							
9/28/97	0301-0600	0.16	0.15	0.32	0.28	2.30	2.31	
9/28/97	0301-0600	0.14		0.25		2.33		
9/28/97	0609-0900	0.23	0.23	-	0.31*	0.66	0.53	MACR not resolved from overlying 70
9/28/97	0609-0900	0.22		0.31		0.39		
9/28/97	0904-1200	0.50	0.50	0.42	0.37	0.99	0.83	
9/28/97	0904-1200	0.50		0.32		0.66		
9/28/97	1300-1600	0.44	0.42	0.41	0.41	0.66	0.68	
9/28/97	1300-1600	0.39		0.40		0.69		
9/28/97	1700-2000	0.60	0.34*	0.78	0.25*	1.23	0.31*	Very low isoprene-d_8
9/28/97	1700-2000	0.34		0.25		0.31		
9/28-29/97	2015-0300	0.06	0.07	0.19	0.19	0.16	0.23	
9/28-29/97	2015-0300	0.08		0.18		0.30		
9/29/97	0310-0600	0.13	0.13	0.38	0.36	0.34	0.29	
9/29/97	0310-0600	0.12		0.33		0.23		
9/29/97	0616-0858	0.31	0.30	0.45	0.44	0.45	0.65	
9/29/97	0616-0858	0.30		0.43		0.86		
9/29/97	0900-1200	0.38	0.37	0.37	0.30	0.60	0.46	
9/29/97	0900-1200	0.36		0.24		0.32		
9/29/97	1300-1600	0.38	0.38	0.31	0.61	0.62	0.74	
9/29/97	1300-1600	0.37		0.92		0.85		
9/29/97	1700-2000	0.40	0.44	0.22	0.22	0.44	0.40	
9/29/97	1700-2000	0.48		0.21		0.36		

Table A-1.1. Detailed Data from Measurements of Isoprene and its Atmospheric Reaction Products in Ambient Air at Azusa (continued).

Date	Sampling	Isoprene ppbv	Isoprene av, ppbv	MACR ppbv	MACR av, ppbv	MVK ppbv	MVK av, ppbv	Reason for discarding data
AZUSA	**Oct 3-4, 1997**							
10/3/97	0301-0600	0.05	0.06	0.12	0.13	0.31	0.26	
10/3/97	0301-0600	0.07		0.14		0.21		
10/3/97	0614-0900	0.06	0.06	0.08	0.07	0.11	0.12	
10/3/97	0614-0900	0.06		0.06		0.12		
10/3/97	0904-1200	0.12	0.12	0.10	0.10	0.21	0.22	
10/3/97	0904-1200	0.12		0.09		0.24		
10/3/97	1300-1600	0.21	0.21	0.21	0.19	0.42	0.38	
10/3/97	1300-1600	0.21		0.16		0.34		
10/3/97	1700-2000	0.17	0.15	0.18	0.15	0.53	0.44	
10/3/97	1700-2000	0.13		0.12		0.35		
10/3-4/97	2011-0300	0.06	0.06	0.21	0.19	0.66	0.50	
10/3-4/97	2011-0300	0.05		0.18		0.33		
10/4/97	0304-0600	0.12	0.12	0.18	0.18	0.98	0.99	
10/4/97	0304-0600	0.13		0.19		1.01		
10/5/97	0612-0900	0.07	0.07	0.07	0.08	0.24	0.26	
10/4/97	0612-0900	0.07		0.10		0.29		
10/4/97	0901-1200	0.17	0.16	0.17	0.16	0.35	0.36	
10/4/97	0901-1200	0.16		0.16		0.38		
10/4/97	1300-1600	0.36	0.24*	0.51	0.29*	1.06	0.64*	Sampling tube contents transferred from broken tube
10/4/97	1300-1600	0.24		0.29		0.64		
10/4/97	1700-2000	0.14	0.14	0.12	0.11	0.22	0.22	
10/4/97	1700-2000	0.14		0.11		0.23		

*Used single value.

Table A-1.2. Detailed Data from Measurements of Isoprene and its Atmospheric Reaction Products in Ambient Air at Pine Mtn. and Mt. Baldy.

Date	Sampling	Isoprene ppbv	Isoprene av, ppbv	MACR ppbv	MACR av, ppbv	MVK ppbv	MVK av, ppbv	Reason for discarding data
PINE MTN.	**Aug 4-6, 1997**							
8/4/97	1710-2000	2.12	2.21	0.89	0.91	1.54	1.58	
8/4/97	1710-2000	2.30		0.94		1.63		
08/4-08/5/97	2025-0259	0.04	0.03	0.60	0.58	1.15	1.11	
08/4-08/5/97	2025-0259	0.02		0.55		1.07		
8/5/97	0314-0559	0.05	0.04	0.15	0.14	0.26	0.25	
8/5/97	0314-0559	0.03		0.13		0.24		
8/5/97	0617-0858	1.85	1.96	0.09	0.09	0.15	0.16	
8/5/97	0617-0858	2.08		0.09		0.17		
8/5/97	0911-1200	0.96	1.00	0.30	0.33	0.81	0.83	
8/5/97	0911-1200	1.05		0.35		0.85		
8/5/97	1302-1600	0.59	0.59*	0.46	0.46*	0.71	0.71*	
8/5/97	1302-1600	-		-		-		Sampling tube missing
8/5/97	1700-2000	1.04	1.09	0.42	0.44	0.68	0.72	
8/5/97	1700-2000	1.15		0.47		0.77		
8/5/97	2015-0255	0.08	0.08	0.07	0.08	0.18	0.19	
8/5/97	2015-0255	0.08		0.08		0.20		
8/6/97	0310-0600	0.03	0.03	0.03	0.03	0.07	0.07	
8/6/97	0310-0600	0.04		0.03		0.07		
8/6/97	0615-0900	0.76	0.80	0.07	0.07	0.14	0.14	
8/6/97	0615-0900	0.84		0.07		0.15		
8/6/97	0915-1200	0.41	0.41	0.18	0.19	0.38	0.36	
8/6/97	0915-1200	0.41		0.20		0.34		
8/6/97	1300-1600	0.58	0.62	0.54	0.59	0.92	1.03	
8/6/97	1300-1600	0.65		0.65		1.13		

Table A-1.2. Detailed Data from Measurements of Isoprene and its Atmospheric Reaction Products in Ambient Air at Pine Mtn. and Mt. Baldy (continued).

Date	Sampling	Isoprene ppbv	Isoprene av, ppbv	MACR ppbv	MACR av, ppbv	MVK ppbv	MVK av, ppbv	Reason for discarding data
PINE MTN.	**Sep 4-7, 1997**							
9/4/97	1702-2000	0.52	0.41	0.72	0.52	0.86	0.72	
9/4/97	1702-2000	0.31		0.32		0.57		
9/4/97	2008-2400	0.03	0.03	0.35	0.33	0.57	0.54	
9/4/97	2008-2400	0.03		0.32		0.52		
9/5/97	0010-0338	0.03	0.02	0.10	0.10	0.23	0.16	
9/5/97	0010-0338	0.02		0.10		0.09		
9/5/97	0349-0600	0.01	0.02	0.08	0.09	0.17	0.18	
9/5/97	0349-0600	0.02		0.09		0.20		
9/5/97	0615-0900	0.66	0.63	0.10	0.10	0.18	0.20	
9/5/97	0615-0900	0.60		0.11		0.21		
9/5/97	0908-1200	0.96	0.93	0.21	0.21	0.38	0.38	
9/5/97	0908-1200	0.89		0.21		0.38		
9/5/97	1300-1600	1.73	1.71	1.05	1.07	0.96	1.38	
9/5/97	1300-1600	1.68		1.09		1.79		
9/5/97	1700-2000	0.62	0.59	0.31	0.30	0.53	0.49	
9/5/97	1700-2000	0.55		0.28		0.46		
9/5/97	2007-2355	0.04	0.03	0.21	0.26	0.32	0.39	
9/5/97	2007-2355	0.02		0.31		0.46		
9/6/97	0000-0255	0.02	0.02	0.09	0.10	0.18	0.17	
9/6/97	0000-0255	0.02		0.10		0.16		
9/6/97	0301-0600	0.03	0.03	0.11	0.10	0.17	0.14	
9/6/97	0301-0600	0.03		0.08		0.11		
9/6/97	0610-0900	0.52	0.48	0.08	0.08	0.17	0.16	
9/6/97	0610-0900	0.44		0.08		0.15		
9/6/97	0905-1200	0.56	0.60	0.20	0.17	0.04	0.17	
9/6/97	0905-1200	0.64		0.15		0.30		

Table A-1.2. Detailed Data from Measurements of Isoprene and its Atmospheric Reaction Products in Ambient Air at Pine Mtn. and Mt. Baldy (continued).

Date	Sampling	Isoprene ppbv	Isoprene av, ppbv	MACR ppbv	MACR av, ppbv	MVK ppbv	MVK av, ppbv	Reason for discarding data
9/6/97	1300-1600	1.62	1.58	0.36	0.25	0.45	0.35	
9/6/97	1300-1600	1.54		0.15		0.25		
9/6/97	1700-2000	0.56	0.55	0.33	0.33	0.54	0.54	
9/6/97	1700-2000	0.54		0.34		0.54		
9/6/97	2007-2355	0.06	0.05	0.17	0.18	0.28	0.26	
9/6/97	2007-2355	0.03		0.18		0.23		
9/7/97	0000-0255	0.03	0.03	0.18	0.16	0.23	0.24	
9/7/97	0000-0255	0.03		0.15		0.25		
9/7/97	0300-0555	0.05	0.05	0.13	0.10	0.19	0.15	
9/7/97	0300-0555	0.04		0.08		0.11		
9/7/97	0600-0900	1.83	1.88	0.12	0.10	0.27	0.21	
9/7/97	0600-0900	1.92		0.07		0.15		
MT. BALDY	**SEP 28-29, 1997**							
9/28/97	0904-1200	1.91	1.90	0.70	0.23*	0.32	0.40	(Ion 69 used to quantitate MACR)
9/28/97	0904-1200	1.90		0.23		0.48		(Ion 69 used to quantitate MACR)
9/28/97	1300-1600	1.14	1.17	0.37	0.37	0.91	0.93	
9/28/97	1300-1600	1.21		0.36		0.95		
9/28/97	1700-2000	2.15	2.27	0.39	0.40	0.82	0.85	
9/28/97	1700-2000	2.38		0.40		0.88		
9/28-29/97	2005-0300	0.09	0.08	0.24	0.24	0.44	0.47	
9/28-29/97	2005-0300	0.07		0.23		0.50		
9/29/97	0307-0600	0.06	0.06	0.07	0.06	0.17	0.17	
9/29/97	0307-0600	0.06		0.06		0.17		
9/29/97	0606-0900	0.69	0.65	0.06	0.06	0.15	0.15	
9/29/97	0606-0900	0.62		0.06		0.15		
9/29/97	0903-1200	1.84	1.84	0.28	0.27	0.65	0.63	
9/29/97	0903-1200	1.85		0.26		0.61		

Table A-1.2. Detailed Data from Measurements of Isoprene and its Atmospheric Reaction Products in Ambient Air at Pine Mtn. and Mt. Baldy (continued).

Date	Sampling	Isoprene ppbv	Isoprene av, ppbv	MACR ppbv	MACR av, ppbv	MVK ppbv	MVK av, ppbv	Reason for discarding data
9/29/97	1300-1600	1.08	1.07	0.29	0.29	0.60	0.61	
9/29/97	1300-1600	1.07		0.28		0.61		
9/29/97	1700-2000	1.94	1.92	0.44	0.39	0.91	0.79	
9/29/97	1700-2000	1.89		0.34		0.66		
MT. BALDY	**OCT 3-4, 1997**							
10/3/97	0619-0900	0.42	0.42	0.02	0.02	0.11	0.12	
10/3/97	0619-0900	0.41		0.02		0.13		
10/3/97	0903-1200	1.39	1.38	0.13	0.13	0.28	0.28	
10/3/97	0903-1200	1.37		0.12		0.28		
10/3/97	1301-1600	1.22	1.23	0.41	0.48	0.77	1.01	
10/3/97	1301-1600	1.23		0.55		1.25		
10/3/97	1703-2003	1.29	1.29*	0.37	0.37*	0.72	0.72*	
10/3/97	1703-2003	1.91		0.60		1.07		Very low isoprene-d_8
10/3-4/97	2010-0302	0.05	0.05	0.12	0.13	0.24	0.26	
10/3-4/97	2010-0302	0.05		0.13		0.27		
10/4/97	0310-0601	0.04	0.04	0.06	0.06	0.11	0.11	
10/4/97	0310-0601	0.04		0.05		0.12		
10/4/97	0612-0900	0.26	0.26	0.04	0.04	0.10	0.10	
10/4/97	0612-0900	0.27		0.04		0.10		
10/4/97	0903-1200	1.54	1.53	0.11	0.12	0.24	0.25	
10/4/97	0903-1200	1.51		0.12		0.25		
10/4/97	1300-1600	0.86	0.88	0.33	0.32	0.77	0.75	
10/4/97	1300-1600	0.90		0.31		0.73		
10/4/97	1700-2000	1.30	1.29	0.36	0.36	0.67	0.66	

*Used single value.

Table A-1.3. Detailed Data from Measurements of Isoprene and its Atmospheric Reaction Products in Ambient Air at Bannning.

Date	Sampling	Isoprene ppbv	Isoprene av, ppbv	MACR ppbv	MACR av, ppbv	MVK ppbv	MVK av, ppbv	Reason for discarding data
BANNING	**AUG 4-6, 1997**							
8/4/97	0600-0855	0.21	0.25	0.12	0.14	0.25	0.33	
8/4/97	0600-0855	0.29		0.16		0.40		
8/4/97	0902-1157	0.06	0.06	0.05	0.09	0.16	0.19	
8/4/97	0902-1157	0.07		0.12		0.23		
8/4/97	-	-	-	-	-	-	-	Wind knocked over sampling equipment, no sample
8/4/97	-	-		-		-		Wind knocked over sampling equipment, no sample
8/4/97	1504-1800	0.18	0.21	0.15	0.12	0.34	0.28	
8/4/97	1504-1800	0.24		0.09		0.21		
8/4-5/1997	1807-0255	0.08	0.08	0.40	0.35	0.76	0.68	
8/4-5/1997	1807-0255	0.08		0.30		0.59		
8/5/97	0303-0550	0.02	0.02	0.16	0.16	0.25	0.26	
8/5/97	0303-0550	0.02		0.16		0.27		
8/5/97	0604-0855	0.32	0.33	0.21	0.20	0.30	0.31	
8/5/97	0604-0855	0.34		0.20		0.32		
8/5/97	0901-1153	0.07	0.08	0.07	0.07	0.15	0.15	
8/5/97	0901-1153	0.08		0.06		0.15		
8/5/97	1159-1452	0.08	0.10	0.04	0.04	0.10	0.11	
8/5/97	1159-1452	0.12		0.04		0.12		
8/5/97	1458-1800	0.12	0.13	0.07	0.07	0.12	0.13	
8/5/97	1458-1800	0.14		0.07		0.14		
8/5- 8/6/97	1816-0255	0.06	0.07	0.15	0.22	0.30	0.39	
8/5- 8/6/97	1816-0255	0.08		0.28		0.48		
8/6/97	0301-0550	0.01	0.01	0.03	0.04	0.07	0.10	
8/6/97	0301-0550	0.02		0.06		0.14		
8/6/97	0605-0855	0.02	0.02	0.02	0.02	0.04	0.04	
8/6/97	0605-0855	0.02		0.02		0.04		

Table A-1.3. Detailed Data from Measurements of Isoprene and its Atmospheric Reaction Products in Ambient Air at Bannning (continued).

Date	Sampling	Isoprene ppbv	Isoprene av, ppbv	MACR ppbv	MACR av, ppbv	MVK ppbv	MVK av, ppbv	Reason for discarding data
8/6/97	0901-1150	0.02	0.02	0.02	0.02	0.04	0.05	
8/6/97	0901-1150	0.03		0.02		0.05		
8/6/97	1155-1455	0.04	0.03	0.02	0.02	0.05	0.06	
8/6/97	1155-1455	0.03		0.02		0.07		
8/6/97	1500-1800	0.16	0.18	0.04	0.05	0.14	0.16	
8/6/97	1500-1800	0.19		0.05		0.17		
BANNING	**AUG 22-23, 1997**							
8/22/97	0600-0855	0.11	0.12	0.06	0.07	0.31	0.36	
8/22/97	0600-0855	0.12		0.08		0.41		
8/22/97	0900-1155	0.24	0.27	0.10	0.10	0.25	0.26	
8/22/97	0900-1155	0.29		0.10		0.27		
8/22/97	1200-1455	0.19	0.20	0.09	0.09	0.22	0.23	
8/22/97	1200-1455	0.21		0.09		0.23		
8/22/97	1500-1800	0.28	0.28	0.12	0.14	0.26	0.32	
8/22/97	1500-1800	0.28		0.17		0.37		
8/22-23/97	1813-0300	0.09	0.08	2.45	2.37	3.08	2.93	
8/22-23/97	1813-0300	0.07		2.29		2.79		
8/23/97	0303-0555	0.01	0.01	0.13	0.16	0.32	0.42	
8/23/97	0303-0555	0.02		0.18		0.51		
8/23/97	0603-0900	0.14	0.14	0.12	0.12	0.26	0.27	
8/23/97	0603-0900	0.14		0.12		0.27		
8/23/97	0903-1200	0.20	0.22	0.06	0.07	0.16	0.18	
8/23/97	0903-1200	0.24		0.08		0.20		
8/23/97	1202-1500	0.19	0.20	0.05	0.05	0.12	0.12	
8/23/97	1202-1500	0.21		0.05		0.12		
8/23/97	1502-1800	0.20	0.22	0.08	0.07	0.25	0.25	
8/23/97	1502-1800	0.23		0.07		0.25		

Table A-1.3. Detailed Data from Measurements of Isoprene and its Atmospheric Reaction Products in Ambient Air at Bannning (continued).

Date	Sampling	Isoprene ppbv	Isoprene av, ppbv	MACR ppbv	MACR av, ppbv	MVK ppbv	MVK av, ppbv	Reason for discarding data
BANNING	**SEP 5-6, 1997**							
9/5/97	0600-0855	0.12	0.12	0.20	0.21	0.44	0.39	
9/5/97	0600-0855	0.13		0.21		0.34		
9/5/97	0900-1155	0.18	0.19	0.09	0.09	0.19	0.21	
9/5/97	0900-1155	0.19		0.09		0.22		
9/5/97	1158-1458	0.16	0.17	0.04	0.03	0.11	0.11	
9/5/97	1158-1458	0.18		0.03		0.10		
9/5/97	1501-1800	0.17	0.17	0.18	0.18	0.59	0.59	
9/5/97	1501-1800	0.18		0.18		0.60		
9/5-6/97	1824-0257	0.03	0.05	0.35	0.45	0.50	0.53	
9/5-6/97	1824-0257	0.06		0.55		0.57		
9/6/97	0308-0550	0.01	0.01*	0.29	0.29*	0.29	0.29*	
9/6/97	0308-0550	-		-		-		Sampling tube contents expelled from tube desorber
9/6/97	0610-0855	0.01	0.10*	0.11	0.33*	0.19	0.44*	Results low, seems like a back sampling tube
9/6/97	0610-0855	0.10		0.33		0.44		
9/6/97	0900-1158	0.03	0.03	0.08	0.05	0.16	0.14	
9/6/97	0900-1158	0.02		0.03		0.13		
9/6/97	1202-1458	0.11	0.12	0.04	0.04	0.11	0.11	
9/6/97	1205-1458	0.13		0.04		0.10		
9/6/97	1502-1800	0.21	0.21*	0.06	0.06*	0.18	0.18*	
9/6/97	1502-1800	1.64		0.60		1.85		Very low isoprene-d_8
BANNING	**OCT 3-4, 1997**							
10/3/97	0600-0858	0.05	0.05	0.07	0.08	0.27	0.25	
10/3/97	0600-0858	0.05		0.10		0.22		
10/3/97	0900-1158	0.06	0.06	0.05	0.07	0.14	0.14	
10/3/97	0900-1158	0.06		0.08		0.14		

Table A-1.3. Detailed Data from Measurements of Isoprene and its Atmospheric Reaction Products in Ambient Air at Bannning (continued).

Date	Sampling	Isoprene ppbv	Isoprene av, ppbv	MACR ppbv	MACR av, ppbv	MVK ppbv	MVK av, ppbv	Reason for discarding data
10/3/97	1200-1458	0.03	0.03	0.03	0.03	0.10	0.08	
10/3/97	1200-1458	0.03		0.03		0.07		
10/3/97	1500-1800	0.19	0.19	0.15	0.15	0.36	0.36	
10/3/97	1500-1800	0.20		0.15		0.35		
10/3-4/97	1807-0258	0.04	0.04	0.17	0.14	0.17	0.18	
10/3-4/97	1807-0258	0.03		0.11		0.18		
10/4/97	0300-0553	0.03	0.04	0.19	0.18	0.30	0.32	
10/4/97	0300-0553	0.04		0.18		0.33		
10/4/97	0601-0858	0.10	0.10	0.17	0.16	0.32	0.29	
10/4/97	0601-0858	0.10		0.16		0.27		
10/4/97	0900-1158	0.14	0.14	0.10	0.10	0.32	0.30	
10/4/97	0900-1158	0.13		0.10		0.27		
10/4/97	1200-1458	0.13	0.12	0.11	0.10	0.31	0.28	
10/4/97	1200-1458	0.12		0.09		0.24		
10/4/97	1500-1800	0.10	0.11	0.13	0.16	0.45	0.46	
10/4/97	1500-1800	0.13		0.19		0.47		

*Used single value.

Table A-1.4. Detailed Data from Measurements of Isoprene and its Atmospheric Reaction Products in Ambient Air at Los Angeles, North Main Street.

Date	Sampling	Isoprene ppbv	Isoprene av, ppbv	MACR ppbv	MACR av, ppbv	MVK ppbv	MVK av, ppbv	Reason for discarding data
LOS ANGELES, NORTH MAIN ST.								
8/22/97	0558-0855	0.40	0.37	0.75	0.77	0.53	0.50	
8/22/97	0558-0855	0.35		0.80		0.47		
8/22/97	0900-1155	0.10	0.11	1.12	1.26	1.10	0.98	
8/22/97	0900-1155	0.11		1.41		0.85		
8/22/97	1202-1457	0.22	0.21	0.50	0.49	0.72	0.67	
8/22/97	1202-1457	0.19		0.48		0.62		
8/22/97	1500-1755	0.14	0.17	0.22	0.27	0.41	0.47	
8/22/97	1500-1755	0.19		0.33		0.54		
8/22-23/97	1806-0556	0.19	0.23	0.22	0.28	0.20	0.41	
8/22-23/97	1806-0556	0.28		0.35		0.61		
8/23/97	0605-0857	0.18	0.21	0.34	0.44	0.32	0.44	
8/23/97	0605-0857	0.24		0.54		0.56		
8/23/97	0900-1156	0.13	0.12	0.34	0.33	0.62	0.73	
8/23/97	0900-1156	0.12		0.32		0.83		
8/23/97	1202-1458	0.14	0.15	0.36	0.39	0.85	0.82	
8/23/97	1202-1458	0.16		0.42		0.79		
8/23/97	1500-1800	0.21	0.21	0.30	0.27	0.45	0.50	
8/23/97	1500-1800	0.21		0.24		0.54		

Table B-1.1. Detailed Data from Measurements of α-Pinene, Camphene, Sabinene and β-Pinene in Ambient Air at Azusa.

Date	Sampling	α-Pinene ppbv	α-Pinene av, ppbv	Camphene ppbv	Camphene av, ppbv	Sabinene ppbv	Sabinene av, ppbv	β-Pinene ppbv	β-Pinene av, ppbv	Reason for discarding data
AZUSA	**AUG 4-6, 1997**									
8/4/97	0600-0900	0.3122	0.3196	0.0100	0.0108	0.3304	0.3454	0.0432	0.0451	
8/4/97	0600-0900	0.3271		0.0115		0.3604		0.0470		
8/4/97	0907-1206	0.1061	0.1106	0.0052	0.0054	0.0791	0.1029	0.0156	0.0162	
8/4/97	0907-1206	0.1150		0.0057		0.1267		0.0169		
8/4/97	1306-1603	0.0284	0.0278	0.0039	0.0029	0.0104	0.0155	0.0075	0.0080	
8/4/97	1306-1603	0.0272		0.0019		0.0206		0.0084		
8/4/97	1700-2000	0.0469	0.0446	0.0030	0.0043	0.0416	0.0283	0.0161	0.0148	
8/4/97	1700-2000	0.0423		0.0056		0.0149		0.0135		
8/4/97	2006-0300	0.1778	0.1800	0.0085	0.0080	0.1569	0.1526	0.0369	0.0368	
8/4/97	2006-0300	0.1822		0.0074		0.1482		0.0366		
8/5/97	0307-0600	0.3515	0.3768	0.0196	0.0211	0.1338	0.1677	0.0940	0.1024	
8/5/97	0307-0600	0.4020		0.0225		0.2016		0.1108		
8/5/97	0618-0900	0.2187	0.2214	0.0133	0.0137	0.0925	0.0901	0.0588	0.0616	
8/5/97	0618-0900	0.2241		0.0141		0.0877		0.0644		
8/5/97	0907-1202	0.1204	0.1221	0.0066	0.0064	0.1041	0.1116	0.0193	0.0198	
8/5/97	0907-1202	0.1238		0.0063		0.1191		0.0204		
8/5/97	1300-1600	0.0336	0.0332	0.0037	0.0041	0.0183	0.0188	0.0109	0.0109	
8/5/97	1300-1600	0.0328		0.0045		0.0192		0.0109		
8/5/97	1701-2000	0.0465	0.0470	0.0042	0.0037	0.0264	0.0283	0.0160	0.0158	
8/5/97	1701-2000	0.0475		0.0031		0.0301		0.0156		
8/5- 8/6/97	2005-0300	0.2825	0.2977	0.0128	0.0134	0.2358	0.2617	0.0478	0.0499	
8/5-8/6/97	2005-0300	0.3130		0.0141		0.2877		0.0520		
8/6/97	0306-0600	0.4373	0.4534	0.0152	0.0164	0.3309	0.3756	0.0646	0.0682	
8/6/97	0306-0600	0.4695		0.0176		0.4204		0.0717		
8/6/97	0616-0900	0.3715	0.3490	0.0174	0.0170	0.2539	0.2061	0.0679	0.0630	
8/6/97	0616-0900	0.3264		0.0167		0.1582		0.0581		
8/6/97	0906-1200	0.0789	0.0808	0.0076	0.0068	0.0308	0.0371	0.0158	0.0161	
8/6/97	0906-1200	0.0827		0.0059		0.0434		0.0163		

Table B-1.1. Detailed Data from Measurements of α-Pinene, Camphene, Sabinene and β-Pinene in Ambient Air at Azusa (continued).

Date	Sampling	α-Pinene ppbv	α-Pinene av, ppbv	Camphene ppbv	Camphene av, ppbv	Sabinene ppbv	Sabinene av, ppbv	β-Pinene ppbv	β-Pinene av, ppbv	Reason for discarding data
8/6/97	1300-1600	0.0300	0.0300	0.0029	0.0028	0.0159	0.0159	0.0085	0.0087	
8/6/97	1300-1600	0.0300		0.0026		0.0158		0.0090		
8/6/97	1700-2000	0.0314	0.0322	0.0022	0.0021	0.0186	0.0147	0.0102	0.0096	
8/6/97	1700-2000	0.0330		0.0021		0.0109		0.0091		
AZUSA	**Aug 22-23, 1997**									
8/22/97	0318-0600	0.1675	0.1675*	0.1396	0.1396*	0.0178	0.0178*	0.0073	0.0073*	
8/22/97	0318-0600	0.8046		0.3350		0.0499		0.0419		Sampling tube contents transferred from broken tube
8/22/97	0610-0900	0.0010	0.3739*	0.0013	0.0084*	0.0013	0.2562*	-**	0.0602*	All results low, seems like a back sampling tube
8/22/97	0610-0900	0.3739		0.0084		0.2562		0.0602		
8/22/97	0905-1157	0.1204	0.1051	0.0067	0.0128	0.0243	0.0155	0.0227	0.0173	
8/22/97	0905-1157	0.0897		0.0189		0.0067		0.0120		
8/22/97	1210-1500	0.0261	0.0395*	0.0223	0.0074*	-**	0.0024*	0.0028	0.0035*	Sampling tube contents transferred from broken tube
8/22/97	1210-1500	0.0395		0.0074		0.0024		0.0035		
8/22/97	1504-1800	0.0327	0.0340	0.0042	0.0052	0.0084	0.0050	0.0101	0.0078	
8/22/97	1504-1800	0.0352		0.0061		0.0016		0.0054		
8/22-23/97	1815-0300	0.1490	0.1429	0.0063	0.0086	0.0713	0.0496	0.0279	0.0246	
8/22-23/97	1815-0300	0.1369		0.0110		0.0279		0.0213		
8/23/97	0304-0600	0.2552	0.4371*	0.0882	0.0113*	0.0180	0.2606*	0.0169	0.0666*	Altered monoterpene profile
8/23/97	0304-0600	0.4371		0.0113		0.2606		0.0666		
8/23/97	0615-0900	0.3878	0.3878	0.0127	0.0127	0.1400	0.1400	0.0430	0.0430	
8/23/97	0615-0900	-		-		-		-		(Mass detector stopped during analysis, sample destroyed)
8/23/97	0903-1200	0.0224	0.0927*	0.0407	0.0036*	0.0023	0.0316*	0.0026	0.0110*	Altered monoterpene profile
8/23/97	0903-1200	0.0927		0.0036		0.0316		0.0110		

Table B-1.1. Detailed Data from Measurements of α-Pinene, Camphene, Sabinene and β-Pinene in Ambient Air at Azusa (continued).

Date	Sampling	α-Pinene ppbv	α-Pinene av, ppbv	Camphene ppbv	Camphene av, ppbv	Sabinene ppbv	Sabinene av, ppbv	β-Pinene ppbv	β-Pinene av, ppbv	Reason for discarding data
8/23/97	1208-1500	0.0127	0.0163	0.0074	0.0047	0.0021	0.0025	0.0016	0.0022	
8/23/97	1208-1500	0.0199		0.0019		0.0030		0.0029		
8/23/97	1505-1800	0.0038	0.0038*	0.0188	0.0188*	0.0014	0.0014*	-**	-**	
8/23/97	1505-1800	0.0008		0.0376		0.0029		-**		Sampling tube contents transferred from broken tube
AZUSA	**Sep 4-7, 1997**									
9/4/97	0300-0600	0.6494	0.5268	0.0135	0.0115	0.3688	0.2610	0.0919	0.0744	
9/4/97	0300-0600	0.4042		0.0094		0.1532		0.0570		
9/4/97	0606-0900	0.2020	0.2141	0.0068	0.0058	0.0063	0.0344	0.0197	0.0234	
9/4/97	0606-0900	0.2262		0.0047		0.0625		0.0271		
9/4/97	0904-1200	0.0924	0.0910	0.0032	0.0028	0.0165	0.0218	0.0110	0.0113	
9/4/97	0904-1200	0.0897		0.0024		0.0271		0.0115		
9/4/97	1300-1600	0.0195	0.0208	0.0019	0.0060	0.0035	0.0058	0.0038	0.0058	
9/4/97	1300-1600	0.0221		0.0101		0.0081		0.0079		
9/4/97	1700-2000	0.0333	0.0416	0.0190	0.0117	0.0132	0.0087	0.0100	0.0104	
9/4/97	1700-2000	0.0498		0.0043		0.0042		0.0108		
9/4/97	2014-2400	0.1401	0.1286	0.0060	0.0043	0.0211	0.0351	0.0101	0.0106	
9/4/97	2014-2400	0.1171		0.0027		0.0491		0.0112		
9/5/97	0006-0300	0.1137	0.1145	0.0155	0.0096	0.0056	0.0103	0.0065	0.0084	
9/5/97	0006-0300	0.1154		0.0037		0.0150		0.0102		
9/5/97	0305-0600	0.2745	0.2838	0.0054	0.0052	0.1250	0.1523	0.0287	0.0302	
9/5/97	0305-0600	0.2931		0.0051		0.1796		0.0317		
9/5/97	0615-0900	-	0.3920*	-	0.0099*	-	0.1082*	-	0.0385*	(High toluene, analysis in the SCAN mode)
9/5/97	0615-0900	0.3920		0.0099		0.1082		0.0385		
9/5/97	0903-1200	0.1164	0.1251	0.0066	0.0065	0.0072	0.0288	0.0117	0.0160	
9/5/97	0903-1200	0.1337		0.0063		0.0504		0.0202		

Table B-1.1. Detailed Data from Measurements of α-Pinene, Camphene, Sabinene and β-Pinene in Ambient Air at Azusa (continued).

Date	Sampling	α-Pinene ppbv	α-Pinene av, ppbv	Camphene ppbv	Camphene av, ppbv	Sabinene ppbv	Sabinene av, ppbv	β-Pinene ppbv	β-Pinene av, ppbv	Reason for discarding data
9/5/97	1300-1600	0.0183	0.0178	0.0027	0.0022	0.0019	0.0032	0.0033	0.0034	
9/5/97	1300-1600	0.0174		0.0016		0.0044		0.0036		
9/5/97	1700-2000	0.0376	0.0356	0.0022	0.0028	0.0034	0.0028	0.0065	0.0056	
9/5/97	1700-2000	0.0336		0.0034		0.0023		0.0048		
9/5/97	2006-2400	0.0989	0.1001	0.0037	0.0043	0.0396	0.0314	0.0159	0.0153	
9/5/97	2006-2400	0.1013		0.0048		0.0231		0.0147		
9/6/97	0008-0300	0.2759	0.2821	0.0084	0.0069	0.0819	0.1693	0.0176	0.0211	
9/6/97	0008-0300	0.2883		0.0053		0.2567		0.0245		
9/6/97	0306-0600	0.2541	0.2507	0.0056	0.0065	0.0476	0.0315	0.0324	0.0302	
9/6/97	0306-0600	0.2474		0.0074		0.0153		0.0281		
9/6/97	0615-0900	0.3310	0.3292	0.0110	0.0111	0.0110	0.0098	0.0382	0.0358	
9/6/97	0615-0900	0.3273		0.0113		0.0086		0.0334		
9/6/97	0903-1200	0.1008	0.1012	0.0035	0.0039	0.0291	0.0244	0.0133	0.0132	
9/6/97	0903-1200	0.1016		0.0043		0.0197		0.0131		
9/6/97	1300-1600	0.0173	0.0190	0.0054	0.0035	0.0014	0.0025	0.0019	0.0027	
9/6/97	1300-1600	0.0208		0.0016		0.0035		0.0036		
9/6/97	1700-1959	0.0269	0.0218	0.0018	0.0027	0.0092	0.0068	0.0065	0.0048	
9/6/97	1700-1959	0.0167		0.0036		0.0044		0.0030		
9/6/97	2010-2400	0.0381	0.0419	0.0031	0.0028	0.0035	0.0151	0.0055	0.0067	
9/6/97	2010-2400	0.0457		0.0025		0.0267		0.0080		
9/7/97	0005-0300	0.2871	0.2871*	0.0090	0.0090*	0.0358	0.0358*	0.0151	0.0151*	
9/7/97	0005-0300	0.1465		0.1006		0.0011		0.0028		Altered monoterpene profile
9/7/97	0306-0600	0.4483	0.4648	0.0095	0.0099	0.2798	0.3051	0.0407	0.0428	
9/7/97	0306-0600	0.4814		0.0104		0.3304		0.0449		
9/7/97	0604-0900	0.4308	0.3851	0.0098	0.0105	0.2207	0.1384	0.0405	0.0330	
9/7/97	0604-0900	0.3394		0.0111		0.0561		0.0256		

Table B-1.1. Detailed Data from Measurements of α-Pinene, Camphene, Sabinene and β-Pinene in Ambient Air at Azusa (continued).

Date	Sampling	α-Pinene ppbv	α-Pinene av, ppbv	Camphene ppbv	Camphene av, ppbv	Sabinene ppbv	Sabinene av, ppbv	β-Pinene ppbv	β-Pinene av, ppbv	Reason for discarding data
AZUSA	**SEP 28-29, 1997**									
9/28/97	0301-0600	0.2548	0.2524	0.0239	0.0242	0.0259	0.0256	0.0571	0.0543	
9/28/97	0301-0600	0.2501		0.0245		0.0253		0.0515		
9/28/97	0609-0900	0.2856	0.2744	0.0103	0.0098	0.2410	0.2305	0.0768	0.0730	
9/28/97	0609-0900	0.2632		0.0094		0.2200		0.0692		
9/28/97	0904-1200	0.0724	0.0687	0.0060	0.0048	0.0161	0.0234	0.0121	0.0121	
9/28/97	0904-1200	0.0651		0.0036		0.0307		0.0121		
9/28/97	1300-1600	0.0249	0.0236	0.0017	0.0020	0.0178	0.0150	0.0087	0.0075	
9/28/97	1300-1600	0.0223		0.0023		0.0123		0.0064		
9/28/97	1700-2000	0.0147	0.0160	0.0050	0.0038	0.0026	0.0067	0.0054	0.0071	
9/28/97	1700-2000	0.0173		0.0026		0.0107		0.0088		
9/28-29/97	2015-0300	0.1072	0.0973	0.0043	0.0061	0.0898	0.0609	0.0214	0.0170	
9/28-29/97	2015-0300	0.0875		0.0080		0.0320		0.0125		
9/29/97	0310-0600	0.2337	0.2222	0.0118	0.0108	0.1762	0.1888	0.0546	0.0512	
9/29/97	0310-0600	0.2108		0.0097		0.2014		0.0478		
9/29/97	0616-0858	0.1701	0.1784	0.0477	0.0445	0.0092	0.0122	0.0131	0.0146	
9/29/97	0616-0858	0.1868		0.0413		0.0152		0.0160		
9/29/97	0900-1200	0.0963	0.0964	0.0044	0.0039	0.0686	0.0858	0.0179	0.0196	
9/29/97	0900-1200	0.0966		0.0034		0.1029		0.0212		
9/29/97	1300-1600	0.0285	0.0262	0.0018	0.0021	0.0262	0.0212	0.0100	0.0087	
9/29/97	1300-1600	0.0239		0.0023		0.0161		0.0074		
9/29/97	1700-2000	0.0050	0.0086	0.0233	0.0265	0.0067	0.0042	0.0028	0.0027	
9/29/97	1700-2000	0.0122		0.0297		0.0018		0.0026		

Table B-1.1. Detailed Data from Measurements of α-Pinene, Camphene, Sabinene and β-Pinene in Ambient Air at Azusa (continued).

Date	Sampling	α-Pinene ppbv	α-Pinene av, ppbv	Camphene ppbv	Camphene av, ppbv	Sabinene ppbv	Sabinene av, ppbv	β-Pinene ppbv	β-Pinene av, ppbv	Reason for discarding data
AZUSA	**OCT 3-4, 1997**									
10/3/97	0301-0600	0.0341	0.0409	0.0075	0.0059	0.0063	0.0164	0.0045	0.0075	
10/3/97	0301-0600	0.0478		0.0043		0.0265		0.0104		
10/3/97	0614-0900	0.0567	0.0575	0.0050	0.0051	0.0378	0.0423	0.0134	0.0135	
10/3/97	0614-0900	0.0584		0.0053		0.0469		0.0135		
10/3/97	0904-1200	0.0342	0.0331	0.0046	0.0053	0.0168	0.0119	0.0068	0.0066	
10/3/97	0904-1200	0.0320		0.0060		0.0071		0.0065		
10/3/97	1300-1600	0.0214	0.0216	0.0049	0.0047	0.0051	0.0060	0.0060	0.0063	
10/3/97	1300-1600	0.0219		0.0044		0.0068		0.0065		
10/3/97	1700-2000	0.0163	0.0162	0.0038	0.0041	0.0067	0.0100	0.0102	0.0103	
10/3/97	1700-2000	0.0160		0.0044		0.0133		0.0104		
10/3-4/97	2011-0300	0.1076	0.0934	0.0049	0.0045	0.0584	0.0450	0.0109	0.0095	
10/3-4/97	2011-0300	0.0791		0.0040		0.0317		0.0081		
10/4/97	0304-0600	0.0306	0.0228	0.1293	0.1306	0.0031	0.0062	0.0025	0.0059	
10/4/97	0304-0600	0.0151		0.1318		0.0093		0.0093		
10/5/97	0612-0900	0.0803	0.0800	0.0063	0.0068	0.0283	0.0213	0.0195	0.0185	
10/4/97	0612-0900	0.0798		0.0074		0.0142		0.0174		
10/4/97	0901-1200	0.0061	0.0108	0.0794	0.0529	0.0112	0.0065	0.0081	0.0060	
10/4/97	0901-1200	0.0154		0.0263		0.0017		0.0039		
10/4/97	1300-1600	0.0099	0.0138	0.0165	0.0096	0.0091	0.0095	-**	0.0063*	
10/4/97	1300-1600	0.0178		0.0027		0.0099		0.0063		
10/4/97	1700-2000	0.0144	0.0140	0.0045	0.0042	0.0066	0.0069	0.0059	0.0059	
10/4/97	1700-2000	0.0136		0.0040		0.0071		0.0059		

*Used single value.
**Not detected.

Table B-1.2. Detailed Data from Measurements of α-Pinene, Camphene, Sabinene and β-Pinene in Ambient Air at Pine Mtn. and Mt. Baldy.

Date	Sampling	α-Pinene ppbv	α-Pinene av, ppbv	Camphene ppbv	Camphene av, ppbv	Sabinene ppbv	Sabinene av, ppbv	β-Pinene ppbv	β-Pinene av, ppbv	Reason for discarding data
PINE MT	**AUG 4-6, 1997**									
8/4/97	1710-2000	0.0200	0.0208	0.0067	0.0069	0.0105	0.0108	0.0054	0.0055	
8/4/97	1710-2000	0.0217		0.0070		0.0110		0.0055		
08/4-08/5/97	2025-0259	0.0007	0.0007	0.0045	0.0045*	0.0007	0.0007	-**	0.0003*	
08/4-08/5/97	2025-0259	0.0007		-**		0.0008		0.0003		
8/5/97	0314-0559	0.0008	0.0010	0.0017	0.0011	0.0009	0.0009	0.0002	0.0003	
8/5/97	0314-0559	0.0011		0.0006		0.0009		0.0004		
8/5/97	0617-0858	0.0148	0.0156	0.0018	0.0020	0.0038	0.0034	0.0051	0.0052	
8/5/97	0617-0858	0.0164		0.0021		0.0030		0.0053		
8/5/97	0911-1200	0.0496	0.0528	0.0080	0.0083	0.0277	0.0312	0.0066	0.0073	
8/5/97	0911-1200	0.0560		0.0086		0.0346		0.0080		
8/5/97	1302-1600	0.0381	0.0381*	0.0107	0.0107*	0.0087	0.0087*	0.0071	0.0071*	
8/5/97	1302-1600	-		-		-		-		(Sample tube missing)
8/5/97	1700-2000	0.0269	0.0277	0.0080	0.0084	0.0179	0.0162	0.0062	0.0063	
8/5/97	1700-2000	0.0285		0.0088		0.0145		0.0065		
8/5/97	2015-0255	0.0028	0.0029	0.0008	0.0009	0.0011	0.0009	0.0010	0.0011	
8/5/97	2015-0255	0.0029		0.0010		0.0007		0.0011		
8/6/97	0310-0600	0.0045	0.0045	0.0012	0.0014	0.0009	0.0012	0.0022	0.0021	
8/6/97	0310-0600	0.0045		0.0015		0.0015		0.0021		
8/6/97	0615-0900	0.0169	0.0164	0.0028	0.0059	0.0022	0.0017	0.0050	0.0039	
8/6/97	0615-0900	0.0159		0.0090		0.0013		0.0028		
8/6/97	0915-1200	0.0304	0.0313	0.0048	0.0051	0.0226	0.0179	0.0042	0.0043	
8/6/97	0915-1200	0.0322		0.0054		0.0132		0.0044		
8/6/97	1300-1600	0.0391	0.0402	0.0102	0.0106	0.0209	0.0153	0.0067	0.0069	
8/6/97	1300-1600	0.0413		0.0111		0.0098		0.0070		

Table B-1.2. Detailed Data from Measurements of α-Pinene, Camphene, Sabinene and β-Pinene in Ambient Air at Pine Mtn. and Mt. Baldy (continued).

Date	Sampling	α-Pinene ppbv	α-Pinene av, ppbv	Camphene ppbv	Camphene av, ppbv	Sabinene ppbv	Sabinene av, ppbv	β-Pinene ppbv	β-Pinene av, ppbv	Reason for discarding data
PINE MT	**SEP 4-7, 1997**									
9/4/97	1702-2000	0.0096	0.0136	0.0106	0.0071	0.0087	0.0143	0.0015	0.0028	
9/4/97	1702-2000	0.0177		0.0036		0.0199		0.0040		
9/4/97	2008-2400	0.0006	0.0006	0.0006	0.0008	0.0019	0.0014	0.0007	0.0008	
9/4/97	2008-2400	0.0005		0.0009		0.0008		0.0010		
9/5/97	0010-0338	0.0006	0.0006	0.0015	0.0082	0.0012	0.0012*	0.0023	0.0023*	
9/5/97	0010-0338	-**		0.0149		-**		-**		
9/5/97	0349-0600	0.0009	0.0007	0.0012	0.0052	0.0027	0.0019	0.0006	0.0006*	
9/5/97	0349-0600	0.0005		0.0093		0.0010		-**		
9/5/97	0615-0900	0.0038	0.0047	0.0252	0.0140	0.0016	0.0017	0.0014	0.0022	
9/5/97	0615-0900	0.0055		0.0029		0.0017		0.0030		
9/5/97	0908-1200	0.0305	0.0290	0.0035	0.0034	0.0206	0.0133	0.0025	0.0024	
9/5/97	0908-1200	0.0275		0.0033		0.0060		0.0023		
9/5/97	1300-1600	0.0288	0.0286	0.0049	0.0050	0.0040	0.0047	0.0033	0.0032	
9/5/97	1300-1600	0.0285		0.0050		0.0054		0.0031		
9/5/97	1700-2000	0.0271	0.0277	0.0042	0.0039	0.0086	0.0132	0.0038	0.0041	
9/5/97	1700-2000	0.0282		0.0035		0.0177		0.0043		
9/5/97	2007-2355	0.0007	0.0008	-**	-**	0.0014	0.0013	-**	-**	
9/5/97	2007-2355	0.0010		-**		0.0013		-**		
9/6/97	0000-0255	0.0007	0.0007	-**	-**	0.0010	0.0010*	0.0009	0.0009*	
9/6/97	0000-0255	0.0007		-**		-**		-**		
9/6/97	0301-0600	0.0009	0.0009	0.0013	0.0012	-**	0.0007*	-**	0.0008*	
9/6/97	0301-0600	0.0009		0.0012		0.0007		0.0008		
9/6/97	0610-0900	0.0033	0.0040	0.0013	0.0016	0.0024	0.0014	0.0015	0.0015	
9/6/97	0610-0900	0.0047		0.0020		0.0004		0.0014		
9/6/97	0905-1200	0.0053	0.0147	0.0048	0.0040	0.0016	0.0035	-**	0.0017*	
9/6/97	0905-1200	0.0240		0.0033		0.0055		0.0017		

Table B-1.2. Detailed Data from Measurements of α-Pinene, Camphene, Sabinene and β-Pinene in Ambient Air at Pine Mtn. and Mt. Baldy (continued).

Date	Sampling	α-Pinene ppbv	α-Pinene av, ppbv	Camphene ppbv	Camphene av, ppbv	Sabinene ppbv	Sabinene av, ppbv	β-Pinene ppbv	β-Pinene av, ppbv	Reason for discarding data
9/6/97	1300-1600	0.0153	0.0154	0.0031	0.0035	0.0064	0.0046	0.0026	0.0023	
9/6/97	1300-1600	0.0154		0.0039		0.0028		0.0020		
9/6/97	1700-2000	0.0169	0.0176	0.0050	0.0046	0.0012	0.0050	0.0025	0.0030	
9/6/97	1700-2000	0.0182		0.0042		0.0088		0.0035		
9/6/97	2007-2355	0.0006	0.0006	0.0010	0.0010*	0.0009	0.0009	0.0013	0.0012	
9/6/97	2007-2355	0.0006		-**		0.0009		0.0010		
9/7/97	0000-0255	0.0008	0.0008	0.0010	0.0085	0.0033	0.0022	0.0018	0.0018*	
9/7/97	0000-0255	0.0008		0.0160		0.0012		-**		
9/7/97	0300-0555	0.0016	0.0014	0.0014	0.0015	0.0011	0.0016	0.0014	0.0018	
9/7/97	0300-0555	0.0013		0.0015		0.0021		0.0022		
9/7/97	0600-0900	0.0046	0.0061	0.0024	0.0020	0.0011	0.0030	0.0008	0.0024	
9/7/97	0600-0900	0.0076		0.0017		0.0050		0.0041		
MT BALDY	**SEP 28-29, 1997**									
9/28/97	0904-1200	0.2032	0.2080	0.0091	0.0083	0.0141	0.0229	0.0563	0.0600	
9/28/97	0904-1200	0.2128		0.0076		0.0317		0.0637		
9/28/97	1300-1600	0.0998	0.1013	0.0049	0.0053	0.0183	0.0161	0.0233	0.0236	
9/28/97	1300-1600	0.1029		0.0058		0.0139		0.0238		
9/28/97	1700-2000	0.1346	0.1316	0.0111	0.0142	0.0109	0.0075	0.0472	0.0397	
9/28/97	1700-2000	0.1286		0.0172		0.0041		0.0322		
9/28-29/97	2005-0300	0.0526	0.0520	0.0056	0.0056	0.0052	0.0045	0.0366	0.0353	
9/28-29/97	2005-0300	0.0513		0.0057		0.0038		0.0340		
9/29/97	0307-0600	0.0590	0.0583	0.0055	0.0052	0.0061	0.0061	0.0380	0.0376	
9/29/97	0307-0600	0.0576		0.0050		0.0061		0.0372		
9/29/97	0606-0900	0.0748	0.0762	0.0057	0.0057	0.0079	0.0090	0.0418	0.0433	
9/29/97	0606-0900	0.0775		0.0056		0.0101		0.0449		
9/29/97	0903-1200	0.0827	0.0833	0.0124	0.0120	0.0017	0.0036	0.0140	0.0146	
9/29/97	0903-1200	0.0840		0.0117		0.0055		0.0153		

Table B-1.2. Detailed Data from Measurements of α-Pinene, Camphene, Sabinene and β-Pinene in Ambient Air at Pine Mtn. and Mt. Baldy (continued).

Date	Sampling	α-Pinene ppbv	α-Pinene av, ppbv	Camphene ppbv	Camphene av, ppbv	Sabinene ppbv	Sabinene av, ppbv	β-Pinene ppbv	β-Pinene av, ppbv	Reason for discarding data
9/29/97	1300-1600	0.0431	0.0526	0.0096	0.0066	0.0071	0.0090	0.0057	0.0100	
9/29/97	1300-1600	0.0621		0.0036		0.0109		0.0142		
9/29/97	1700-2000	0.0837	0.0840	0.0079	0.0102	0.0105	0.0075	0.0332	0.0311	
9/29/97	1700-2000	0.0843		0.0125		0.0044		0.0291		
MT BALDY	**OCT 3-4, 1997**									
10/3/97	0619-0900	0.0396	0.0397	0.0059	0.0059	0.0070	0.0089	0.0177	0.0217	
10/3/97	0619-0900	0.0398		0.0059		0.0107		0.0257		
10/3/97	0903-1200	0.0565	0.0498	0.0064	0.0080	0.0089	0.0074	0.0234	0.0172	
10/3/97	0903-1200	0.0431		0.0096		0.0060		0.0111		
10/3/97	1301-1600	0.0151	0.0500*	0.0370	0.0068*	0.0018	0.0113*	0.0017	0.0102*	Altered monoterpene profile
10/3/97	1301-1600	0.0500		0.0068		0.0113		0.0102		
10/3/97	1703-2003	0.0354	0.0354*	0.0078	0.0078*	0.0082	0.0082*	0.0141	0.0141*	
10/3/97	1703-2003	-**		-**		-**		-**		Seems like a back sampling tube
10/3-4/97	2010-0302	0.0198	0.0195	0.0028	0.0028	0.0030	0.0029	0.0155	0.0152	
10/3-4/97	2010-0302	0.0192		0.0027		0.0028		0.0149		
10/4/97	0310-0601	0.0250	0.0253	0.0040	0.0047	0.0028	0.0030	0.0218	0.0204	
10/4/97	0310-0601	0.0255		0.0053		0.0032		0.0190		
10/4/97	0612-0900	0.0458	0.0458*	0.0054	0.0054*	0.0080	0.0080*	0.0325	0.0325*	
10/4/97	0612-0900	0.0281		0.0206		0.0043		0.0078		Altered monoterpene profile
10/4/97	0903-1200	0.0660	0.0632	0.0087	0.0091	0.0033	0.0032	0.0109	0.0106	
10/4/97	0903-1200	0.0604		0.0096		0.0031		0.0103		
10/4/97	1300-1600	0.0451	0.0459	0.0056	0.0058	0.0102	0.0099	0.0107	0.0106	
10/4/97	1300-1600	0.0467		0.0059		0.0096		0.0105		
10/4/97	1700-2000	0.0390	0.0389	0.0074	0.0072	0.0048	0.0056	0.0126	0.0127	
10/4/97	1700-2000	0.0389		0.0071		0.0064		0.0129		

*Used single value.
**Not detected.

Table B-1.3. Detailed Data from Measurements of α-Pinene, Camphene, Sabinene and β-Pinene in Ambient Air at Banning.

Date	Sampling	α-Pinene ppbv	α-Pinene av, ppbv	Camphene ppbv	Camphene av, ppbv	Sabinene ppbv	Sabinene av, ppbv	β-Pinene ppbv	β-Pinene av, ppbv	Reason for discarding data
BANNING	**AUG 4-6, 1997**									
8/4/97	0600-0855	0.0283	0.0347	0.0028	0.0031	0.0061	0.0096	0.0054	0.0065	
8/4/97	0600-0855	0.0411		0.0035		0.0131		0.0075		
8/4/97	0902-1157	0.0129	0.0139	0.0009	0.0009*	0.0048	0.0074	0.0037	0.0041	
8/4/97	0902-1157	0.0150		-**		0.0101		0.0046		
8/4/97	-	-	-	-	-	-	-	-	-	Wind knocked over sampling equipment, no sample
8/4/97	-	-		-		-		-		Wind knocked over sampling equipment, no sample
8/4/97	1504-1800	0.0113	0.0114	0.0014	0.0023	0.0047	0.0042	0.0032	0.0027	
8/4/97	1504-1800	0.0115		0.0032		0.0037		0.0022		
8/4-5/1997	1807-0255	0.0081	0.0083	0.0014	0.0014	0.0018	0.0016	0.0026	0.0026	
8/4-5/1997	1807-0255	0.0085		0.0013		0.0014		0.0027		
8/5/97	0303-0550	0.0205	0.0211	0.0020	0.0022	0.0019	0.0020	0.0053	0.0055	
8/5/97	0303-0550	0.0216		0.0023		0.0020		0.0056		
8/5/97	0604-0855	0.0588	0.0602	0.0045	0.0047	0.0079	0.0069	0.0119	0.0120	
8/5/97	0604-0855	0.0616		0.0049		0.0059		0.0121		
8/5/97	0901-1153	0.0312	0.0323	0.0013	0.0013	0.0018	0.0019	0.0088	0.0096	
8/5/97	0901-1153	0.0334		0.0014		0.0021		0.0104		
8/5/97	1159-1452	0.0299	0.0314	0.0008	0.0018	0.0082	0.0065	0.0035	0.0055	
8/5/97	1159-1452	0.0329		0.0027		0.0048		0.0075		
8/5/97	1458-1800	0.0170	0.0188	0.0013	0.0014	0.0029	0.0024	0.0054	0.0056	
8/5/97	1458-1800	0.0207		0.0015		0.0020		0.0057		
8/5- 8/6/97	1816-0255	0.0082	0.0083	0.0022	0.0023	0.0014	0.0011	0.0023	0.0021	
8/5- 8/6/97	1816-0255	0.0085		0.0025		0.0008		0.0019		
8/6/97	0301-0550	0.0027	0.0037	0.0007	0.0011	0.0018	0.0027	0.0012	0.0021	
8/6/97	0301-0550	0.0046		0.0015		0.0036		0.0030		
8/6/97	0605-0855	0.0322	0.0329	0.0008	0.0008	0.0032	0.0044	0.0108	0.0118	
8/6/97	0605-0855	0.0336		0.0008		0.0056		0.0127		

Table B-1.3. Detailed Data from Measurements of α-Pinene, Camphene, Sabinene and β-Pinene in Ambient Air at Banning (continued).

Date	Sampling	α-Pinene ppbv	α-Pinene av, ppbv	Camphene ppbv	Camphene av, ppbv	Sabinene ppbv	Sabinene av, ppbv	β-Pinene ppbv	β-Pinene av, ppbv	Reason for discarding data
8/6/97	0901-1150	0.0446	0.0445	0.0004	0.0019	0.0040	0.0033	0.0153	0.0124	
8/6/97	0901-1150	0.0444		0.0034		0.0025		0.0094		
8/6/97	1155-1455	0.0439	0.0466	0.0006	0.0006	0.0055	0.0052	0.0159	0.0168	
8/6/97	1155-1455	0.0494		0.0006		0.0049		0.0177		
8/6/97	1500-1800	0.0227	0.0243	0.0014	0.0017	0.0047	0.0033	0.0073	0.0073	
8/6/97	1500-1800	0.0259		0.0019		0.0020		0.0074		
BANNING	**AUG 22-23, 1997**									
8/22/97	0600-0855	0.0383	0.0393	0.0030	0.0029	0.0034	0.0043	0.0051	0.0055	
8/22/97	0600-0855	0.0402		0.0027		0.0052		0.0059		
8/22/97	0900-1155	0.0181	0.0193	0.0020	0.0022	0.0018	0.0017	0.0019	0.0021	
8/22/97	0900-1155	0.0206		0.0025		0.0017		0.0023		
8/22/97	1200-1455	0.0089	0.0095	0.0020	0.0021	0.0007	0.0007	0.0010	0.0009	
8/22/97	1200-1455	0.0101		0.0021		0.0007		0.0008		
8/22/97	1500-1800	0.0099	0.0102	0.0014	0.0016	0.0004	0.0010	0.0015	0.0016	
8/22/97	1500-1800	0.0106		0.0017		0.0016		0.0017		
8/22-23/97	1813-0300	0.0049	0.0052	0.0021	0.0020	0.0005	0.0006	0.0010	0.0011	
8/22-23/97	1813-0300	0.0054		0.0019		0.0007		0.0011		
8/23/97	0303-0555	0.0007	0.0006	0.0012	0.0024	0.0041	0.0023	-**	-**	
8/23/97	0303-0555	0.0005		0.0036		0.0005		-**		
8/23/97	0603-0900	0.0135	0.0139	0.0022	0.0018	0.0015	0.0016	0.0017	0.0019	
8/23/97	0603-0900	0.0142		0.0014		0.0018		0.0021		
8/23/97	0903-1200	0.0067	0.0071	0.0013	0.0014	0.0009	0.0010	0.0010	0.0011	
8/23/97	0903-1200	0.0076		0.0014		0.0011		0.0012		
8/23/97	1202-1500	0.0024	0.0038	0.0075	0.0043	0.0008	0.0007	0.0004	0.0005	
8/23/97	1202-1500	0.0052		0.0011		0.0006		0.0005		
8/23/97	1502-1800	0.0048	0.0049	0.0013	0.0013	0.0004	0.0005	0.0007	0.0008	
8/23/97	1502-1800	0.0051		0.0013		0.0005		0.0008		

Table B-1.3. Detailed Data from Measurements of α-Pinene, Camphene, Sabinene and β-Pinene in Ambient Air at Banning (continued).

Date	Sampling	α-Pinene ppbv	α-Pinene av, ppbv	Camphene ppbv	Camphene av, ppbv	Sabinene ppbv	Sabinene av, ppbv	β-Pinene ppbv	β-Pinene av, ppbv	Reason for discarding data
BANNING	**SEP 5-6, 1997**									
9/5/97	0600-0855	0.0620	0.0639	0.0041	0.0049	0.0041	0.0042	0.0071	0.0074	
9/5/97	0600-0855	0.0657		0.0058		0.0043		0.0077		
9/5/97	0900-1155	0.0096	0.0101	0.0016	0.0017	0.0016	0.0016	0.0014	0.0014	
9/5/97	0900-1155	0.0107		0.0018		0.0016		0.0014		
9/5/97	1158-1458	0.0088	0.0092	0.0009	0.0008	0.0014	0.0014	0.0010	0.0010	
9/5/97	1158-1458	0.0096		0.0008		0.0014		0.0010		
9/5/97	1501-1800	0.0073	0.0075	0.0014	0.0014	0.0011	0.0012	0.0008	0.0009	
9/5/97	1501-1800	0.0077		0.0014		0.0012		0.0009		
9/5-6/97	1824-0257	0.0105	0.0105*	0.0015	0.0015*	0.0009	0.0009*	0.0020	0.0020*	
9/5-6/97	1824-0257	-**		-**		-**		-**		Sampling tube contents transferred from broken tube
9/6/97	0308-0550	0.0172	0.0172*	0.0021	0.0021*	0.0018	0.0018*	0.0034	0.0034*	
9/6/97	0308-0550	-		-		-		-		Sampling tube contents expelled from tube desorber
9/6/97	0610-0855	0.0178	0.0121*	0.0009	0.0096*	0.0018	0.0022*	0.0045	0.0015*	Results low, seems like a back sampling tube
9/6/97	0610-0855	0.0121		0.0096		0.0022		0.0015		
9/6/97	0900-1158	0.0104	0.0160	0.0054	0.0032	-**	0.0010*	-**	0.0046*	
9/6/97	0900-1158	0.0217		0.0009		0.0010		0.0046		
9/6/97	1202-1458	0.0064	0.0069	0.0008	0.0010	0.0008	0.0009	0.0007	0.0008	
9/6/97	1205-1458	0.0073		0.0012		0.0009		0.0009		
9/6/97	1502-1800	0.0069	0.0069*	0.0015	0.0015*	0.0011	0.0011*	0.0009	0.0009*	
9/6/97	1502-1800	0.0670		0.0163		0.0074		0.0097		Very low tricyclene

Table B-1.3. Detailed Data from Measurements of α-Pinene, Camphene, Sabinene and β-Pinene in Ambient Air at Banning (continued).

Date	Sampling	α-Pinene ppbv	α-Pinene av, ppbv	Camphene ppbv	Camphene av, ppbv	Sabinene ppbv	Sabinene av, ppbv	β-Pinene ppbv	β-Pinene av, ppbv	Reason for discarding data
BANNING	**OCT 3-4, 1997**									
10/3/97	0600-0858	0.0142	0.0142*	0.0231	0.0231*	0.0009	0.0009*	0.0022	0.0022*	
10/3/97	0600-0858	0.0043		0.1494		-**		-**		Altered monoterpene profile
10/3/97	0900-1158	0.0038	0.0027	0.0597	0.0732	-**	-**	-**	-**	
10/3/97	0900-1158	0.0016		0.0867		-**		-**		
10/3/97	1200-1458	0.0033	0.0030	0.0395	0.0490	-**	0.0015*	-**	-**	
10/3/97	1200-1458	0.0028		0.0586		0.0015		-**		
10/3/97	1500-1800	0.0069	0.0069*	0.0037	0.0037*	0.0014	0.0014*	0.0016	0.0016*	
10/3/97	1500-1800	0.0019		0.0681		-**		-**		Altered monoterpene profile
10/3-4/97	1807-0258	0.0013	0.0091*	0.0366	0.0096*	-**	0.0007*	-**	0.0016*	Altered monoterpene profile
10/3-4/97	1807-0258	0.0091		0.0096		0.0007		0.0016		
10/4/97	0300-0553	0.1984	0.1922	0.0070	0.0091	0.0034	0.0037	0.0273	0.0244	
10/4/97	0300-0553	0.1860		0.0111		0.0039		0.0215		
10/4/97	0601-0858	0.3502	0.3356	0.0105	0.0118	0.0098	0.0065	0.0393	0.0354	
10/4/97	0601-0858	0.3210		0.0131		0.0031		0.0316		
10/4/97	0900-1158	0.0179	0.0177	0.0038	0.0034	0.0009	0.0011	0.0026	0.0033	
10/4/97	0900-1158	0.0174		0.0031		0.0014		0.0039		
10/4/97	1200-1458	0.0075	0.0074	0.0019	0.0019	0.0016	0.0015	0.0012	0.0012	
10/4/97	1200-1458	0.0073		0.0020		0.0015		0.0011		
10/4/97	1500-1800	0.0060	0.0060	0.0022	0.0033	0.0007	0.0008	0.0014	0.0012	
10/4/97	1500-1800	0.0060		0.0044		0.0009		0.0010		

*Used single value.
**Not detected.

Table B-1.4. Detailed Data from Measurements of α-Pinene, Camphene, Sabinene and β-Pinene in Ambient Air at Los Angeles, North Main Street.

Date	Sampling	α-Pinene ppbv	α-Pinene av, ppbv	Camphene ppbv	Camphene av, ppbv	Sabinene ppbv	Sabinene av, ppbv	β-Pinene ppbv	β-Pinene av, ppbv	Reason for discarding data
LOS ANGELES NORTH MAIN ST.			**AUG 22-23, 1997**							
8/22/97	0558-0855	0.1977	0.2916	0.0302	0.0217	0.0095	0.0503	0.0141	0.0324	
8/22/97	0558-0855	0.3855		0.0132		0.0911		0.0506		
8/22/97	0900-1155	0.0421	0.0361	0.0263	0.0273	0.0018	0.0042	0.0041	0.0033	
8/22/97	0900-1155	0.0302		0.0283		0.0065		0.0025		
8/22/97	1202-1457	0.0057	0.0048	0.0032	0.0082	0.0012	0.0024	0.0022	0.0016	
8/22/97	1202-1457	0.0039		0.0132		0.0035		0.0011		
8/22/97	1500-1755	0.0042	0.0044	0.0016	0.0015	-**	0.0005*	0.0019	0.0018	
8/22/97	1500-1755	0.0046		0.0014		0.0005		0.0018		
8/22-23/97	1806-0556	0.1158	0.1224	0.0085	0.0084	0.0050	0.0041	0.0310	0.0319	
8/22-23/97	1806-0556	0.1290		0.0084		0.0031		0.0328		
8/23/97	0605-0857	0.1764	0.1721	0.0098	0.0130	0.0051	0.0035	0.0251	0.0201	
8/23/97	0605-0857	0.1677		0.0163		0.0020		0.0152		
8/23/97	0900-1156	0.0200	0.0197	0.0040	0.0044	0.0011	0.0010	0.0057	0.0048	
8/23/97	0900-1156	0.0194		0.0048		0.0009		0.0039		
8/23/97	1202-1458	0.0015	0.0018	0.0015	0.0164	0.0003	0.0003*	0.0008	0.0008*	
8/23/97	1202-1458	0.0022		0.0313		-**		-**		
8/23/97	1500-1800	0.0009	0.0010	0.0004	0.0006	0.0004	0.0004*	0.0006	0.0004	
8/23/97	1500-1800	0.0010		0.0009		-**		0.0003		

*Used single value.
**Not detected.

Table C-1.1. Detailed Data from Measurements of Limonene, 1,8-Cineole and Camphor in Ambient Air at Azusa.

Date	Sampling	Limonene ppbv	Limonene av, ppbv	1,8-Cineole ppbv	1,8-Cineole av, ppbv	Camphor ppbv	Camphor av, ppbv	Reason for discarding data
AZUSA	**AUG 4-6, 1997**							
8/4/97	0600-0900	0.1827	0.1878	0.0427	0.0433	0.0235	0.0216	
8/4/97	0600-0900	0.1928		0.0439		0.0197		
8/4/97	0907-1206	0.0865	0.0919	0.0372	0.0406	0.0176	0.0180	
8/4/97	0907-1206	0.0973		0.0439		0.0184		
8/4/97	1306-1603	0.0820	0.0805	0.0231	0.0221	0.0108	0.0108	
8/4/97	1306-1603	0.0790		0.0212		0.0109		
8/4/97	1700-2000	0.0939	0.0954	0.0338	0.0334	0.0078	0.0072	
8/4/97	1700-2000	0.0970		0.0330		0.0066		
8/4/97	2006-0300	0.1920	0.1901	0.0361	0.0370	0.0125	0.0129	
8/4/97	2006-0300	0.1882		0.0379		0.0133		
8/5/97	0307-0600	0.5276	0.5682	0.0674	0.0764	0.0309	0.0320	
8/5/97	0307-0600	0.6088		0.0855		0.0332		
8/5/97	0618-0900	0.2678	0.2776	0.1030	0.0999	0.0539	0.0577	
8/5/97	0618-0900	0.2873		0.0967		0.0615		
8/5/97	0907-1202	0.0961	0.1004	0.0512	0.0527	0.0303	0.0307	
8/5/97	0907-1202	0.1047		0.0543		0.0310		
8/5/97	1300-1600	0.0808	0.0810	0.0304	0.0312	0.0178	0.0188	
8/5/97	1300-1600	0.0813		0.0320		0.0199		
8/5/97	1701-2000	0.0739	0.0737	0.0234	0.0255	0.0166	0.0165	
8/5/97	1701-2000	0.0735		0.0276		0.0165		
8/5- 8/6/97	2005-0300	0.2385	0.2514	0.0499	0.0526	0.0209	0.0224	
8/5-8/6/97	2005-0300	0.2643		0.0553		0.0240		
8/6/97	0306-0600	0.3595	0.3721	0.0705	0.0723	0.0247	0.0244	
8/6/97	0306-0600	0.3848		0.0742		0.0242		
8/6/97	0616-0900	0.4873	0.4545	0.0828	0.0768	0.0372	0.0350	
8/6/97	0616-0900	0.4218		0.0709		0.0328		
8/6/97	0906-1200	0.1286	0.1275	0.0480	0.0475	0.0266	0.0273	
8/6/97	0906-1200	0.1264		0.0470		0.0280		

Table C-1.1. Detailed Data from Measurements of Limonene, 1,8-Cineole and Camphor in Ambient Air at Azusa (continued).

Date	Sampling	Limonene ppbv	Limonene av, ppbv	1,8-Cineole ppbv	1,8-Cineole av, ppbv	Camphor ppbv	Camphor av, ppbv	Reason for discarding data
8/6/97	1300-1600	0.0943	0.0939	0.0302	0.0260	0.0166	0.0172	
8/6/97	1300-1600	0.0934		0.0217		0.0178		
8/6/97	1700-2000	0.0564	0.0541	0.0156	0.0159	0.0066	0.0065	
8/6/97	1700-2000	0.0518		0.0162		0.0064		
AZUSA	**Aug 22-23, 1997**							
8/22/97	0318-0600	2.2970	2.2970*	0.0437	0.0437*	0.0381	0.0381*	
8/22/97	0318-0600	5.8994		0.1286		0.1261		Sampling tube contents transferred from broken tube
8/22/97	0610-0900	0.0060	0.6929*	-**	0.0642*	-**	0.0300*	All results low, seems like a back sampling tube
8/22/97	0610-0900	0.6929		0.0642		0.0300		
8/22/97	0905-1157	0.1484	0.1483	0.0478	0.0461	0.0213	0.0208	
8/22/97	0905-1157	0.1482		0.0445		0.0204		
8/22/97	1210-1500	0.0956	0.1211*	0.0113	0.0237*	0.0135	0.0121*	Sampling tube contents transferred from broken tube
8/22/97	1210-1500	0.1211		0.0237		0.0121		
8/22/97	1504-1800	0.1711	0.1652	0.0261	0.0268	0.0105	0.0101	
8/22/97	1504-1800	0.1593		0.0276		0.0097		
8/22-23/97	1815-0300	0.1990	0.1986	0.0301	0.0298	0.0127	0.0123	
8/22-23/97	1815-0300	0.1982		0.0295		0.0120		
8/23/97	0304-0600	0.4643	0.4749*	0.0426	0.0511*	0.0259	0.0192*	Altered monoterpene profile
8/23/97	0304-0600	0.4749		0.0511		0.0192		
8/23/97	0615-0900	0.4649	0.4649*	0.0408	0.0408*	0.0241	0.0241*	
8/23/97	0615-0900	-		-		-		(Mass detector stopped during analysis, sample destroyed)
8/23/97	0903-1200	0.0918	0.0796*	0.0335	0.0316*	0.0173	0.0156*	Altered monoterpene profile
8/23/97	0903-1200	0.0796		0.0316		0.0156		
8/23/97	1208-1500	0.0474	0.0435	0.0184	0.0196	0.0095	0.0098	
8/23/97	1208-1500	0.0396		0.0209		0.0102		

Table C-1.1. Detailed Data from Measurements of Limonene, 1,8-Cineole and Camphor in Ambient Air at Azusa (continued).

Date	Sampling	Limonene ppbv	Limonene av, ppbv	1,8-Cineole ppbv	1,8-Cineole av, ppbv	Camphor ppbv	Camphor av, ppbv	Reason for discarding data
8/23/97	1505-1800	0.0302	0.0302*	0.0114	0.0114*	0.0054	0.0054*	
8/23/97	1505-1800	0.0161		-**		-**		Sampling tube contents transferred from broken tube
AZUSA	**Sep 4-7, 1997**							
9/4/97	0300-0600	0.7931	0.6358	0.0305	0.0257	0.0212	0.0173	
9/4/97	0300-0600	0.4786		0.0209		0.0134		
9/4/97	0606-0900	0.2756	0.2910	0.0324	0.0308	0.0350	0.0359	
9/4/97	0606-0900	0.3064		0.0292		0.0368		
9/4/97	0904-1200	0.1199	0.1215	0.0289	0.0296	0.0288	0.0281	
9/4/97	0904-1200	0.1231		0.0303		0.0275		
9/4/97	1300-1600	0.0937	0.1065	0.0350	0.0346	0.0206	0.0213	
9/4/97	1300-1600	0.1194		0.0342		0.0220		
9/4/97	1700-2000	0.3697	0.2779	0.0317	0.0317*	0.0136	0.0106	
9/4/97	1700-2000	0.1861		-**		0.0076		
9/4/97	2014-2400	0.1700	0.1533	0.0134	0.0152	0.0106	0.0094	
9/4/97	2014-2400	0.1365		0.0169		0.0081		
9/5/97	0006-0300	0.1278	0.1135	0.0227	0.0207	0.0115	0.0105	
9/5/97	0006-0300	0.0991		0.0186		0.0094		
9/5/97	0305-0600	0.2764	0.2849	0.0277	0.0292	0.0187	0.0190	
9/5/97	0305-0600	0.2934		0.0306		0.0192		
9/5/97	0615-0900	-	0.4983*	-	0.0341*	-	0.0228*	(High toluene, analysis in the SCAN mode)
9/5/97	0615-0900	0.4983		0.0341		0.0228		
9/5/97	0903-1200	0.1416	0.1626	0.0323	0.0313	0.0207	0.0232	
9/5/97	0903-1200	0.1837		0.0302		0.0258		
9/5/97	1300-1600	0.1265	0.1287	0.0180	0.0162	0.0065	0.0073	
9/5/97	1300-1600	0.1310		0.0144		0.0081		
9/5/97	1700-2000	0.0591	0.0587	0.0096	0.0097	0.0040	0.0037	
9/5/97	1700-2000	0.0584		0.0097		0.0034		

Table C-1.1. Detailed Data from Measurements of Limonene, 1,8-Cineole and Camphor in Ambient Air at Azusa (continued).

Date	Sampling	Limonene ppbv	Limonene av, ppbv	1,8-Cineole ppbv	1,8-Cineole av, ppbv	Camphor ppbv	Camphor av, ppbv	Reason for discarding data
9/5/97	2006-2400	0.1797	0.1799	0.0162	0.0146	0.0071	0.0074	
9/5/97	2006-2400	0.1800		0.0130		0.0078		
9/6/97	0008-0300	0.2756	0.2827	0.0177	0.0190	0.0134	0.0128	
9/6/97	0008-0300	0.2899		0.0203		0.0122		
9/6/97	0306-0600	0.2602	0.2534	0.0186	0.0186	0.0166	0.0164	
9/6/97	0306-0600	0.2465		0.0186		0.0162		
9/6/97	0615-0900	0.2859	0.2745	0.0347	0.0350	0.0263	0.0257	
9/6/97	0615-0900	0.2630		0.0354		0.0250		
9/6/97	0903-1200	0.0616	0.0645	0.0318	0.0333	0.0235	0.0232	
9/6/97	0903-1200	0.0673		0.0348		0.0229		
9/6/97	1300-1600	0.1057	0.1035	0.0126	0.0130	0.0082	0.0074	
9/6/97	1300-1600	0.1013		0.0134		0.0066		
9/6/97	1700-1959	0.1018	0.0970	0.0072	0.0077	0.0022	0.0023	
9/6/97	1700-1959	0.0922		0.0082		0.0024		
9/6/97	2010-2400	0.0826	0.0968	0.0097	0.0095	0.0066	0.0069	
9/6/97	2010-2400	0.1110		0.0093		0.0072		
9/7/97	0005-0300	0.2741	0.2741*	0.0201	0.0201*	0.0148	0.0148*	
9/7/97	0005-0300	0.3651		0.0200		0.0266		Altered monoterpene profile
9/7/97	0306-0600	0.6203	0.6366	0.0355	0.0362	0.0290	0.0311	
9/7/97	0306-0600	0.6529		0.0369		0.0332		
9/7/97	0604-0900	0.7725	0.6723	0.0514	0.0454	0.0443	0.0379	
9/7/97	0604-0900	0.5721		0.0394		0.0315		
AZUSA	**SEP 28-29, 1997**							
9/28/97	0301-0600	0.4213	0.4025	0.0796	0.0767	0.0383	0.0368	
9/28/97	0301-0600	0.3836		0.0738		0.0353		
9/28/97	0609-0900	3.9707	3.7978	0.0650	0.0626	0.0376	0.0346	
9/28/97	0609-0900	3.6249		0.0602		0.0316		
9/28/97	0904-1200	0.1039	0.0813	0.0436	0.0417	0.0369	0.0325	
9/28/97	0904-1200	0.0587		0.0398		0.0281		

Table C-1.1. Detailed Data from Measurements of Limonene, 1,8-Cineole and Camphor in Ambient Air at Azusa (continued).

Date	Sampling	Limonene ppbv	Limonene av, ppbv	1,8-Cineole ppbv	1,8-Cineole av, ppbv	Camphor ppbv	Camphor av, ppbv	Reason for discarding data
9/28/97	1300-1600	0.0620	0.0610	0.0443	0.0379	0.0279	0.0257	
9/28/97	1300-1600	0.0599		0.0315		0.0236		
9/28/97	1700-2000	0.0663	0.0562	0.0281	0.0266	0.0190	0.0160	
9/28/97	1700-2000	0.0461		0.0252		0.0129		
9/28-29/97	2015-0300	0.1319	0.1230	0.0306	0.0277	0.0156	0.0143	
9/28-29/97	2015-0300	0.1141		0.0249		0.0131		
9/29/97	0310-0600	0.6488	0.5995	0.0698	0.0632	0.0463	0.0424	
9/29/97	0310-0600	0.5501		0.0567		0.0385		
9/29/97	0616-0858	0.6943	0.6689	0.0492	0.0443	0.0331	0.0296	
9/29/97	0616-0858	0.6436		0.0395		0.0261		
9/29/97	0900-1200	0.0979	0.1155	0.0489	0.0581	0.0238	0.0295	
9/29/97	0900-1200	0.1330		0.0674		0.0352		
9/29/97	1300-1600	0.1915	0.1950	0.0406	0.0419	0.0222	0.0261	
9/29/97	1300-1600	0.1984		0.0431		0.0301		
9/29/97	1700-2000	0.2560	0.1952	0.0310	0.0291	0.0237	0.0207	
9/29/97	1700-2000	0.1344		0.0273		0.0177		
AZUSA	**OCT 3-4, 1997**							
10/3/97	0301-0600	0.0831	0.1046	0.0149	0.0215	0.0126	0.0175	
10/3/97	0301-0600	0.1261		0.0281		0.0224		
10/3/97	0614-0900	0.1566	0.1525	0.0587	0.0563	0.1143	0.1136	
10/3/97	0614-0900	0.1484		0.0539		0.1129		
10/3/97	0904-1200	0.0769	0.0976	0.0314	0.0380	0.0639	0.0675	
10/3/97	0904-1200	0.1183		0.0446		0.0712		
10/3/97	1300-1600	0.0899	0.0909	0.0407	0.0418	0.0246	0.0240	
10/3/97	1300-1600	0.0919		0.0429		0.0234		
10/3/97	1700-2000	0.1081	0.1050	0.0260	0.0249	0.0245	0.0240	
10/3/97	1700-2000	0.1019		0.0238		0.0236		
10/3-4/97	2011-0300	0.0807	0.0670	0.0251	0.0206	0.0112	0.0090	
10/3-4/97	2011-0300	0.0533		0.0161		0.0067		

Table C-1.1. Detailed Data from Measurements of Limonene, 1,8-Cineole and Camphor in Ambient Air at Azusa (continued).

Date	Sampling	Limonene ppbv	Limonene av, ppbv	1,8-Cineole ppbv	1,8-Cineole av, ppbv	Camphor ppbv	Camphor av, ppbv	Reason for discarding data
10/4/97	0304-0600	0.1573	0.1224	0.0249	0.0249	0.0372	0.0413	
10/4/97	0304-0600	0.0875		0.0248		0.0454		
10/5/97	0612-0900	0.1392	0.1371	0.0603	0.0606	0.0523	0.0519	
10/4/97	0612-0900	0.1349		0.0609		0.0515		
10/4/97	0901-1200	0.1310	0.1251	0.0402	0.0393	0.0618	0.0493	
10/4/97	0901-1200	0.1192		0.0384		0.0367		
10/4/97	1300-1600	0.0475	0.0492	0.0120	0.0214	0.0106	0.0138	
10/4/97	1300-1600	0.0509		0.0308		0.0171		
10/4/97	1700-2000	0.0866	0.0870	0.0155	0.0159	0.0153	0.0161	
10/4/97	1700-2000	0.0874		0.0162		0.0168		

*Used single value.
**Not detected.

Table C-1.2. Detailed Data from Measurements of Limonene, 1,8-Cineole and Camphor in Ambient Air at Pine Mtn. and Mt. Baldy.

Date	Sampling	Limonene ppbv	Limonene av, ppbv	1,8-Cineole ppbv	1,8-Cineole av, ppbv	Camphor ppbv	Camphor av, ppbv	Reason for discarding data
PINE MT	**AUG 4-6, 1997**							
8/4/97	1710-2000	0.0115	0.0107	0.0232	0.0240	0.0246	0.0246	
8/4/97	1710-2000	0.0098		0.0248		0.0245		
08/4-08/5/97	2025-0259	0.0066	0.0050	0.0110	0.0147	0.0205	0.0214	
08/4-08/5/97	2025-0259	0.0035		0.0184		0.0224		
8/5/97	0314-0559	0.0020	0.0021	0.0058	0.0060	0.0078	0.0079	
8/5/97	0314-0559	0.0021		0.0063		0.0081		
8/5/97	0617-0858	0.0106	0.0111	0.0044	0.0048	0.0042	0.0043	
8/5/97	0617-0858	0.0116		0.0051		0.0043		
8/5/97	0911-1200	0.0119	0.0124	0.0299	0.0310	0.0298	0.0299	
8/5/97	0911-1200	0.0129		0.0322		0.0300		
8/5/97	1302-1600	0.0118	0.0118*	0.0468	0.0468*	0.0547	0.0547*	
8/5/97	1302-1600	-		-		-		(Sample tube missing)
8/5/97	1700-2000	0.0073	0.0082	0.0313	0.0329	0.0459	0.0483	
8/5/97	1700-2000	0.0090		0.0344		0.0506		
8/5/97	2015-0255	0.0028	0.0030	0.0154	0.0157	0.0277	0.0286	
8/5/97	2015-0255	0.0031		0.0160		0.0295		
8/6/97	0310-0600	0.0035	0.0039	0.0029	0.0036	0.0055	0.0059	
8/6/97	0310-0600	0.0043		0.0042		0.0063		
8/6/97	0615-0900	0.0073	0.0083	0.0074	0.0070	0.0096	0.0095	
8/6/97	0615-0900	0.0093		0.0065		0.0095		
8/6/97	0915-1200	0.0087	0.0090	0.0214	0.0227	0.0265	0.0278	
8/6/97	0915-1200	0.0094		0.0240		0.0290		
8/6/97	1300-1600	0.0103	0.0106	0.0536	0.0563	0.0578	0.0577	
8/6/97	1300-1600	0.0109		0.0589		0.0575		

Table C-1.2. Detailed Data from Measurements of Limonene, 1,8-Cineole and Camphor in Ambient Air at Pine Mtn. and Mt. Baldy (continued).

Date	Sampling	Limonene ppbv	Limonene av, ppbv	1,8-Cineole ppbv	1,8-Cineole av, ppbv	Camphor ppbv	Camphor av, ppbv	Reason for discarding data
PINE MT	**SEP 4-7, 1997**							
9/4/97	1702-2000	0.0116	0.0121	0.0079	0.0092	0.0106	0.0106	
9/4/97	1702-2000	0.0126		0.0105		0.0106		
9/4/97	2008-2400	0.0033	0.0033	0.0076	0.0079	0.0092	0.0079	
9/4/97	2008-2400	0.0034		0.0082		0.0066		
9/5/97	0010-0338	0.0042	0.0037	-**	-**	0.0029	0.0029*	
9/5/97	0010-0338	0.0033		-**		-**		
9/5/97	0349-0600	0.0064	0.0062	0.0059	0.0059*	0.0049	0.0044	
9/5/97	0349-0600	0.0059		-**		0.0040		
9/5/97	0615-0900	0.0059	0.0049	-**	-**	0.0057	0.0052	
9/5/97	0615-0900	0.0038		-**		0.0048		
9/5/97	0908-1200	0.0088	0.0076	0.0119	0.0088	0.0141	0.0127	
9/5/97	0908-1200	0.0063		0.0056		0.0112		
9/5/97	1300-1600	0.0080	0.0079	0.0121	0.0121	0.0168	0.0153	
9/5/97	1300-1600	0.0079		0.0121		0.0138		
9/5/97	1700-2000	0.0092	0.0090	0.0086	0.0089	0.0105	0.0103	
9/5/97	1700-2000	0.0088		0.0093		0.0101		
9/5/97	2007-2355	-**	-**	0.0062	0.0058	0.0072	0.0068	
9/5/97	2007-2355	-**		0.0055		0.0064		
9/6/97	0000-0255	0.0035	0.0032	0.0046	0.0046	0.0058	0.0053	
9/6/97	0000-0255	0.0029		0.0046		0.0047		
9/6/97	0301-0600	0.0027	0.0023	-**	-**	0.0037	0.0037	
9/6/97	0301-0600	0.0019		-**		0.0037		
9/6/97	0610-0900	0.0026	0.0028	0.0058	0.0058*	0.0053	0.0056	
9/6/97	0610-0900	0.0030		-**		0.0058		
9/6/97	0905-1200	-**	0.0061*	0.0068	0.0090	-**	0.0105*	
9/6/97	0905-1200	0.0061		0.0112		0.0105		

Table C-1.2. Detailed Data from Measurements of Limonene, 1,8-Cineole and Camphor in Ambient Air at Pine Mtn. and Mt. Baldy (continued).

Date	Sampling	Limonene ppbv	Limonene av, ppbv	1,8-Cineole ppbv	1,8-Cineole av, ppbv	Camphor ppbv	Camphor av, ppbv	Reason for discarding data
9/6/97	1300-1600	0.0051	0.0048	0.0110	0.0113	0.0119	0.0106	
9/6/97	1300-1600	0.0046		0.0116		0.0094		
9/6/97	1700-2000	0.0060	0.0057	0.0082	0.0090	0.0096	0.0096	
9/6/97	1700-2000	0.0053		0.0099		0.0097		
9/6/97	2007-2355	0.0026	0.0025	0.0050	0.0038	0.0051	0.0046	
9/6/97	2007-2355	0.0025		0.0026		0.0042		
9/7/97	0000-0255	0.0022	0.0026	-**	-**	0.0029	0.0036	
9/7/97	0000-0255	0.0029		-**		0.0043		
9/7/97	0300-0555	0.0023	0.0026	0.0088	0.0088*	0.0022	0.0025	
9/7/97	0300-0555	0.0029		-**		0.0028		
9/7/97	0600-0900	0.0041	0.0035	-**	-**	0.0016	0.0015	
9/7/97	0600-0900	0.0030		-**		0.0013		
MT BALDY	**SEP 28-29, 1997**							
9/28/97	0904-1200	0.0570	0.0564	0.0142	0.0142	0.0120	0.0133	
9/28/97	0904-1200	0.0558		0.0142		0.0146		
9/28/97	1300-1600	0.0198	0.0208	0.0204	0.0222	0.0155	0.0162	
9/28/97	1300-1600	0.0218		0.0239		0.0170		
9/28/97	1700-2000	0.0258	0.0305	0.0232	0.0224	0.0101	0.0118	
9/28/97	1700-2000	0.0351		0.0215		0.0135		
9/28-29/97	2005-0300	0.0115	0.0110	0.0196	0.0188	0.0109	0.0104	
9/28-29/97	2005-0300	0.0106		0.0180		0.0099		
9/29/97	0307-0600	0.0129	0.0125	0.0139	0.0140	0.0087	0.0083	
9/29/97	0307-0600	0.0121		0.0140		0.0079		
9/29/97	0606-0900	0.0165	0.0172	0.0156	0.0160	0.0070	0.0072	
9/29/97	0606-0900	0.0178		0.0164		0.0074		
9/29/97	0903-1200	0.0285	0.0297	0.0201	0.0204	0.0108	0.0110	
9/29/97	0903-1200	0.0308		0.0208		0.0111		

Table C-1.2. Detailed Data from Measurements of Limonene, 1,8-Cineole and Camphor in Ambient Air at Pine Mtn. and Mt. Baldy (continued).

Date	Sampling	Limonene ppbv	Limonene av, ppbv	1,8-Cineole ppbv	1,8-Cineole av, ppbv	Camphor ppbv	Camphor av, ppbv	Reason for discarding data
9/29/97	1300-1600	0.0196	0.0162	0.0123	0.0121	0.0080	0.0076	
9/29/97	1300-1600	0.0128		0.0120		0.0072		
9/29/97	1700-2000	0.0150	0.0218	0.0183	0.0192	0.0082	0.0089	
9/29/97	1700-2000	0.0286		0.0200		0.0096		
MT BALDY	**OCT 3-4, 1997**							
10/3/97	0619-0900	0.0190	0.0234	0.0134	0.0181	0.0168	0.0258	
10/3/97	0619-0900	0.0279		0.0228		0.0349		
10/3/97	0903-1200	0.0296	0.0337	0.0362	0.0308	0.0478	0.0414	
10/3/97	0903-1200	0.0378		0.0254		0.0349		
10/3/97	1301-1600	0.0183	0.0098*	0.0148	0.0234*	0.0031	0.0186*	Altered monoterpene profile
10/3/97	1301-1600	0.0098		0.0234		0.0186		
10/3/97	1703-2003	0.0191	0.0191*	0.0432	0.0432*	0.0247	0.0247*	
10/3/97	1703-2003	-**		-**		-**		Seems like a back sampling tube.
10/3-4/97	2010-0302	0.0046	0.0046	0.0112	0.0118	0.0112	0.0113	
10/3-4/97	2010-0302	0.0046		0.0124		0.0114		
10/4/97	0310-0601	0.0065	0.0074	0.0117	0.0130	0.0058	0.0066	
10/4/97	0310-0601	0.0083		0.0143		0.0074		
10/4/97	0612-0900	0.0188	0.0188*	0.0164	0.0164*	0.0066	0.0066*	
10/4/97	0612-0900	0.0218		0.0103		0.0054		Altered monoterpene profile
10/4/97	0903-1200	0.0196	0.0201	0.0154	0.0151	0.0089	0.0081	
10/4/97	0903-1200	0.0206		0.0147		0.0073		
10/4/97	1300-1600	0.0103	0.0114	0.0262	0.0272	0.0189	0.0208	
10/4/97	1300-1600	0.0125		0.0283		0.0227		
10/4/97	1700-2000	0.0194	0.0178	0.0381	0.0354	0.0245	0.0243	
10/4/97	1700-2000	0.0162		0.0327		0.0242		

*Used single value.
**Not detected.

Table C-1.3. Detailed Data from Measurements of Limonene, 1,8-Cineole and Camphor in Ambient Air at Banning.

Date	Sampling	Limonene ppbv	Limonene av, ppbv	1,8-Cineole ppbv	1,8-Cineole av, ppbv	Camphor ppbv	Camphor av, ppbv	Reason for discarding data
BANNING	**AUG 4-6, 1997**							
8/4/97	0600-0855	0.0105	0.0111	0.0154	0.0198	0.0129	0.0153	
8/4/97	0600-0855	0.0118		0.0241		0.0177		
8/4/97	0902-1157	0.0028	0.0036	0.0048	0.0051	0.0040	0.0040	
8/4/97	0902-1157	0.0043		0.0054		0.0040		
8/4/97	-	-	-	-	-	-	-	Wind knocked over sampling equipment, no sample
8/4/97	-	-		-		-		Wind knocked over sampling equipment, no sample
8/4/97	1504-1800	0.0055	0.0070	0.0126	0.0147	0.0175	0.0179	
8/4/97	1504-1800	0.0085		0.0169		0.0183		
8/4-5/1997	1807-0255	0.0062	0.0064	0.0215	0.0222	0.0083	0.0086	
8/4-5/1997	1807-0255	0.0066		0.0228		0.0090		
8/5/97	0303-0550	0.0266	0.0273	0.0178	0.0179	0.0095	0.0098	
8/5/97	0303-0550	0.0280		0.0180		0.0101		
8/5/97	0604-0855	0.0230	0.0227	0.0196	0.0200	0.0125	0.0134	
8/5/97	0604-0855	0.0224		0.0203		0.0143		
8/5/97	0901-1153	0.0050	0.0048	0.0048	0.0047	0.0070	0.0074	
8/5/97	0901-1153	0.0047		0.0047		0.0078		
8/5/97	1159-1452	0.0050	0.0055	0.0026	0.0026	0.0031	0.0030	
8/5/97	1159-1452	0.0060		0.0026		0.0028		
8/5/97	1458-1800	0.0061	0.0065	0.0045	0.0051	0.0036	0.0036	
8/5/97	1458-1800	0.0069		0.0057		0.0035		
8/5- 8/6/97	1816-0255	0.0065	0.0069	0.0337	0.0351	0.0243	0.0248	
8/5- 8/6/97	1816-0255	0.0074		0.0364		0.0252		
8/6/97	0301-0550	0.0020	0.0033	0.0066	0.0096	0.0061	0.0097	
8/6/97	0301-0550	0.0047		0.0126		0.0134		
8/6/97	0605-0855	0.0040	0.0045	0.0031	0.0029	0.0022	0.0022	
8/6/97	0605-0855	0.0049		0.0027		0.0022		

Table C-1.3. Detailed Data from Measurements of Limonene, 1,8-Cineole and Camphor in Ambient Air at Banning (continued).

Date	Sampling	Limonene ppbv	Limonene av, ppbv	1,8-Cineole ppbv	1,8-Cineole av, ppbv	Camphor ppbv	Camphor av, ppbv	Reason for discarding data
8/6/97	0901-1150	0.0041	0.0051	-**	0.0029*	0.0018	0.0017	
8/6/97	0901-1150	0.0061		0.0029		0.0015		
8/6/97	1155-1455	0.0043	0.0048	0.0024	0.0027	0.0018	0.0018	
8/6/97	1155-1455	0.0052		0.0029		0.0018		
8/6/97	1500-1800	0.0038	0.0041	0.0120	0.0117	0.0125	0.0121	
8/6/97	1500-1800	0.0045		0.0114		0.0116		
BANNING	**AUG 22-23, 1997**							
8/22/97	0600-0855	0.0251	0.0271	0.0121	0.0119	0.0073	0.0067	
8/22/97	0600-0855	0.0291		0.0117		0.0061		
8/22/97	0900-1155	0.0068	0.0084	0.0113	0.0116	0.0066	0.0067	
8/22/97	0900-1155	0.0099		0.0119		0.0067		
8/22/97	1200-1455	0.0030	0.0035	0.0208	0.0242	0.0255	0.0307	
8/22/97	1200-1455	0.0039		0.0276		0.0359		
8/22/97	1500-1800	0.0037	0.0037	0.0120	0.0139	0.0128	0.0132	
8/22/97	1500-1800	0.0037		0.0158		0.0137		
8/22-23/97	1813-0300	0.0077	0.0080	0.0295	0.0304	0.0180	0.0187	
8/22-23/97	1813-0300	0.0083		0.0313		0.0195		
8/23/97	0303-0555	0.0020	0.0026	0.0184	0.0169	0.0169	0.0154	
8/23/97	0303-0555	0.0033		0.0155		0.0138		
8/23/97	0603-0900	0.0029	0.0033	0.0120	0.0122	0.0108	0.0111	
8/23/97	0603-0900	0.0036		0.0124		0.0115		
8/23/97	0903-1200	0.0019	0.0019	0.0060	0.0065	0.0064	0.0058	
8/23/97	0903-1200	0.0020		0.0070		0.0051		
8/23/97	1202-1500	0.0021	0.0020	0.0059	0.0071	0.0061	0.0053	
8/23/97	1202-1500	0.0019		0.0083		0.0045		
8/23/97	1502-1800	0.0019	0.0020	0.0084	0.0088	0.0103	0.0120	
8/23/97	1502-1800	0.0022		0.0092		0.0138		

Table C-1.3. Detailed Data from Measurements of Limonene, 1,8-Cineole and Camphor in Ambient Air at Banning (continued).

Date	Sampling	Limonene ppbv	Limonene av, ppbv	1,8-Cineole ppbv	1,8-Cineole av, ppbv	Camphor ppbv	Camphor av, ppbv	Reason for discarding data
BANNING	**SEP 5-6, 1997**							
9/5/97	0600-0855	0.0101	0.0160	0.0367	0.0381	0.0125	0.0131	
9/5/97	0600-0855	0.0218		0.0395		0.0137		
9/5/97	0900-1155	0.0026	0.0027	0.0133	0.0133	0.0048	0.0053	
9/5/97	0900-1155	0.0028		0.0133		0.0057		
9/5/97	1158-1458	0.0028	0.0029	0.0070	0.0074	0.0053	0.0056	
9/5/97	1158-1458	0.0030		0.0077		0.0058		
9/5/97	1501-1800	0.0032	0.0033	0.0081	0.0092	0.0092	0.0085	
9/5/97	1501-1800	0.0033		0.0104		0.0077		
9/5-6/97	1824-0257	0.0080	0.0080*	0.0181	0.0181*	0.0127	0.0127*	
9/5-6/97	1824-0257	-**		-**		-**		Sampling tube contents transferred from broken tube
9/6/97	0308-0550	0.0103	0.0103*	0.0232	0.0232*	0.0097	0.0097*	
9/6/97	0308-0550	-		-		-		Sampling tube contents expelled from tube desorber
9/6/97	0610-0855	0.0041	0.0212*	0.0075	0.0335*	0.0056	0.0067*	Results low, seems like a back sampling tube
9/6/97	0610-0855	0.0212		0.0335		0.0067		
9/6/97	0900-1158	0.0245	0.0142	-**	-**	-**	0.0018*	
9/6/97	0900-1158	0.0039		-**		0.0018		
9/6/97	1202-1458	0.0030	0.0035	0.0085	0.0092	0.0076	0.0081	
9/6/97	1205-1458	0.0039		0.0099		0.0087		
9/6/97	1502-1800	0.0038	0.0038*	0.0113	0.0113*	0.0103	0.0103*	
9/6/97	1502-1800	0.0481		0.1317		0.1055		Very low tricyclene
BANNING	**OCT 3-4, 1997**							
10/3/97	0600-0858	0.0275	0.0275*	0.0241	0.0241*	0.0232	0.0232*	
10/3/97	0600-0858	0.0469		-**		0.0277		Altered monoterpene profile
10/3/97	0900-1158	0.0203	0.0214	0.0099	0.0099*	0.0144	0.0134	
10/3/97	0900-1158	0.0226		-**		0.0124		

Table C-1.3. Detailed Data from Measurements of Limonene, 1,8-Cineole and Camphor in Ambient Air at Banning (continued).

Date	Sampling	Limonene ppbv	Limonene av, ppbv	1,8-Cineole ppbv	1,8-Cineole av, ppbv	Camphor ppbv	Camphor av, ppbv	Reason for discarding data
10/3/97	1200-1458	0.0159	0.0159	-**	-**	0.0032	0.0042	
10/3/97	1200-1458	0.0160		-**		0.0053		
10/3/97	1500-1800	0.0066	0.0066*	0.0157	0.0157*	0.0085	0.0085*	
10/3/97	1500-1800	0.0225		-**		0.0137		Altered monoterpene profile
10/3-4/97	1807-0258	0.0247	0.0318*	0.0122	0.0321*	0.0243	0.0244*	Altered monoterpene profile
10/3-4/97	1807-0258	0.0318		0.0321		0.0244		
10/4/97	0300-0553	0.0590	0.0583	0.0785	0.0769	0.0356	0.0326	
10/4/97	0300-0553	0.0575		0.0754		0.0296		
10/4/97	0601-0858	0.0464	0.0437	0.0586	0.0570	0.0194	0.0183	
10/4/97	0601-0858	0.0410		0.0554		0.0173		
10/4/97	0900-1158	0.0098	0.0094	0.0234	0.0255	0.0141	0.0135	
10/4/97	0900-1158	0.0091		0.0276		0.0129		
10/4/97	1200-1458	0.0052	0.0049	0.0168	0.0172	0.0111	0.0109	
10/4/97	1200-1458	0.0047		0.0176		0.0107		
10/4/97	1500-1800	0.0052	0.0157	0.0124	0.0131	0.0077	0.0077	
10/4/97	1500-1800	0.0262		0.0139		0.0077		

*Used single value.
**Not detected.

Table C-1.4. Detailed Data from Measurements of Limonene, 1,8-Cineole and Camphor in Ambient Air at Los Angeles, North Main Street.

Date	Sampling	Limonene ppbv	Limonene av, ppbv	1,8-Cineole ppbv	1,8-Cineole av, ppbv	Camphor ppbv	Camphor av, ppbv	Reason for discarding data
LOS ANGELES NORTH MAIN ST.			**AUG 22-23. 1997**					
8/22/97	0558-0855	0.3211	0.3381	0.1014	0.1201	0.0463	0.0467	
8/22/97	0558-0855	0.3551		0.1388		0.0471		
8/22/97	0900-1155	0.1208	0.1200	0.0558	0.0525	0.0433	0.0447	
8/22/97	0900-1155	0.1192		0.0493		0.0461		
8/22/97	1202-1457	0.0189	0.0358	0.0173	0.0177	0.0091	0.0138	
8/22/97	1202-1457	0.0527		0.0181		0.0185		
8/22/97	1500-1755	0.0244	0.0252	0.0059	0.0074	0.0050	0.0054	
8/22/97	1500-1755	0.0260		0.0089		0.0058		
8/22-23/97	1806-0556	0.2304	0.2302	0.0360	0.0387	0.0188	0.0194	
8/22-23/97	1806-0556	0.2301		0.0413		0.0200		
8/23/97	0605-0857	0.2299	0.2547	0.0511	0.0508	0.0243	0.0266	
8/23/97	0605-0857	0.2795		0.0505		0.0290		
8/23/97	0900-1156	0.0312	0.0325	0.0262	0.0252	0.0157	0.0145	
8/23/97	0900-1156	0.0338		0.0242		0.0133		
8/23/97	1202-1458	0.0072	0.0097	0.0077	0.0127	0.0058	0.0085	
8/23/97	1202-1458	0.0121		0.0177		0.0113		
8/23/97	1500-1800	0.0057	0.0056	-*	-*	0.0034	0.0036	
8/23/97	1500-1800	0.0055		-*		0.0037		

*Not detected.