Enhanced Ozone Over Western North America from Biomass Burning in Eurasia During April 2008 as Seen in Surface and Profile Observations

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During April 2008, as part of the International Polar Year, several ground-based and aircraft campaigns were carried out in the North American Arctic region. The ubiquitous presence during this period of biomass burning effluent, both gaseous and particulate, has been reported. Unusually high ozone readings for this time of year were recorded at surface ozone monitoring sites from northern Alaska to northern California. At Barrow, Alaska the highest April ozone readings recorded at the surface (hourly average values >55 ppbv) in 36 years of observation were measured on April 19, 2008. At Denali National Park (NP) in central Alaska an hourly average of 79 ppbv was recorded during an 8 hour period in which the average was over 75 ppb. These averages exceeded the ozone ambient air standard threshold value in the U.S.. Elevated ozone (>60 ppbv) persisted almost continuously from April 19-23 at the monitoring site during this event. At a coastal site in northern California (Trinidad Head) hourly ozone readings were ≥50 ppb nearly continuously for a 35-hour period from April 18-20. At several sites in northern California, located to the east of the Trinidad Head coastal site, extensive occurrences of ozone readings exceeding 60 ppbv were recorded during April 2008. During the first three weeks of April 2008, near daily ozone soundings were performed at several sites in western North America as part of the Arctic Intensive Ozonesonde Network Study in conjunction with Arctic Research of the Composition of the Troposphere from Aircraft & Satellites. These soundings showed lower tropospheric features at ~1-4 km with enhanced ozone during the times of elevated ozone amounts at the surface sites noted above. Ancillary information, such as aerosol optical thickness and back trajectories, are employed to diagnose the potential air masses that may have contributed to these elevated ozone readings. The back trajectories appear to be matched with known burning source regions in the Eurasian region during April 2008. At a few surface sites, atmospheric trace constituents in addition to ozone were measured that help identify biomass burning as a likely source of the enhanced ozone readings.

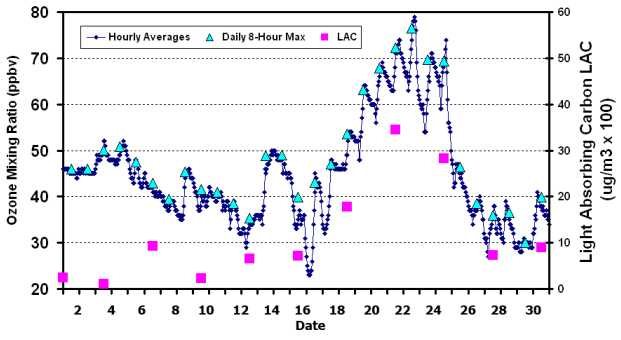

Figure 1. Surface ozone mixing ratio and light absorbing carbon at Denali NP, Alaska during April 2008.

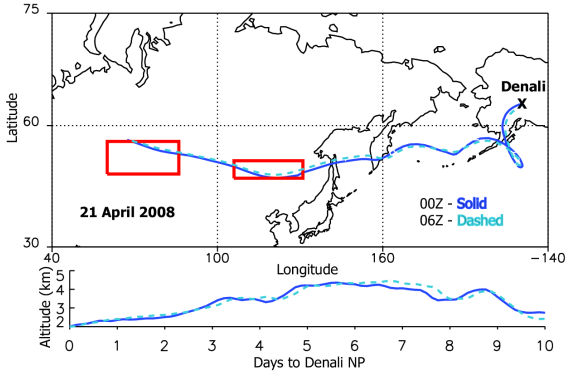

Figure 2. Back trajectories from Denali on 21 April 2008 during high ozone episode. Red boxes denote biomass burning regions.