Aerosols at Mauna Loa Observatory (MLO) – Spring 2001, Versus Spring and Fall, 2011

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The rapid development in the Chinese industry has raised concerns about aerosol impacts and climate in the Pacific basin. In the Aerosol Characterization Experiment (ACE)-study of March – May, 2001, we measured Chinese aerosols at 3 sites, sampled by DRUM impactors in 3 hr. increments, in 8 size modes. These were compositionally analyzed for 32 elements using Synchrotron-induced X-Ray Fluorescence, including toxic metals like lead and mercury. To establish the downwind impacts in the 2001 work, we deployed at 19 aerosol sampling sites from Taiwan, Korea, and Japan to the United States, including MLO. We have duplicated the sampling and analysis of ACE-Asia at MLO in spring, 2011, and added data from fall, 2011. Several modern transport models and satellite data were used to identify the transport paths to MLO; 1) Fast Asian aerosols often arrive at MLO from the east during spring, with circulating clockwise around the Pacific high, carrying dust and several industrial metals, and 2) Slow transport west to east during the rest of the year, especially from mid-latitudes in China, with little dust but high organic matter highly correlated to sulfates. Since 2001, sulfates rose by a factor of 1.40, close to the rise in total Chinese SO_2 emissions, 1.32.

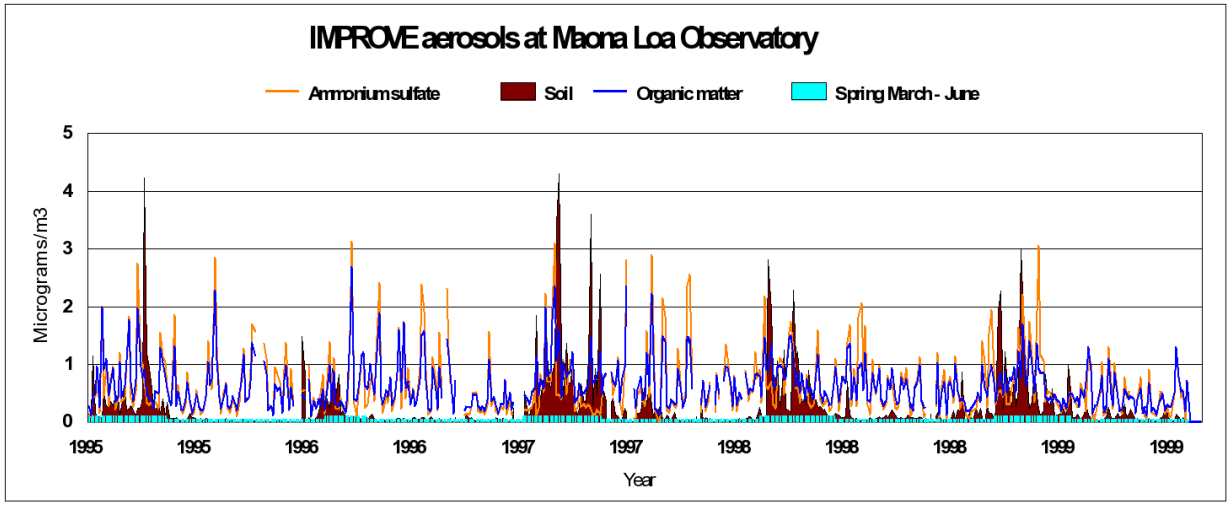

Figure 1. IMPROVE aerosols at Mauna Loa Observatory.

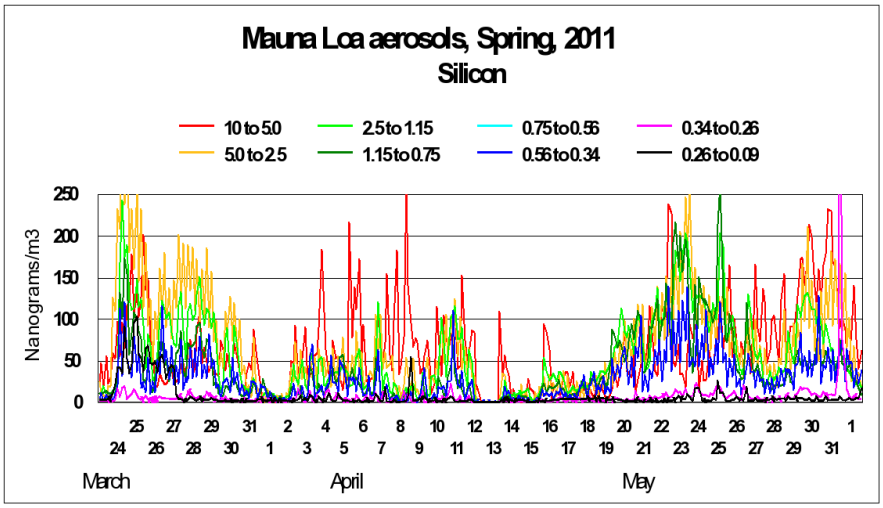

Figure 2. Size and time resolved silicon aerosols (a soil tracer) at Mauna Loa Observatory, spring 2011.