

Preliminary Conceptual Model - Causes of Haze in Sikes (SIKE1)

Sulfate from the eastern United States in the summer is the major cause of haze at Sikes. In the 20% worst days, it contributes in average ~ 67% to regional haze.

The SIKE1 IMPROVE site is located in north central Louisiana 6 km (4 mi) southeast of the small community of Sikes. The site elevation is 45 m (148 ft) and surrounding terrain in the vicinity is flat, primarily agricultural. In Sikes during the sampling period of 2001 – 2002, the average PM_{2.5} mass concentration is 10.1 µg/m³. The average total light extinction coefficient (B_{ext}) is 83.6 Mm⁻¹ (Visual Range ~ 47 Km; Deciview ~ 21). The average contributions of the major aerosol components to Sikes haze are particulate sulfate 57%, nitrate 5.8%, organic matter (OMC) 15.3%, elemental carbon (light absorbing carbon, LAC) 4.6%, fine soil 1.0% and coarse mass (CM) 4.0%.

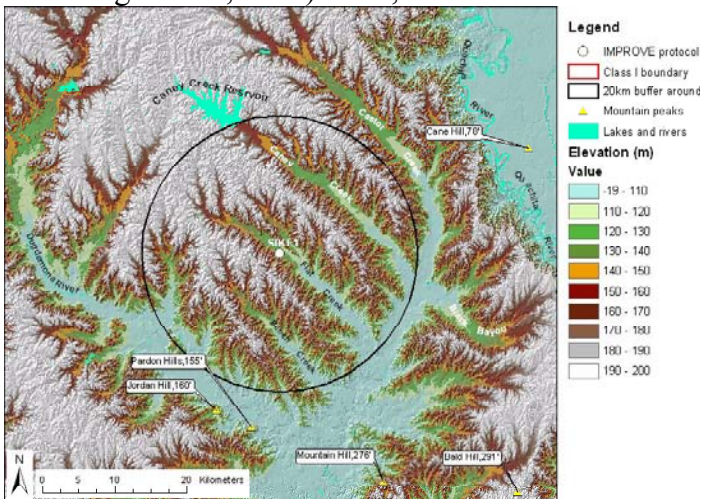


Figure 1. 20 Km terrain map

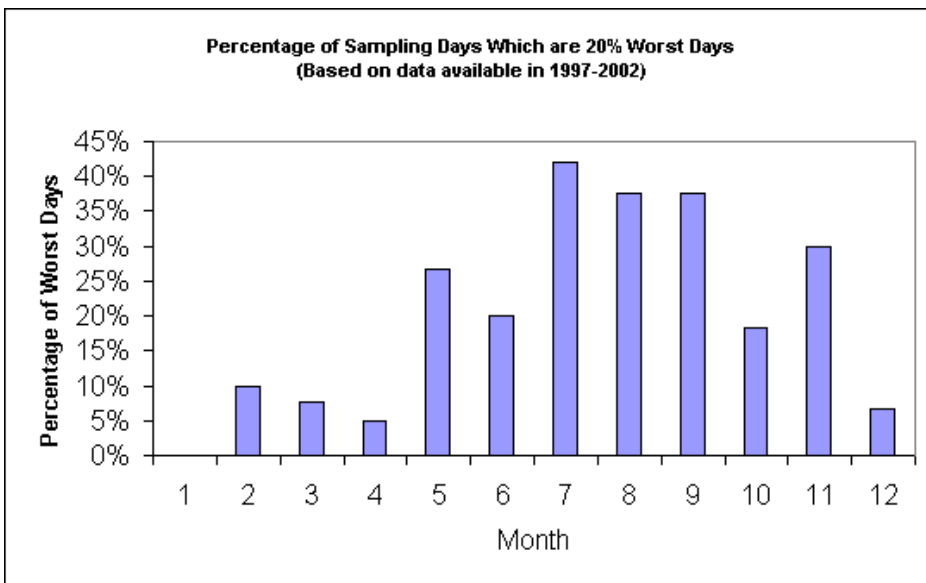


Figure 2. Percentage of sampling days that are 20% worst days in each month (based on data available from 2001-2002)

Figure 2 suggests that the highest occurrence of the 20% worst days happened in the summer from July to September, in which about 40% of the sampling days are the 20% haziest days at Sikes. As shown in Figure 3, sulfate is the largest aerosol contributor to haze throughout the year.

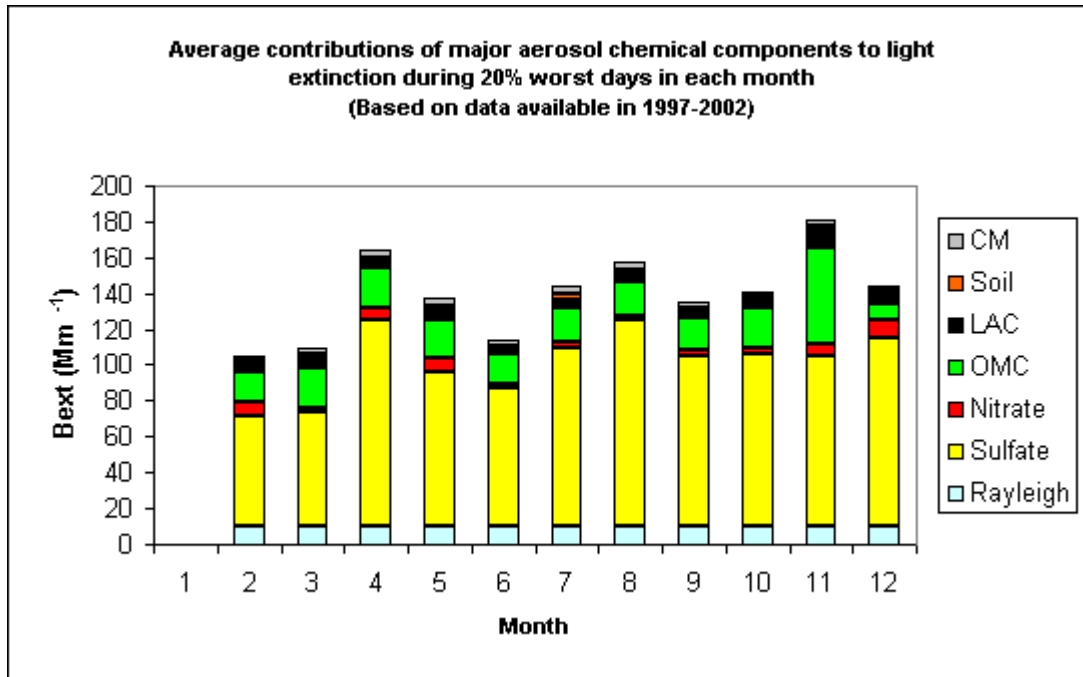


Figure 3. Average contributions of major aerosol chemical components to light extinction during 20% worst days in each month (based on data available from 2001-2002)

Figure 4 indicates that air is generally transported from the central United States in the 20% best days, while flows from the eastern United States become dominant in the 20% worst haze days. Figure 5 and 6 suggest that sulfate is transported from the eastern US.

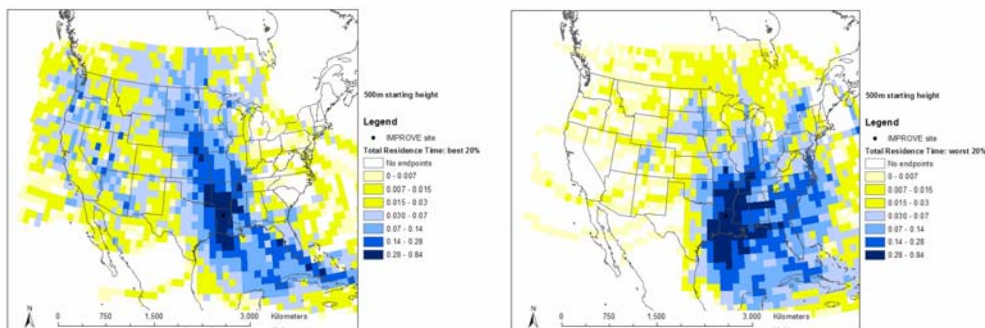


Figure 4. Normalized residence time for 20% best (left) and 20% worst (right) days (based on data from 2000-2002, air mostly transported from the blue area under the given sampling days)

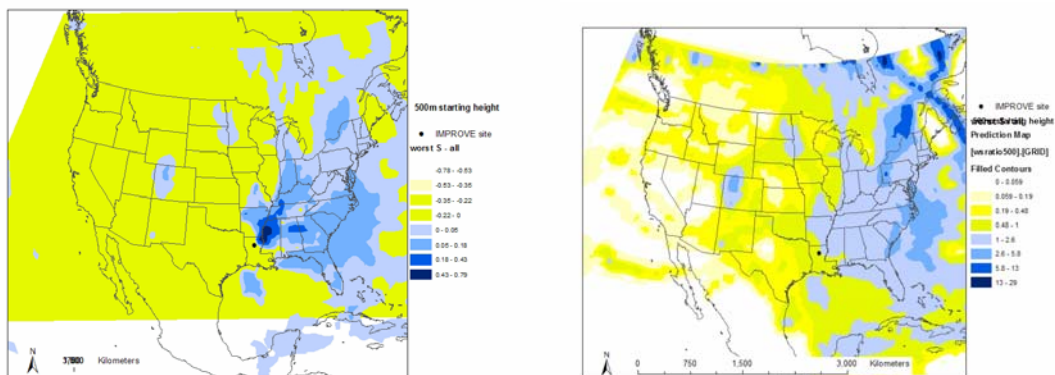


Figure 5. Difference (left) and ratio (right) of normalized residence time in 20% worst sulfate days and all days during 2001-2002 (possible important source regions are shown up as blue in the maps)

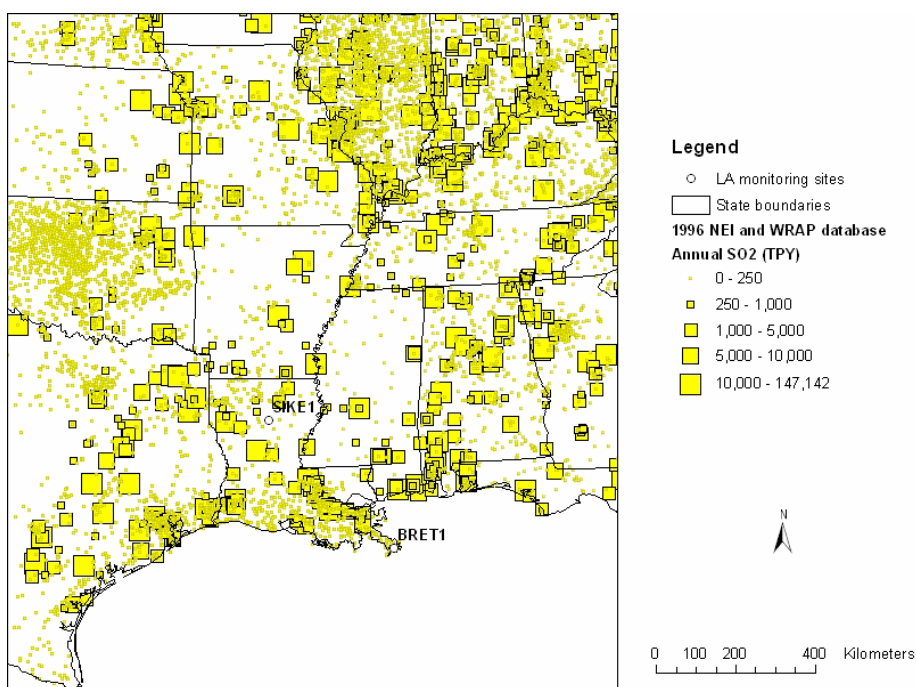


Figure 6. SO₂ sources based on 1996 NEI and WRAP database