*Teaching Notes – Chemistry of Aerosols*

**Overview:**

In this lesson, students will be exposed to real scientific data gathered on Pico Mountain and analyzed back in the lab at MTU. Scientists collect aerosols using the high volume samplers. The first video students will watch explains how the samples work and what an aerosol collection on the filter looks like. The second video illustrates how the samples are analyzed in the lab. After the videos, students will analyze the data collected in the lab and determine where the aerosols may have travelled from. Some research team members have the task of modeling and extrapolating back to determine weather patterns and events. The graphs were created by Simeon Schum, MTU.

**The Lesson:**

To start the day’s lesson, use the PowerPoint provided:

* Slide 1 – Photo showing aerosols on a filter from a high volume sampler
* Slide 2 – Video questions for students to answer (Pico Video High Volume Sampler)
* Slide 3 – Link to the high volume sampler video (approximately 7 minutes)
* Slide 4 – Video questions for students to answer (Pico Video OC/EC)
* Slide 5 – Link to the OC/EC video (approximately 10 minutes)
* Slide 6 – Today’s tasks
* Slide 7 – Websites to use to investigate weather patterns and events
* Slide 8 – Graphic illustrating global wind patterns
* Slides 9-10 – Examples of analyzed data
* Slide 11 – Explanation of event and non-event

Aerosols are collected in samplers located in the caldera of Pico Mountain. There are 4 samplers, each sampler runs for 24 hours and filters are changed every 3-4 days. The filters are carefully packaged, kept cold and brought back to MTU to be analyzed in the lab. The aerosols are measured in micrograms per cubic meter of air. The graphs provided are the end result of the analysis. Students will analyze these graphs for events and use weather data to determine were the aerosols could have travelled from. Aerosol particles can take several days to reach Pico, depending on the source of the aerosol. Keep in mind, these aerosol particles are from the free troposphere and, therefore, are not local to Pico.

Peaks in data indicate high levels of organic carbon or elemental carbon. For example, the peak shown on the graph for July 3, 2013 originally was thought to be dust when we saw the color on the filter. However, upon analysis it was determined to be organic carbon, possibly from the forest fires occurring in Canada at that time. By examining the fire event website and weather patterns, students should be able to come to that same conclusion.

Other scientists on the research team analyze the specific types of carbon molecules collected on the filters. They use other pieces of equipment and determine the number of carbon atoms in the chain and narrow down further what the aerosol particles are.

**Answers:**

All are events except the first September graph (Sept 9 – 12). July event was most likely due to forest fires occurring in Canada.