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Now you see it, now you don't: Impact of temporary closures of a coal-fired power plant on air quality in the Columbia River Gorge National Scenic Area

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Abstract. The goal of this study is to identify major point sources that contribute to elevated particulate matter in the Columbia River Gorge, USA and to quantify their contribution. To answer this question we analyzed 14 years of aerosol data spanning 1993–2006 from the IMPROVE site at Wishram, Washington (45.66° N, 121.00° W; 178 m a.s.l.) in the Columbia River Gorge (CRG) National Scenic Area of the Pacific Northwest of the USA. Two types of analyses were conducted. First, we examined the transport for days with the highest fine mass ($PM_{2.5}$) concentrations using HYSPLIT backtrajectories. We found that the highest $PM_{2.5}$ concentrations occurred during autumn and were associated with easterly flow, down the CRG. Such flow transports emissions from a large coal power plant in Boardman, Oregon and a large agricultural facility into the CRG. This transport was found on 20 out of the 50 worst $PM_{2.5}$ days and resulted in an average daily concentration of 20.1 μg/m^3, compared with an average of 18.8 μg/m^3 for the 50 highest days and 5.9 μg/m^3 for all days. These airmasses contain not only high $PM_{2.5}$ concentrations, but also elevated levels of aerosol NO_3^-. In the second analysis, we examined $PM_{2.5}$ concentrations in the CRG during periods when the Boardman power plant was shut down due to repairs and compared these values with concentrations when the facility was operating at near full capacity. We also examined this relationship on the days when backtrajectories suggested the greatest influence from the power plant on air quality in the CRG. From this analysis, we found significantly higher $PM_{2.5}$ concentrations when the power plant was operating at or near full capacity. We use these data to calculate that the contribution to $PM_{2.5}$ mass in the CRG from the Boardman power plant was 0.90 μg/m^3 averaged over the entire year, 3.94 μg/m^3 if only the month of November is considered and 7.40 μg/m^3 if only November days when the airflow is "down-gorge" (from east to west). This represents 14, 46 and 56% of the $PM_{2.5}$ mass in the CRG for the full year, November only and November days with "down-gorge" transport, respectively.

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