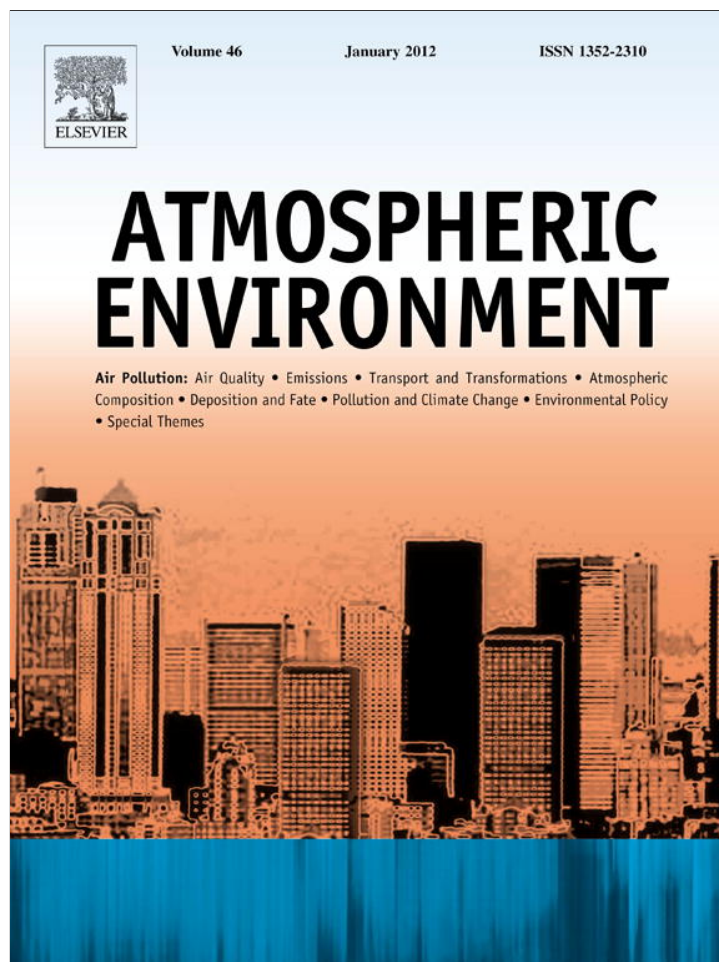


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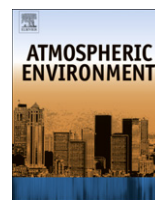
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Reply

Reply to comment on effect of coal-fired power generation on visibility at a nearby national park (Terhorst and Berkman, 2010)

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W.H. White, R.J. Farber, W.C. Malm, M. Nuttall, M.I. Pitchford, and B.A. Schichtel (White et al.) assert that our paper discredits previous studies and their interpretation by regulators. They are wrong on the former and right on the latter. We credit the tracer study component of the Project Mohave report for predicting an outcome similar to what has actually occurred following the closure of the Mohave Power Project (MPP) – very modest visibility improvement at the Grand Canyon at best. We do, however, raise questions about the transport modeling exercises conducted as part of Project Mohave that failed to predict the outcome. There was no consensus between these approaches. The study gave equal weight to tracer and transport modeling studies (Pitchford et al., 1999). In fact, the uncertainties regarding transport modeling should have been more clearly acknowledged at the time. This is an important distinction. As we stressed in our paper, the transport modeling effort reflects a method that continues to be an important tool for developing environmental policy. We think that our paper encourages greater use of tracer studies while raising concerns about the air quality modeling tools.

As we acknowledged, the tracer results were largely consistent with ours. Sulfate levels did drop resulting in minor air quality improvements after the plant closed as predicted. These improvements, however, were very small and did not lead to major visibility improvements. White et al. assert, "... that there is no reason to doubt that MPP's closure improved optical air quality over what would have been experienced had the plant continued operating." This fails to acknowledge the modest scale of any improvement. As White et al. note, Project Mohave determined that deciview improvements would be "well short of presumptive perceptibility". There have been no reports from the Grand Canyon suggesting any dramatic changes in visibility or tourist enjoyment post Mohave closure.¹ Further, the observed improvements do not come close to those predicted by the transport modeling, which anticipated a 5% or more visibility improvement.

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¹ It would be useful to apply the very modest improvement to a willingness-to-pay analysis. See for example, Bell et al. (1985). Indeed that exercise or the application of some other valuation technique would have been part of the cost-benefit study necessary to gauge the need for a billion dollar investment. See the discussion below.

The conflicting results from the tracer study and modeling efforts resulted in an ambiguous description of the study outcome that, as presented, perhaps unintentionally encouraged the decision to require greater emissions controls at MPP. EPA (1999) stated that,

The results of the Project MOHAVE study indicate that the Mohave Generating Station contributes to visibility impairment at the Grand Canyon National Park. The empirical data from the tracer study show that emissions from MGS reach the Meadview site at the western end of GCNP in sufficient concentrations to, under certain meteorological conditions, convert to sulfate and cause visibility impairment. EPA notes that the study results show that the Mohave Generating Station is not the major cause of visibility impairment at the GCNP. However, the study indicates that because of the quantity of SO₂ emitted from the Mohave Generating Station and its proximity to the Grand Canyon, no other single point source is likely to have as great an impact on visibility in the Park.

This misstates Project Mohave's findings. The Project Mohave report (Pitchford et al., 1999) states,

Detailed analysis of field measurements was unable to link elevated sulfate concentrations with MPP emissions. In general, the concentrations of visibility-impairing species seemed to be affected by regional sources and regional meteorology. Several analyses of concentration patterns and of distributions of the PFT [perfluorocarbon tracer] and of other natural tracers all concluded that dominant sources of GCNP visibility impairment were area sources (principally urban) in Southern California, Arizona, and northern Mexico. The Las Vegas urban area was also implicated in some analysis.

The report did not identify any particular point source as a major source of visibility reduction including MPP. Our findings and the tracer study results both indicate that reducing emissions at Mohave, even if it was the largest single point source of SO₂, would not greatly improve Grand Canyon visibility.

White et al. also take issue with our linking the MPP scrubber requirement to the owners' decision to close the plant rather than make the investment. They suggest that other factors including water and a coal contract dispute played equally important roles. Neither of these factors, however, was sufficient by itself or in

combination to lead to plant closure, while a billion dollar investment was sufficient. The water supply for coal slurry line that delivered coal to MPP was an issue, but the Department of Interior's Office of Surface Mining concluded, following several studies and 19 years of operating data, that slurry line water demands were not depleting an aquifer (Office of Surface Mining Reclamation and Enforcement, 2008).² Moreover, a second aquifer had been identified making it possible to end the controversy. The coal contract dispute regarding royalty rates dating back to the 1980's was independent of the scrubber investment and had been in litigation for years. Plant closure was never an issue during the course of this litigation. A settlement was finally reached in 2011 (Peabody Energy – News Releases, 2011).

In the end, it appears that regulators did not make the best use of the information that Project Mohave provided. Had, for example, the EPA conducted a cost-benefit analysis of adding scrubbers at MPP using Project Mohave tracer study results, it seems likely that such an investment would not have been supported since a billion dollar investment would have been compared to very modest visibility improvements. The plant's closure has had other important consequences. According to the U.S. Energy Information Administration (EIA, 2009) the closure of Mohave contributed to the substantial increase in electricity rates experienced in Nevada.

The closure also resulted in substantial revenue and job losses to the Navajo and Hopi. Unfortunately, sound science did not result in sound regulation.

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² White et al. refer to a Natural Resources Defense Council report (Grabiel, 2006) that drew a different conclusion.