



Do the Himalaya Export Air Pollutants from the Ganges Basin?

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The Ganges Basin in South Asia ranks close to Eastern China in both population and air pollutant emissions. During the winter-spring dry season it often experiences a similar “atmospheric brown cloud” haze layer of aerosols and trace gases. Global model results, however, have suggested that the Ganges Basin’s contribution to long distance pollution transport is significantly less than that of Eastern China. The assumption is that, for much of the dry season, the Ganges Basin experiences a large-scale inversion that suppresses vertical mixing of pollutants into the jet stream aloft. Yet both observations at high-altitude stations (such as the Nepal Climate Observatory – Pyramid station located at 5079 meters above sea level near Everest Base Camp) and vertically resolved satellite data show significant pollution levels at high altitudes over the Himalaya, which line the northern edge of the Ganges Basin.

Using the WRF model at resolutions as high as 1 km, along with photography over the Himalaya, we present several mechanisms by which pollutants from the boundary layer over the Ganges Basin can be transported vertically by Himalaya meteorology to heights where they can mix into the jetstream and be exported long distances. These mechanisms are closely tied to the shape of the topography and operate at scales of less than a few kilometers while global model grid spacing typically exceeds 100 km. We attempt to sum up the total contribution to pollutant export by the entire Himalaya region, and discuss the implications for both air quality over the Ganges Basin and global atmospheric chemistry and climate.