



## **Air Quality in China: Distribution, Trends, and Sources**

Robert Rohde

Berkeley Earth, Zurich, Switzerland (robert@berkeleyearth.org)

Several years ago, China began an aggressive program to improve air quality, including the installation of more than 1,500 real-time air monitoring sites and the tightening of pollution controls. This monitoring program, one of the largest in the world, has provided a rich source of data including hourly PM<sub>2.5</sub>, PM<sub>10</sub>, NO<sub>2</sub>, SO<sub>2</sub>, CO, and O<sub>3</sub> observations at nearly all sites. An analysis of this station data has allowed the identification of spatial and temporal trends within China. Combining these observations with weather data further allows a regional estimation of pollutant sources.

It is found that PM<sub>2.5</sub> annual area-average concentrations in China have declined by 5% per year since 2015. This includes a 10% per year decline during the summer. Winter pollution concentrations have been more variable, with improvements in some areas but not others, but winter conditions are also subject to greater year-to-year variations due to weather. More significantly, population-weighted exposure has declined by about 20% since 2015, which would be expected to reduce PM<sub>2.5</sub> related mortality by approximately 100,000 lives per year. This is partial offset by a 10% increase in ozone concentrations over the same time period.

As expected, the greatest current PM<sub>2.5</sub> concentrations occur in the extended region between Beijing and Shanghai; however, this is also the region that has seen the most rapid reductions in exposure. Nearly all of China has benefitted from declining PM<sub>2.5</sub> concentrations over the last few years, though a few inland cities have mild increases, possibly indicating the relocation of polluting activities to more remote locations. The strongest source regions include Hebei and Shandong Provinces south of Beijing, as well as the desert regions in the far west which occasionally produce natural dust storms.

The presentation will include additional discussion of other pollutants and further exploration of the spatial and temporal variations across China.

The overall conclusion is that China's emission controls program has been having the desired effect and is likely to produce a significant health benefit. China's air remains significantly polluted; however, the recent trend has been very positive.