

To improve the air quality in Beijing for the Olympics, the Chinese government acted to reduce the emissions of carbon dioxide (CO₂) prior to the start of the games. Carbon monoxide (CO) measurements from NASA’s Aura MLS instrument can be used to evaluate the effectiveness of this effort. The MLS website states: “In the upper troposphere and lower stratosphere CO is a measure of pollution that has upwelled from the boundary layer.” (http://mls.jpl.nasa.gov/products/co_product.php) Aura data is stored in the HDF-EOS5 file format.

NASA’s Advancing Collaborative Connections for Earth Science (ACCESS) Program supports the HDF5-OPeNDAP Project, whose goal is to enable easy access to HDF-EOS5 data via the Internet. A DAP4-HDF5 server was previously completed, and a prototype HDF5-friendly DAP client library was implemented during the second year of the project. As a demonstration of the capabilities facilitated by this project, the GrADS OPeNDAP client (<http://grads.iges.org/grads/grads.html>) was used with the HDF5-OPeNDAP prototype client library to quickly visualize a small sample of remotely-stored MLS swath data relevant to Beijing air quality.

The image below, generated by the GrADS client and later annotated (in orange) to highlight relevant elevations, shows the vertical profile of CO over Beijing for three different dates in the summer of 2008. The amount of CO, reported in units of 1.0e-7 VMR (volume mixing ratio), is shown on the X axis. Atmospheric pressure, in hectoPascals (hPa), is shown on the Y axis. The CO amounts between 200 hPa (lower stratosphere) and 315 hPa (upper troposphere) are measures of pollution, as described above. These pressures correspond to elevations of approximately 12 and 9 kilometers above sea level. The plot shows decreasing CO levels as measured by the Aura MLS instrument on the three dates examined, indicating improved air quality.

This case study demonstrates how the HDF5-OPeNDAP Project’s DAP4-HDF5 server and prototype DAP client library, Aura MLS data served by NASA, and the standard GrADS OPeNDAP client can facilitate quick analysis of air quality without reliance on special-purpose tools or applications.

See <http://www.hdfgroup.org/projects/opendap> for more information about the HDF5-OPeNDAP Project.

