**North America Chemical Reanalysis (NACR)**

**Overview**

The North America Chemical Reanalysis (NACR) project is an ongoing effort to reconstruct historic chemical composition variability at fine spatial and temporal resolutions. Chemical composition of the atmosphere affects air quality, human health, ecosystem and climate. The goal of this project is to generate long-term high quality datasets to document the status and changes in atmospheric composition, which provides a foundation to enable research and policy making on related issues.

**Approach**

Our approach starts with assimilating observed chemical data from surface air pollutant monitoring networks and satellite remote sensing. The main set of ground data is provided by the US EPA Air Quality System network. Satellite observations are provided by National Aeronautic and Space Administration (NASA), National Oceanic and Atmospheric Administration (NOAA) and other space agencies. The Methodology used has been explained in details in Tang et al. (2015). Most OI methods assume that the observations or modeled results in nearby locations are correlated, with the strength of that correlation inversely proportional to their distance. An Optimal Interpolation algorithm is used limited the influence of the observations to horizontal length scale for background error correlation at about 150 km.

Tang, Y., T. Chai, L. Pan, P. Lee, D. Tong, H Kim, and W Chen (2015) Using Optimal Interpolation to assimilate surface measurement and satellite AOD for ozone and pm2.5: A case study for July 2011, J. Air and Waste Management Assoc. 65, 10, 1206-1216, doi: 10.1080/10962247.2015.1062439

**Datasets**

Table 1 lists the chemical components produced by this project:

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| --- | --- | --- | --- |
| Components | Name | Model Version | Earth Observations |
| O3 | Ozone surface concentration | CMAQ 5.02 | AQS |
| NO2 | Nitrogen Dioxide surface concentration | CMAQ 5.02 | AQS |
| SO2 | Sulfur Dioxide surface concentration | CMAQ 5.02 | AQS |
| CO | Carbon Monoxide surface concentration | CMAQ 5.02 | AQS |
| NH3 | Ammonia surface concentration | CMAQ 5.02 | AQS |
| PM25 | Particulate Matter with diameter less than 2.5 micrometer (PM2.5) | CMAQ 5.02 | AQS |
| PM10 | Particulate Matter with diameter less than 10 micrometer (PM10) | CMAQ 5.02 | AQS |
| SO4 | Sulfate in PM2.5 | CMAQ 5.02 | AQS |
| NO3 | Nitrate in PM2.5 | CMAQ 5.02 | AQS |
| NH4 | Ammonium in PM2.5 | CMAQ 5.02 | AQS |
| EC | Elemental Carbon (Black Carbon) in PM2.5 | CMAQ 5.02 | AQS |
| OC | Organic Carbon in PM2.5 | CMAQ 5.02 | AQS |
| SOIL | Fine Soil in PM2.5 | CMAQ 5.02 | AQS |

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