Converting Gridded Inventories to ORL Format for Processing with SMOKE

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SMOKE Processing Approaches

- SMOKE is optimized for source-based processing
- Gridded inventory data are allowed but not ideal
  - Inefficient
  - Limited flexibility for spatial allocation
Objectives

• Streamline the processing of gridded inventories in SMOKE
• Overcome the limitations of using coarse grid inventories for regional/urban modeling
• Use only open-source software to prepare and process the gridded inventory data
Approach

- Use a GIS to extract administrative unit (AU) totals from gridded inventories
- Format the AU totals to a SMOKE area source inventory
- Develop spatial surrogates to re-grid the AU inventories to different modeling grids
- Compare the native gridded inventories to the re-gridded emissions
Tools and Utilities

- **Spatial Allocator**
  - ALLOCATE mode
  - Surrogate tool

- **Fortran Utilities**
  - GEIA2NCF, EDGAR2NCF, EMEP2NCF
  - CSV2ORL
Datasets

• Inventories
  – GEIAv1, EDGAR32FT2000, EMEP

• Administrative Unit Shapefile
  – Global year 2000 country boundaries (1:1,000,000)

• Global Population Shapefile
  – SEDAC 2.5’ 2005 population
Results

• 5-10% loss of total emissions from gridded inventory relative to extracted inventory
  – AU Shapefile did not contain marine areas as a polygon, resulted in loss of offshore emissions
• 1-10% difference in emissions at the AU level between EMEP country totals and extracted inventory
  – Coarse resolution AU Shapefile does not resolve the country boundaries well; differences in country boundary definitions between EMEP database and this application
  – Loss of offshore and coastal emissions (small islands and countries with long coastlines have largest losses)
Results

• GEIA 1985 NOx on the native 1° grid vs. US 12-km grid allocated by population
Results

- GEIA 1985 NOx on the native 1° grid vs. India 24-km grid allocated by population
Results

- GEIA 1985 NOx on the native 1° grid vs. Rio/Sao Paulo 12-km grid allocated by population
Results

• GEIA 1985 NOx on the native 1° grid vs. Nile Delta 4-km grid allocated by population

![Map of GEIA 1985 NOx](image1.png)

![Map of Nile Delta NOx](image2.png)
Conclusions and Future Work

• This approach is a way to make preparing gridded inventories for air quality modeling more accessible and efficient for areas of the world where only gridded emissions estimates are available.
• Dependent on the availability of AU Shapefiles
• Areas of the world that lack detailed inventories also lack detailed ancillary data
• Future work will confirm why some emissions are being lost in the conversion from the gridded to AU total inventories
• The approach can shift resources away from tedious SMOKE processing tasks to focusing on the improvements of the emissions data, collection ancillary data, etc.