

Converting Gridded Inventories to ORL Format for Processing with SMOKE



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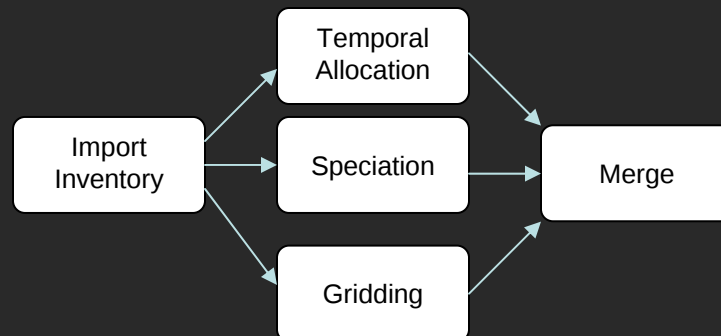
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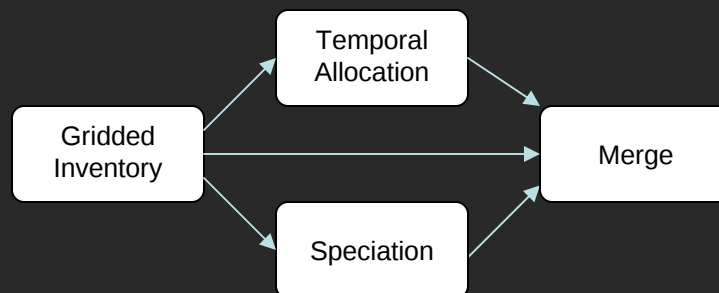
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SMOKE Processing Approaches

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



Area source processing approach



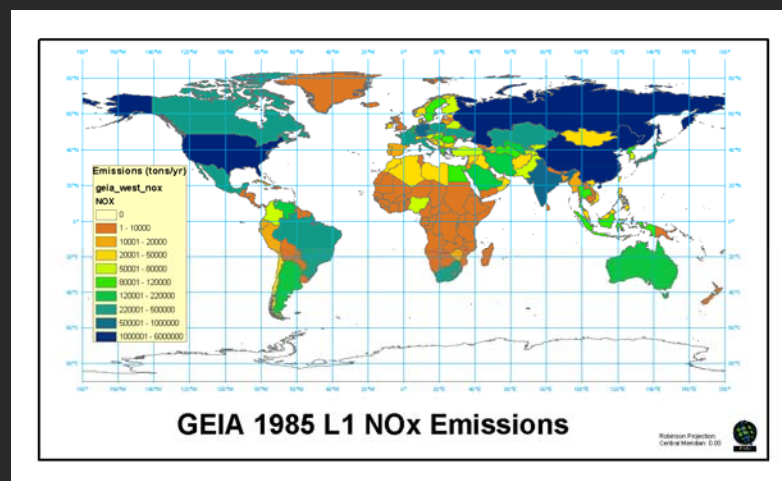
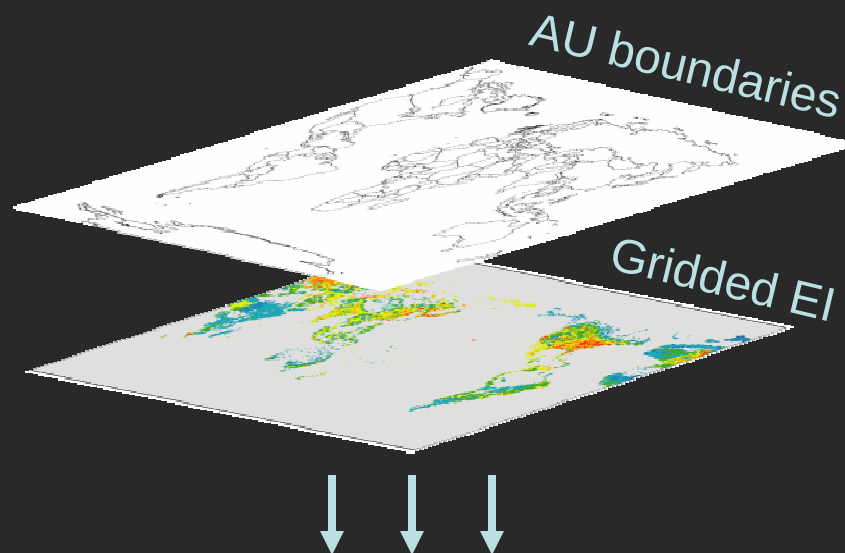
Gridded inventory processing approach

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

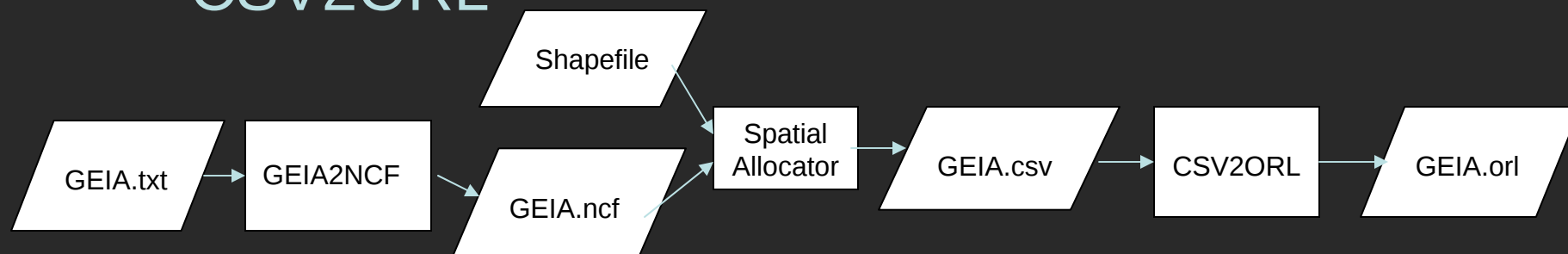
Approach

- 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



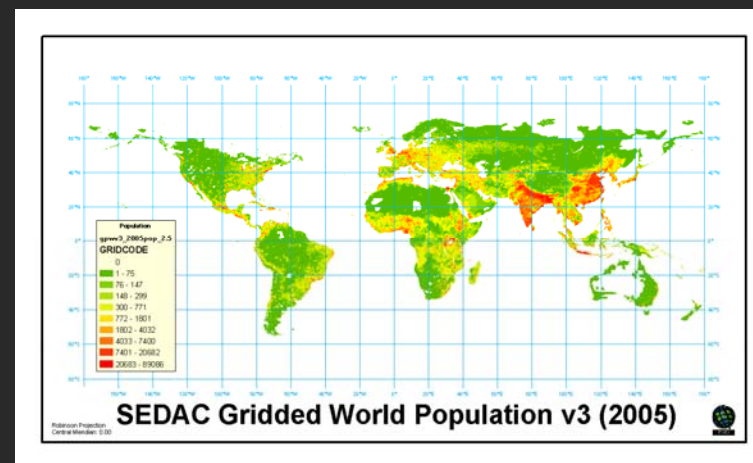
Tools and Utilities

- 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

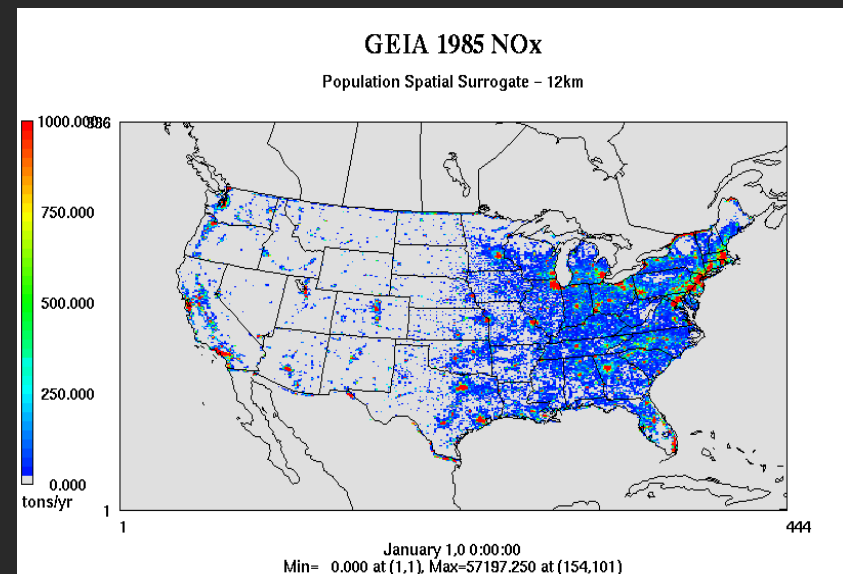
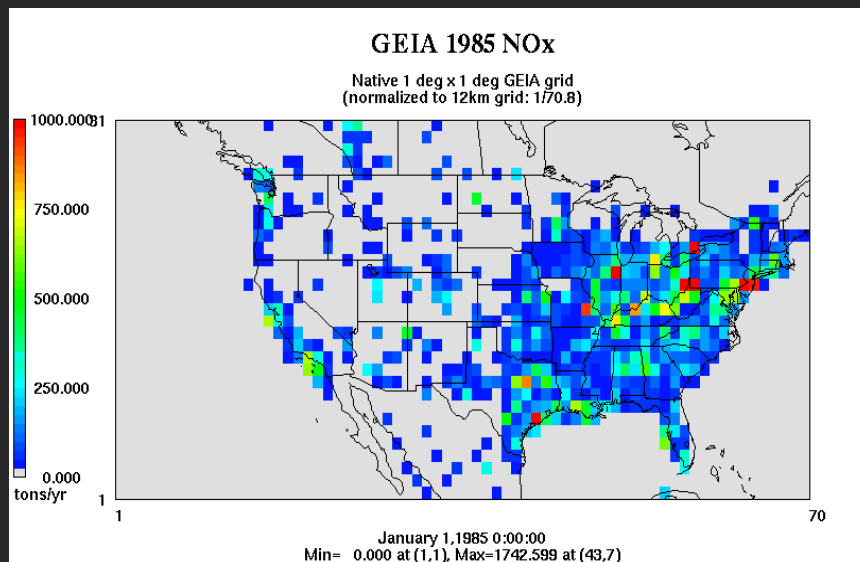


Results

- 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)

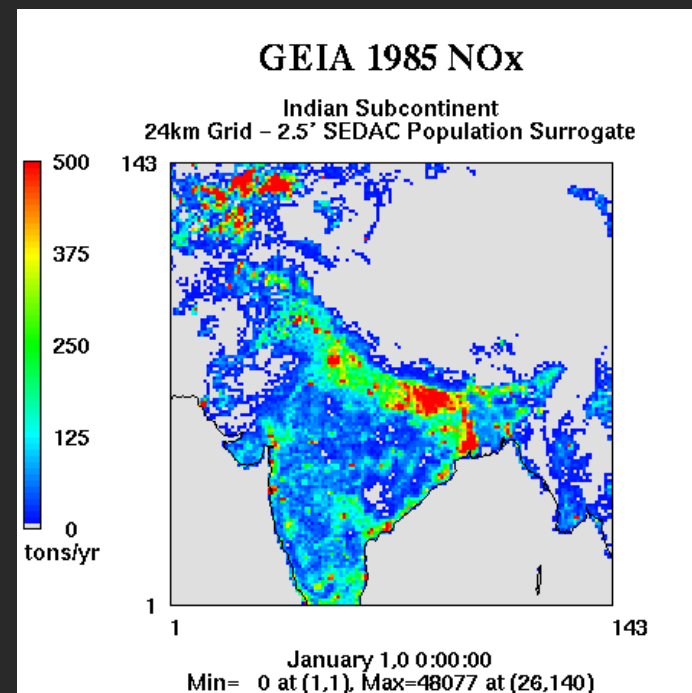
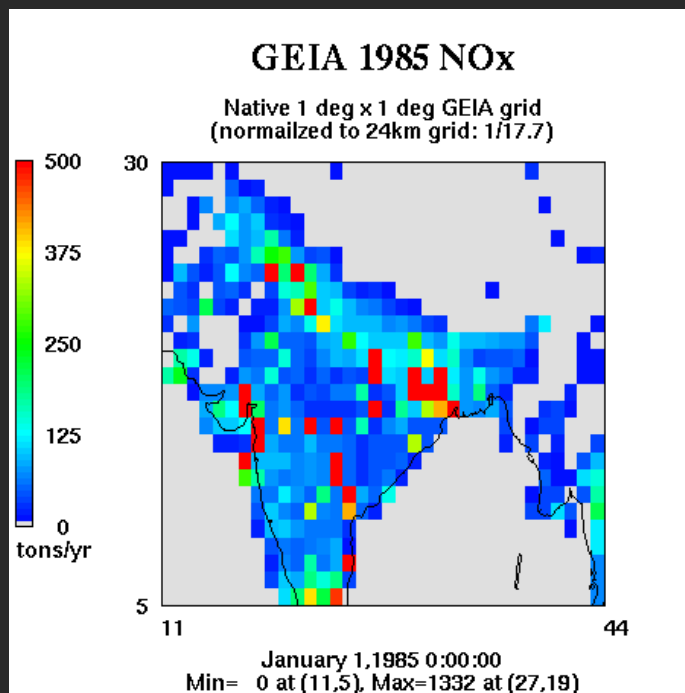
Results

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



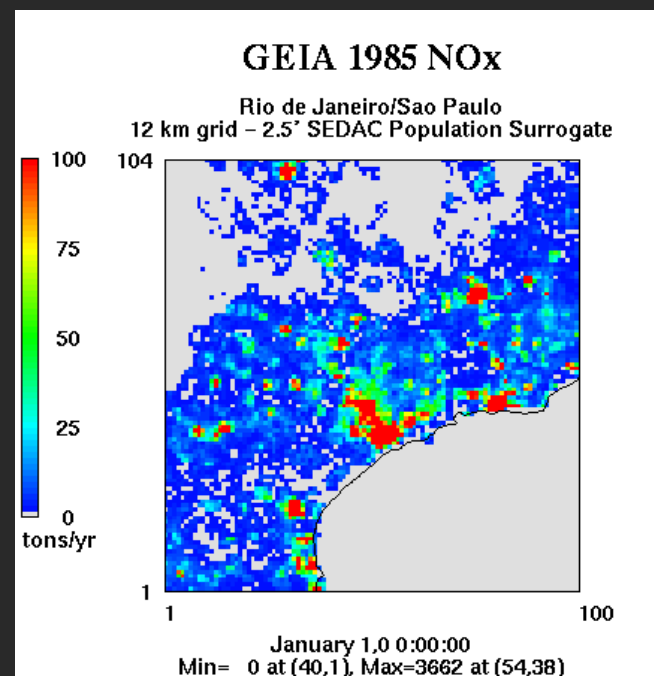
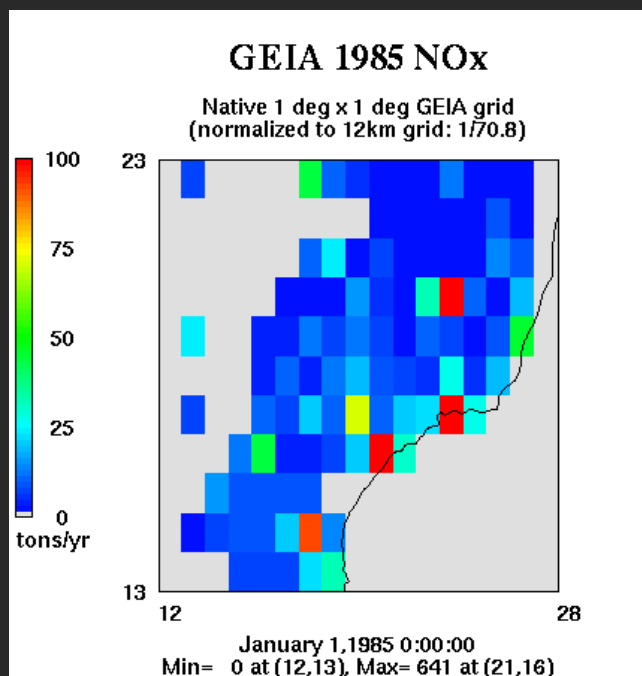
Results

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



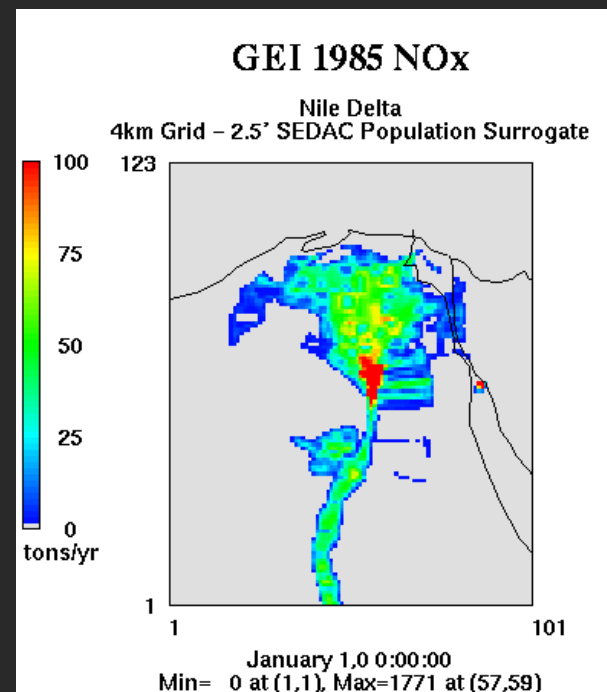
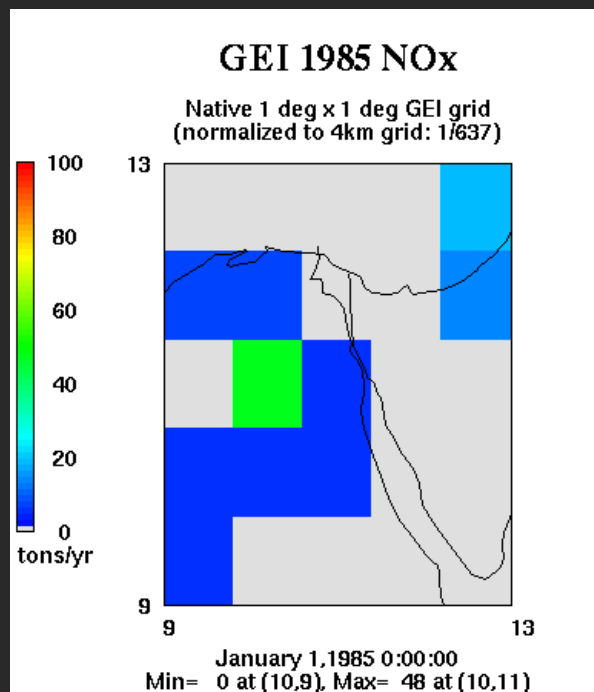
Results

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



Results

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



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.