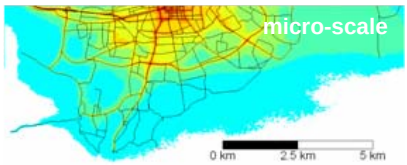
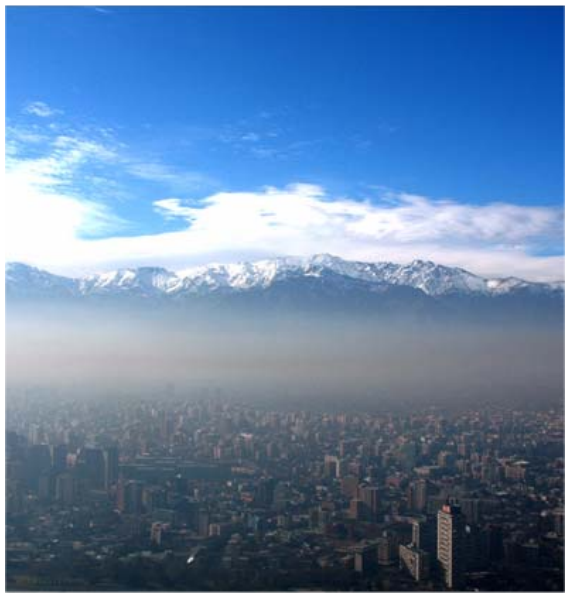
Development of a modeling chain for the description of the air quality within the greater area of Santiago de Chile

1. Context

- A detailed understanding of the distribution and behavior of pollutants in the air is a prerequisite for studies on the health impact of contaminated air.
- Air quality data from monitoring stations is usually not representative for the concentration of contaminants within a larger (three-dimensional) area.
- Common air quality models operate on a broad scale, with distances measured in kilometers. While this approach works very well for regional (meso-scale) air pollution modeling, it is not suitable to estimate levels of contaminants within the urban system (micro-scale).
- As traffic emissions account for an immense share of contaminants, their dispersion in the air is the most relevant of processes on the micro-scale to be considered when modeling urban air quality.





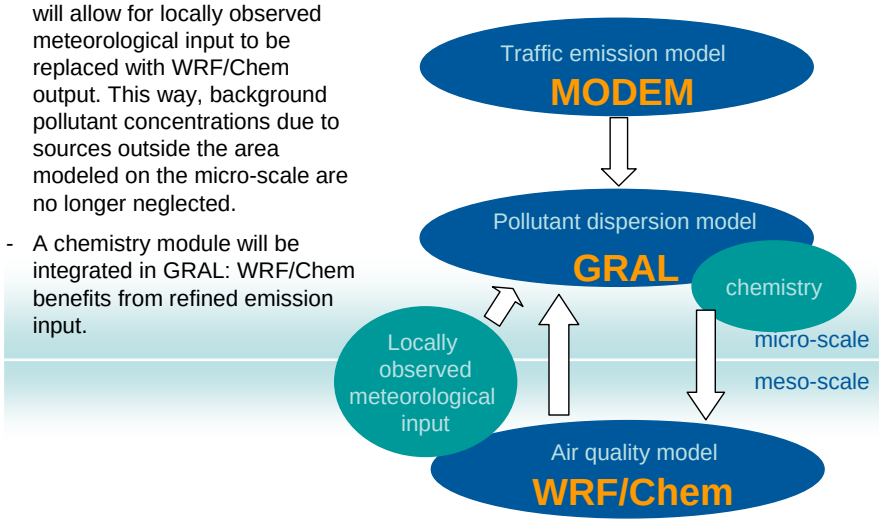
Source: Mickey Ashmore

2. Objective and research questions

- The objective is to develop a modeling chain, starting with the simulation of the dispersion of traffic emissions within a street canyon and reaching up to modeling meteorology and air chemistry for grid cells of 3km by 3km.
- How can I integrate models across scales? More specifically, how do chemical processes occurring on the micro-scale relate to those taken into account on the meso-scale?

3. Methodology

- Linking GRAL and WRF/Chem will allow for locally observed meteorological input to be replaced with WRF/Chem output. This way, background pollutant concentrations due to sources outside the area modeled on the micro-scale are no longer neglected.
- A chemistry module will be integrated in GRAL: WRF/Chem benefits from refined emission input.



4. Preliminary Results

- The work has recently started. Results at this point reduce to first simulations with GRAL based on meteorological input from WRF/Chem as well as clarifying methodology and tasks.

5. Linkages to other FoA/CCCs

- A joint effort with the FOA Transportation producing data on dynamic driving behavior will provide a basis to improve traffic emission modeling by complementing MODEM with modules from alternative models (NEMO, IVE).
- As socio-spatial differences correspond to local discrepancies in the fleet composition (which is essential when estimating traffic emissions), insights in the FOA socio-spatial differences are likely to advance the traffic emission inventory.
- Modeling results can be translated into air pollution risk maps, which are essential for health impact studies: a link to the CCC Risk.

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