

Exploring Links between climate change and air quality

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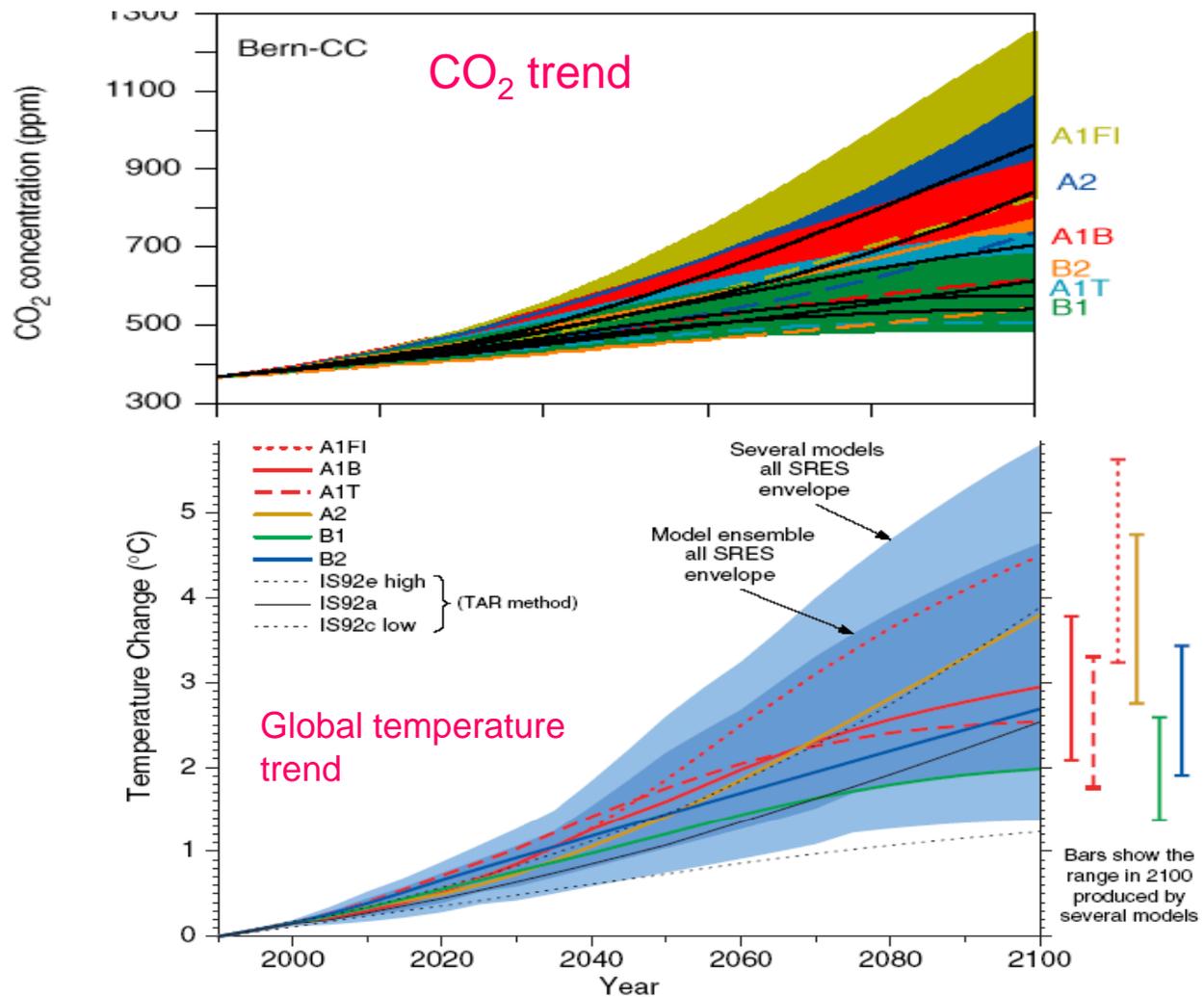
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Key Questions

- How will global warming affect air quality directly through higher temperatures?
- How will global warming affect air quality indirectly through changes in regional/local circulation patterns and land cover?
- How will changes in land use affect regional air quality?
- At what scale can the links between climate change and air quality be reasonably understood?

PROJECTED WARMING OVER 21st CENTURY



IPCC, 2007

Some Air Quality issues that might be affected by climate change

- Ground-level (tropospheric) ozone
- Concentrations of certain air-pollutants
- Air pollutants from Forest Fires
- Long-range transport of air pollutants
- Aeroallergens

Links

- Climatic changes on scales ranging from year-to-year variations to long-term global warming may result in changing the chemistry and transport patterns of certain air-pollutants.
- Climatic changes may affect distribution and concentration of certain pollutants
- Climatic changes may affect air-pollution emissions
- Changes in the following meteorological fields (**PBL temp., H₂O, cloud cover, precip., wind, atm. Pressure**) may have significant impact on regional air quality.

Two Conceptual Frameworks to study the links

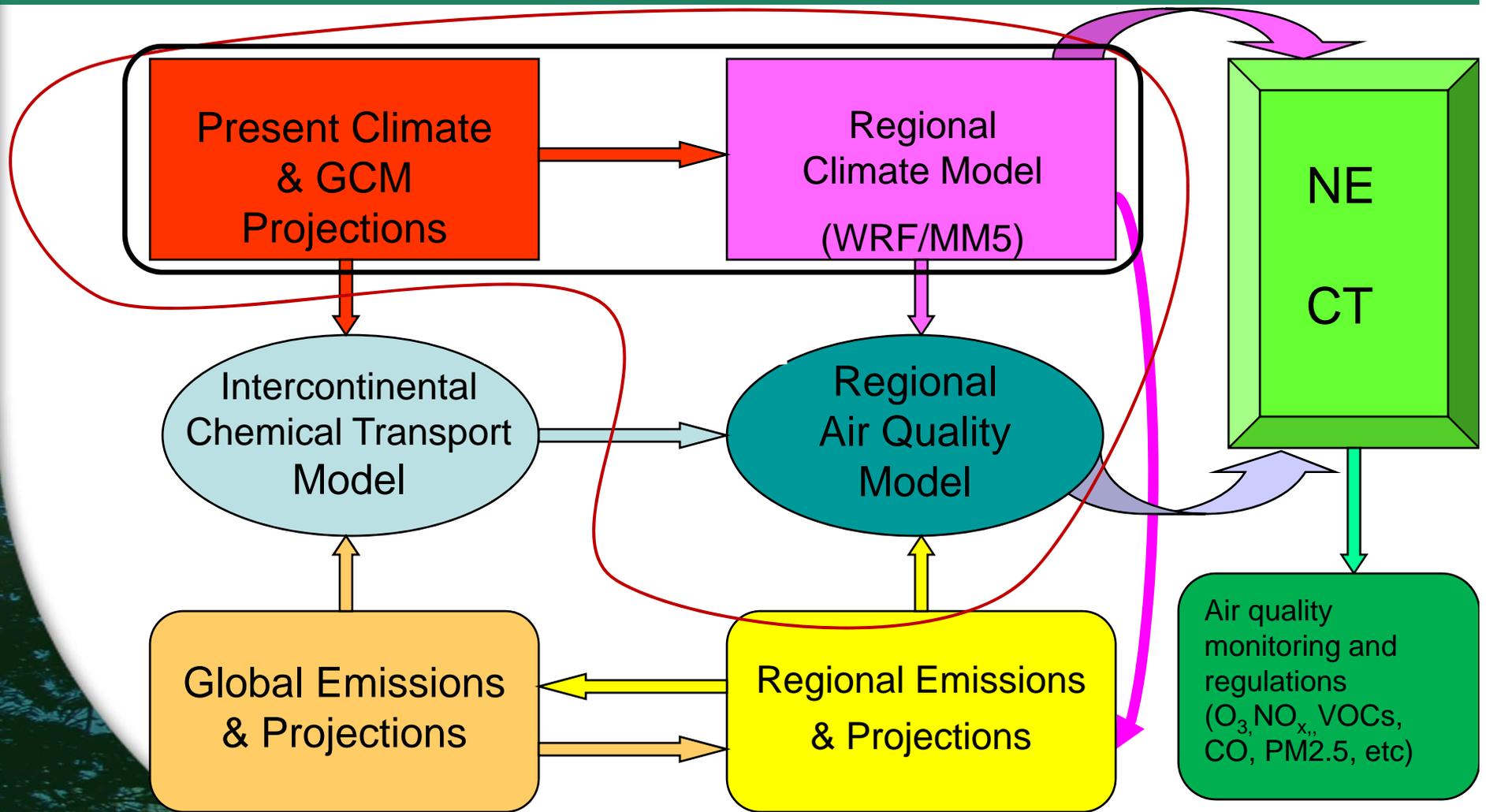
- **Statistical Techniques**

(Relationships between meteorology and air quality)

- **Dynamical Techniques**

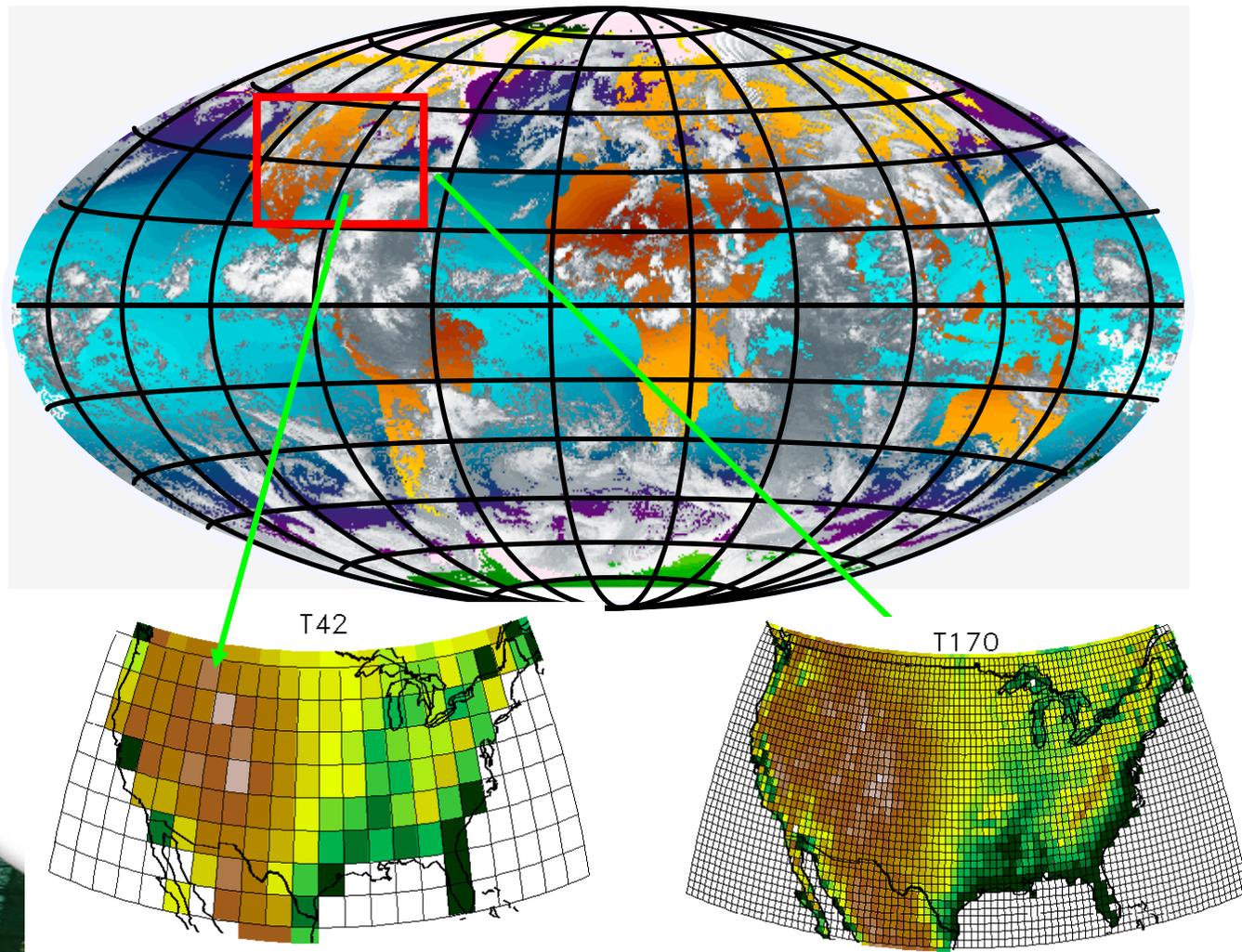
(Air quality modeling)

Nested global-regional modeling concept

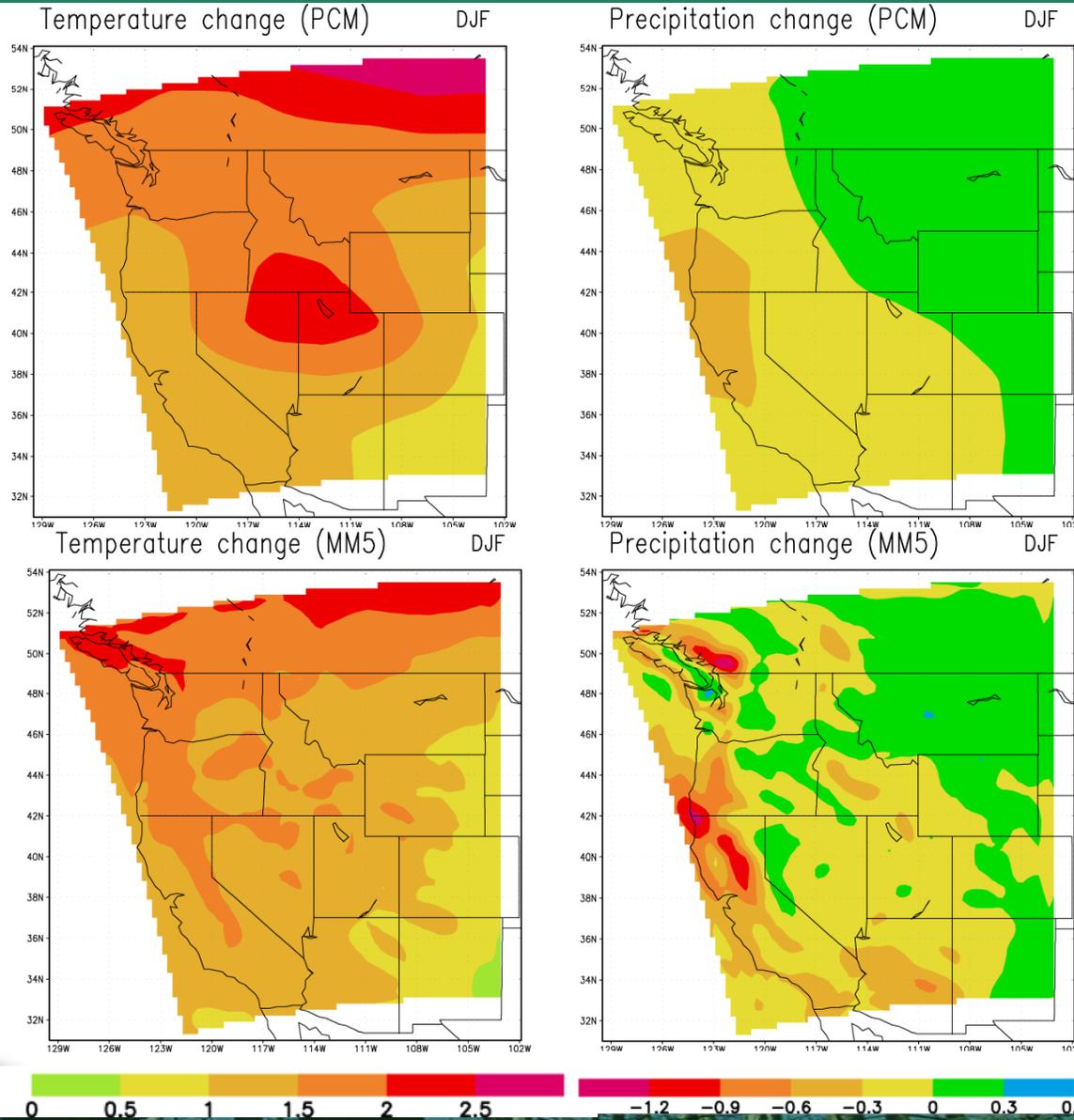


(Modified from Liang et al., 2005)

Benefits of downscaling

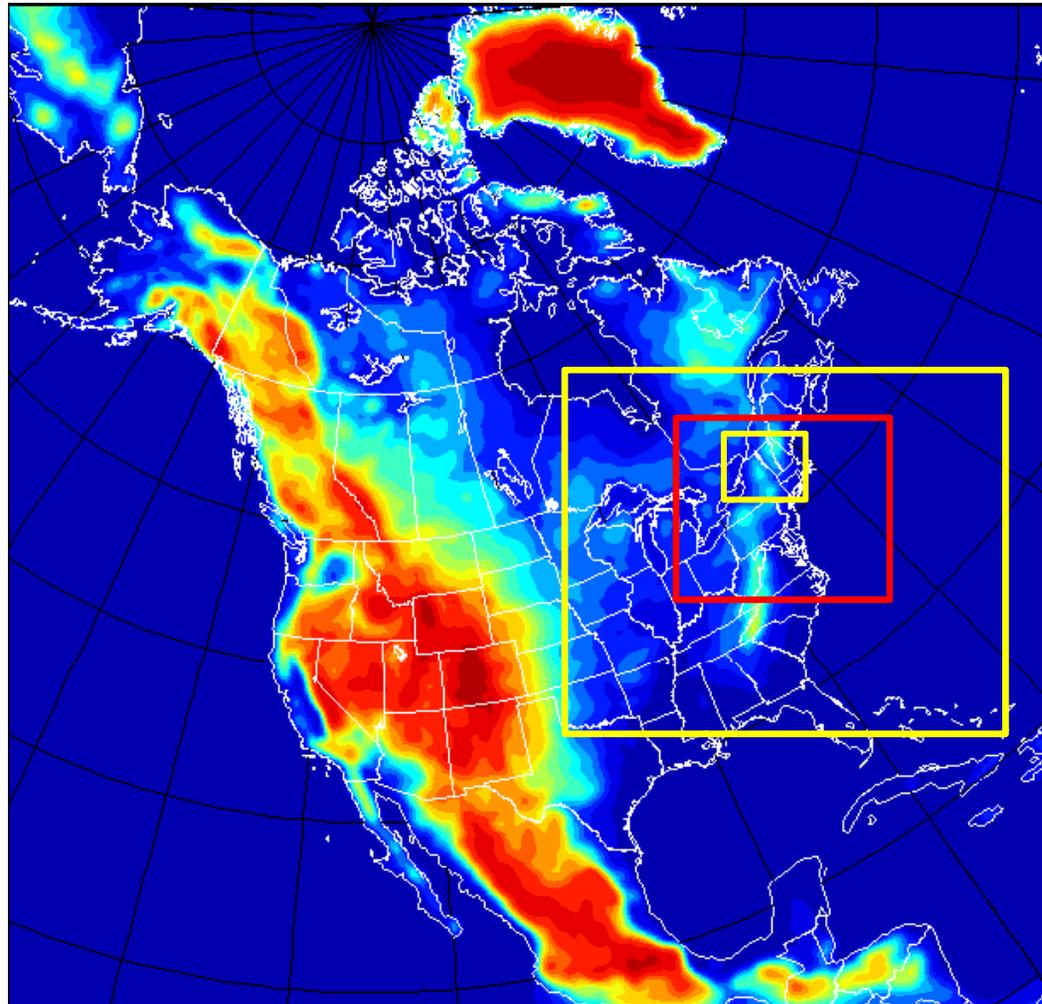


GCM vs. RCM Resolution (climate projections)



Mearns et al., 2005

Area of focus



North American Regional Climate Change Assessment Program (NARCCAP) Products

<http://www.narccap.ucar.edu/>

- Exploration of multiple uncertainties in global and regional climate model projections.
- Development of multiple high resolution regional climate scenarios for use in impacts assessments (CT air quality).
- Use results as scenarios for impacts studies on NEUS/CT air-quality
- Further dynamical or statistical downscaling of NARCCAP to provide higher resolution scenarios for CT

Challenges in modeling links between climate and air quality changes

- Requires time (computational time?)
- Integrated modeling: requires diverse expertise
- Uncertainties resulting from Data input requirements and model evaluation
- Input of climate change scenarios into the air quality modeling system

THANK YOU!



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