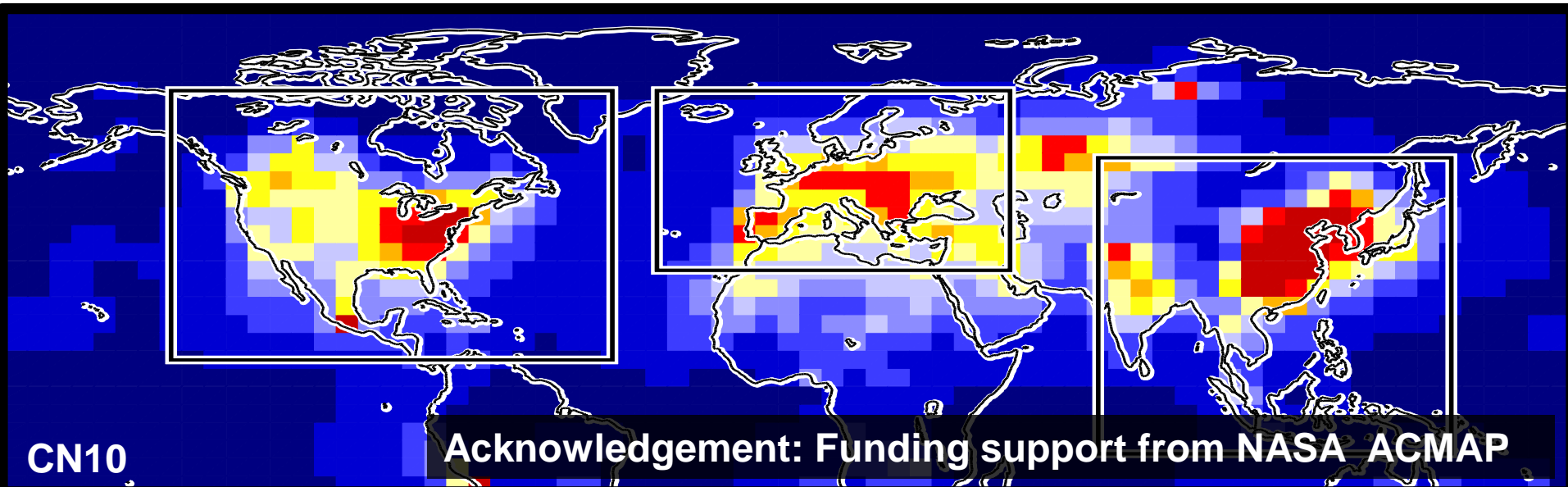


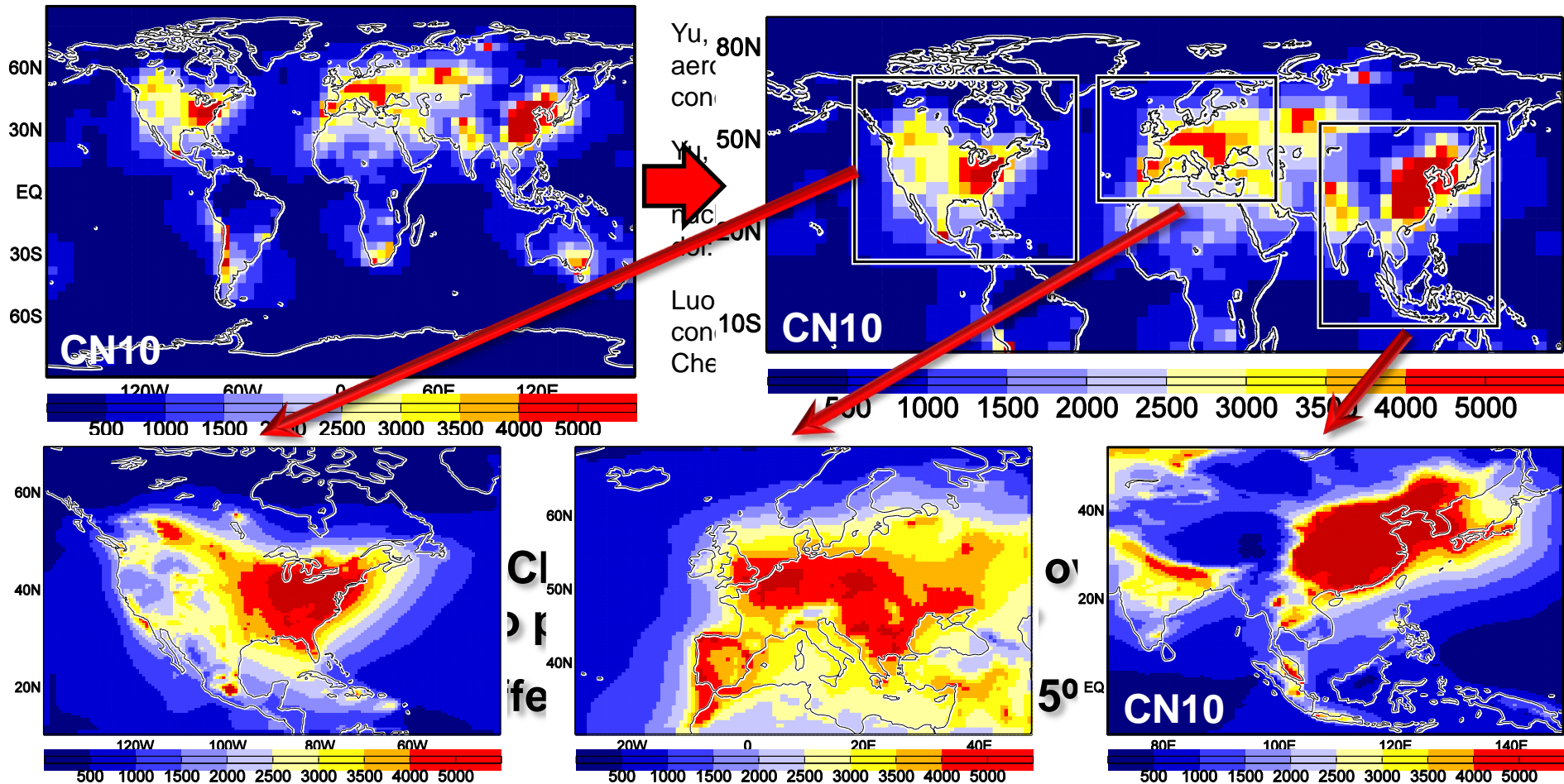
GEOS-Chem + APM simulations over three nested domains (**North America**, **Europe**, **East Asia**) and comparisons with particle measurements

Gan Luo and Fangqun Yu

SUNY-Albany, May 2nd, 2011



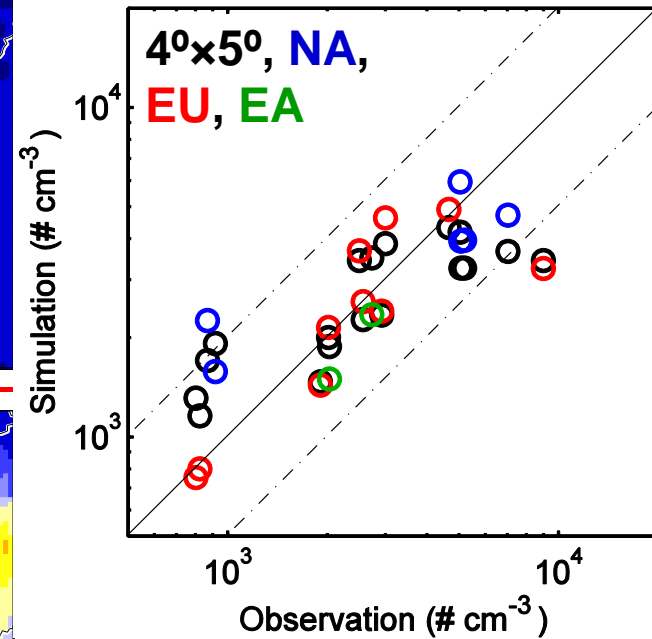
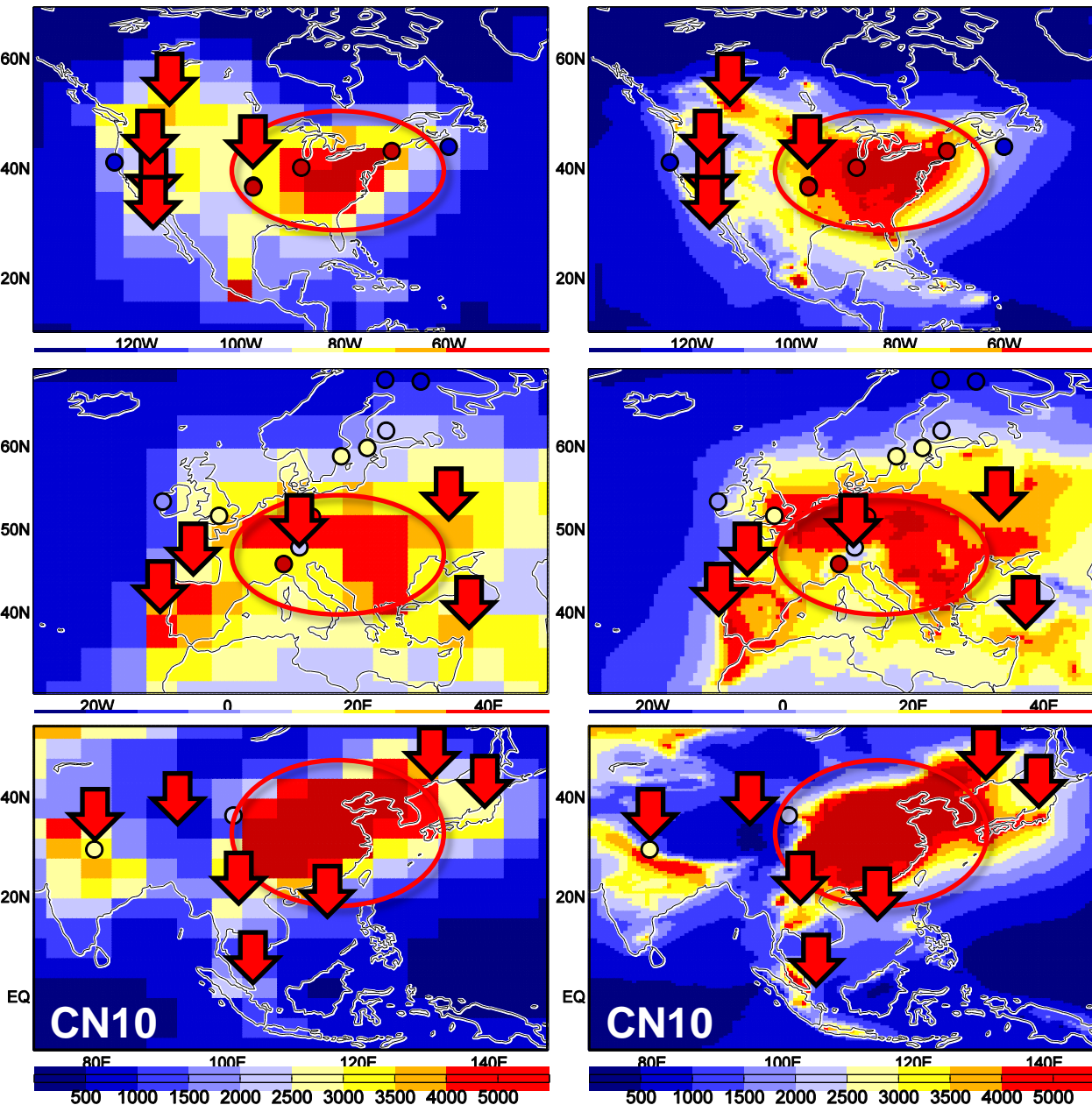
Introduction



Main features

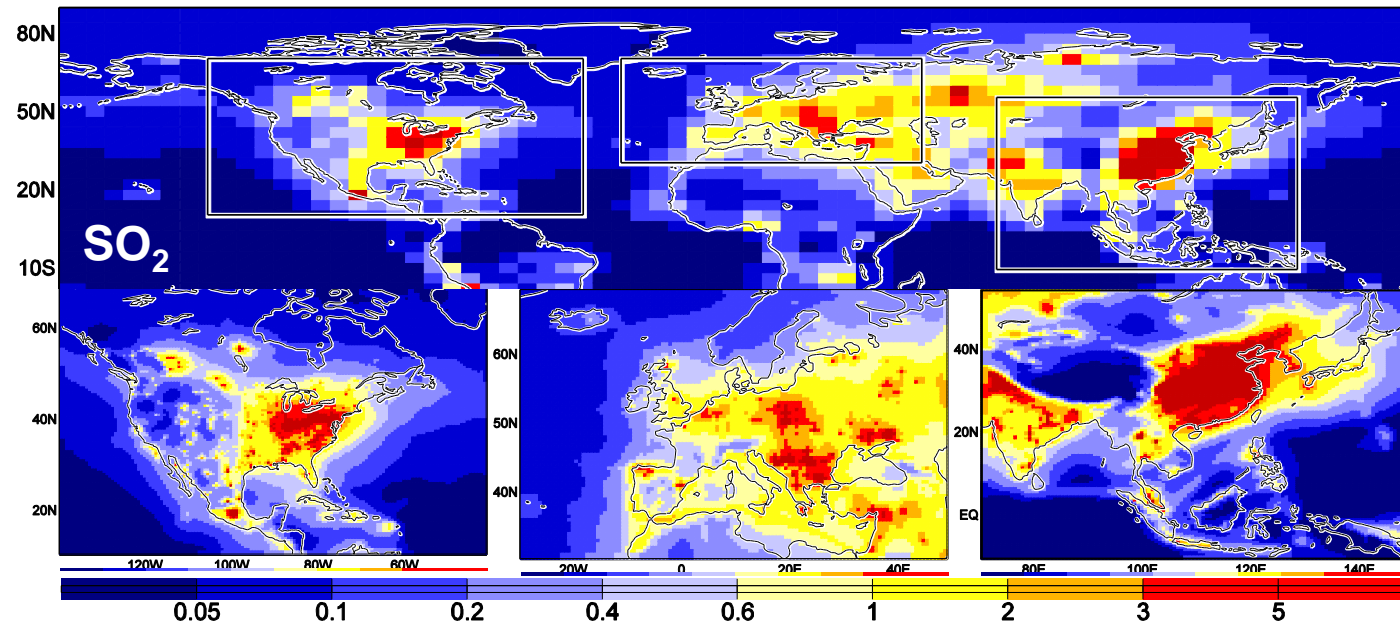
- ❖ Using the same chemical and aerosol microphysics schemes;
- ❖ $4^\circ \times 5^\circ$ simulation provide initial and boundary conditions for all species;
- ❖ contains a number of computing efficiency algorithms (only double the computing cost of 59 species standard simulation)

Nested simulation shows good agreement with Obs.



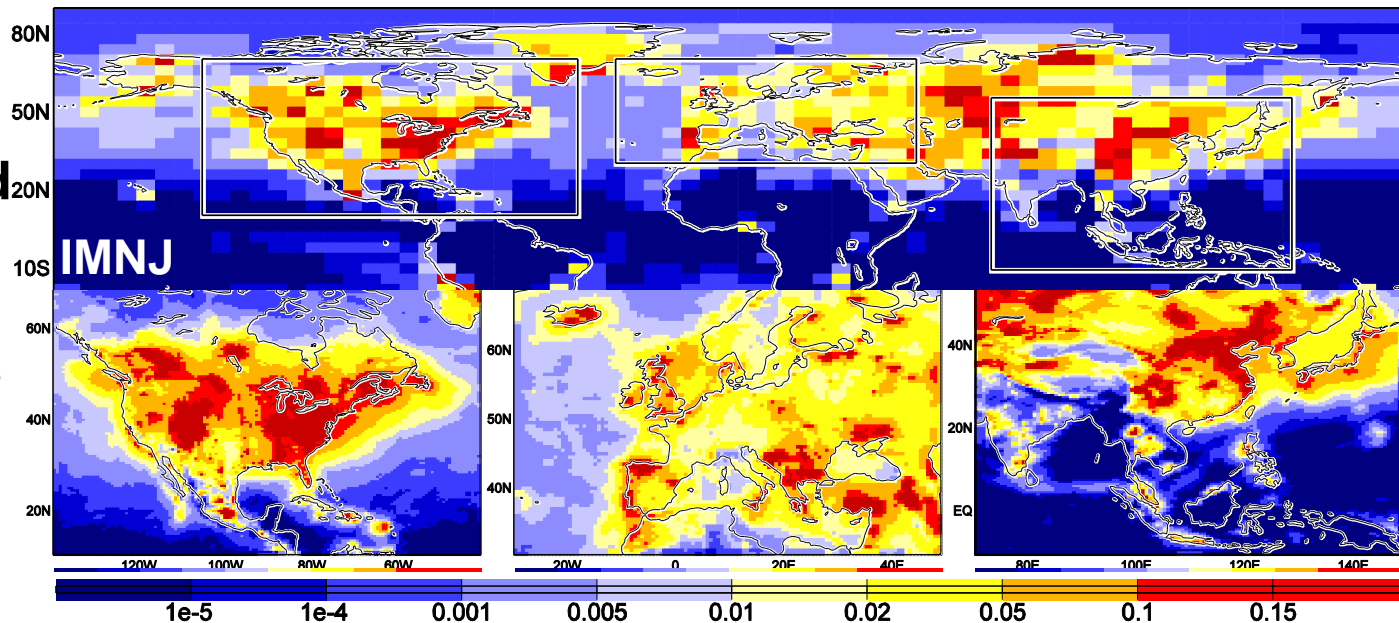
The nesting simulation shows good agreement with ground-based long-term Condensation Nuclei (>10 nm) observations at 17 sites
(NA: 5; EU: 10; EA: 2)

Significant impact on short lifetime variables

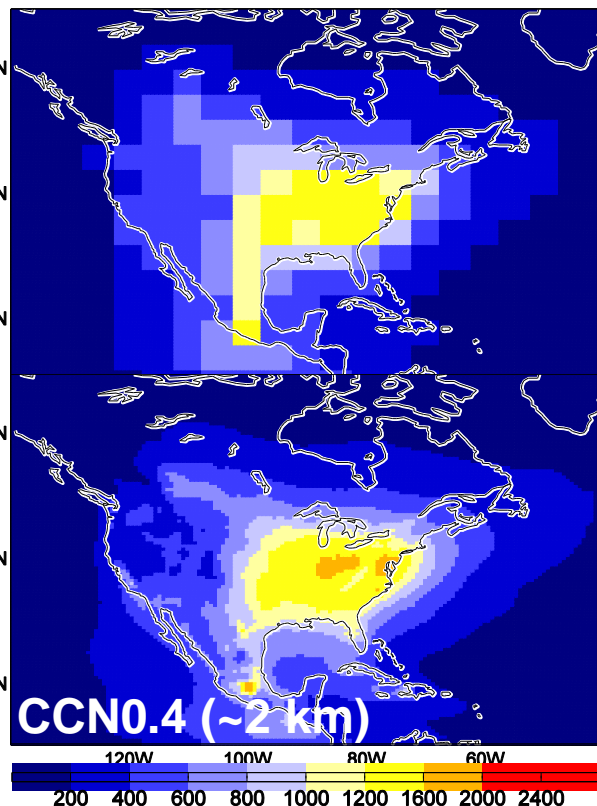


- ❖ Capture more details;
- ❖ Reflect the impacts of terrain, urban and local condition;
- ❖ Important for the study of regional air quality

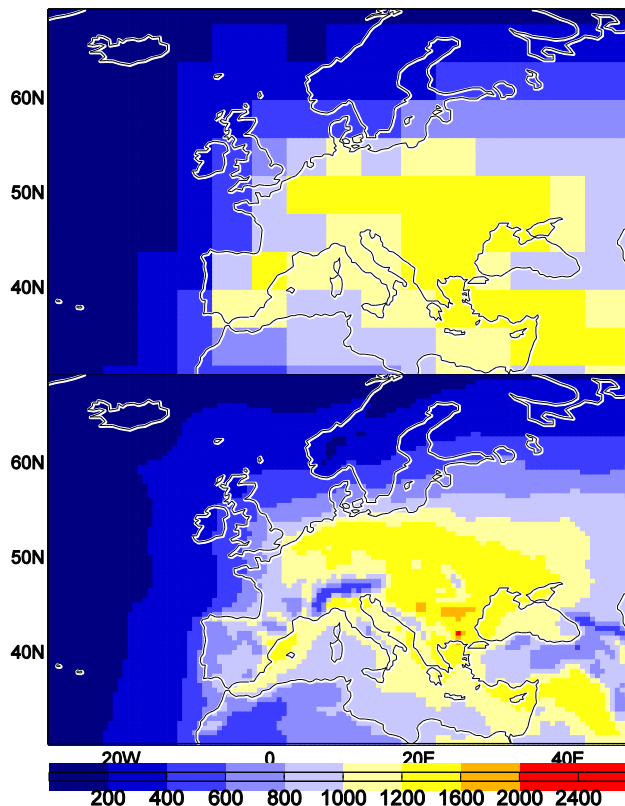
- ❖ Very sensitive to model resolution;
- ❖ local [H₂SO₄] and meteorology can impact the rate;
- ❖ Important for the investigation of freshly nucleated particles



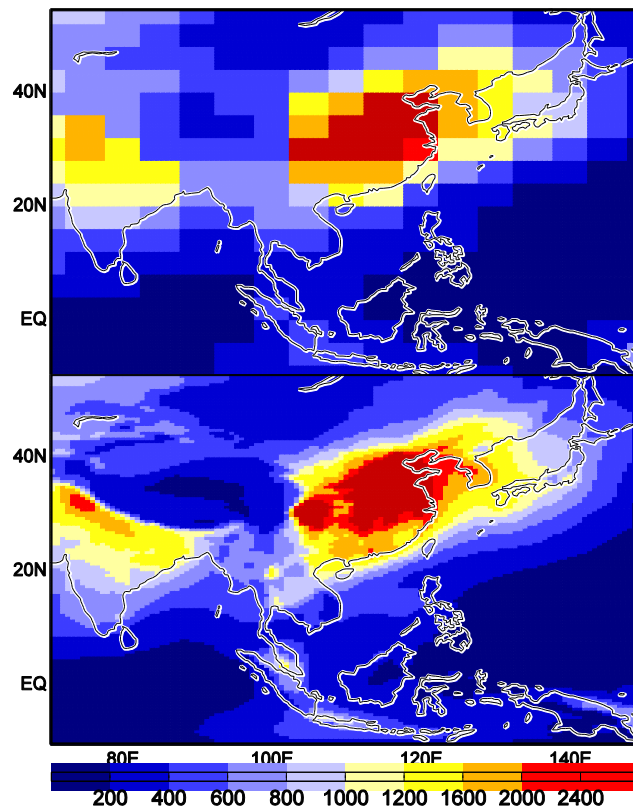
Impact on Cloud Condensation Nuclei



$4^\circ \times 5^\circ$: 395 # cm^{-3}
Nesting: 408 # cm^{-3}
Rate: 1.03



$4^\circ \times 5^\circ$: 714 # cm^{-3}
Nesting: 704 # cm^{-3}
Rate: 0.99



$4^\circ \times 5^\circ$: 579 # cm^{-3}
Nesting: 606 # cm^{-3}
Rate: 1.05

- ❖ Small differences are shown in nesting simulation;
- ❖ long lifetime traces can be well mixed and transported in the $4^\circ \times 5^\circ$ and nesting simulations

Conclusions

- ❧ **GEOS-Chem + APM simulated aerosol microphysics over three nested domains (North America, Europe, East Asia) with a relatively small increase in the computing cost;**
- ❧ **Nesting simulations show good agreement (within a factor of two) in all sites around the globe that have at least one full year of CN10 measurements;**
- ❧ **Nesting simulations show a significant benefit in capturing the high values of short lifetime species, especially at those isolated urban/source regions within large remote areas;**
- ❧ **For the long lifetime tracers, the differences between the $4^{\circ} \times 5^{\circ}$ and nesting simulations are very small. The $4^{\circ} \times 5^{\circ}$ simulations can reflect the major spatial patterns.**

The End

Thank You !

