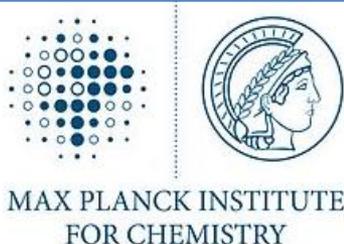
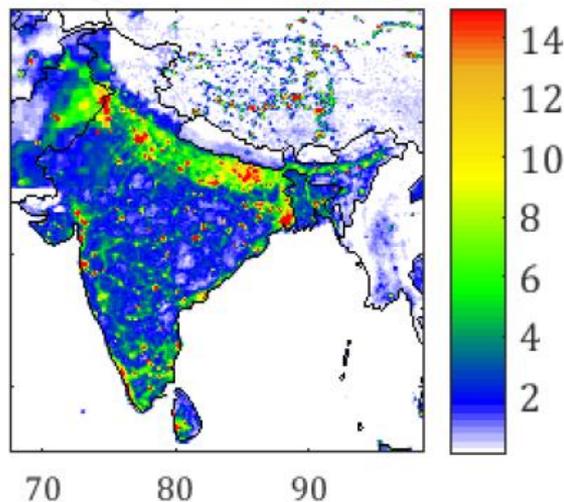


High resolution regional air quality modelling over south Asian region



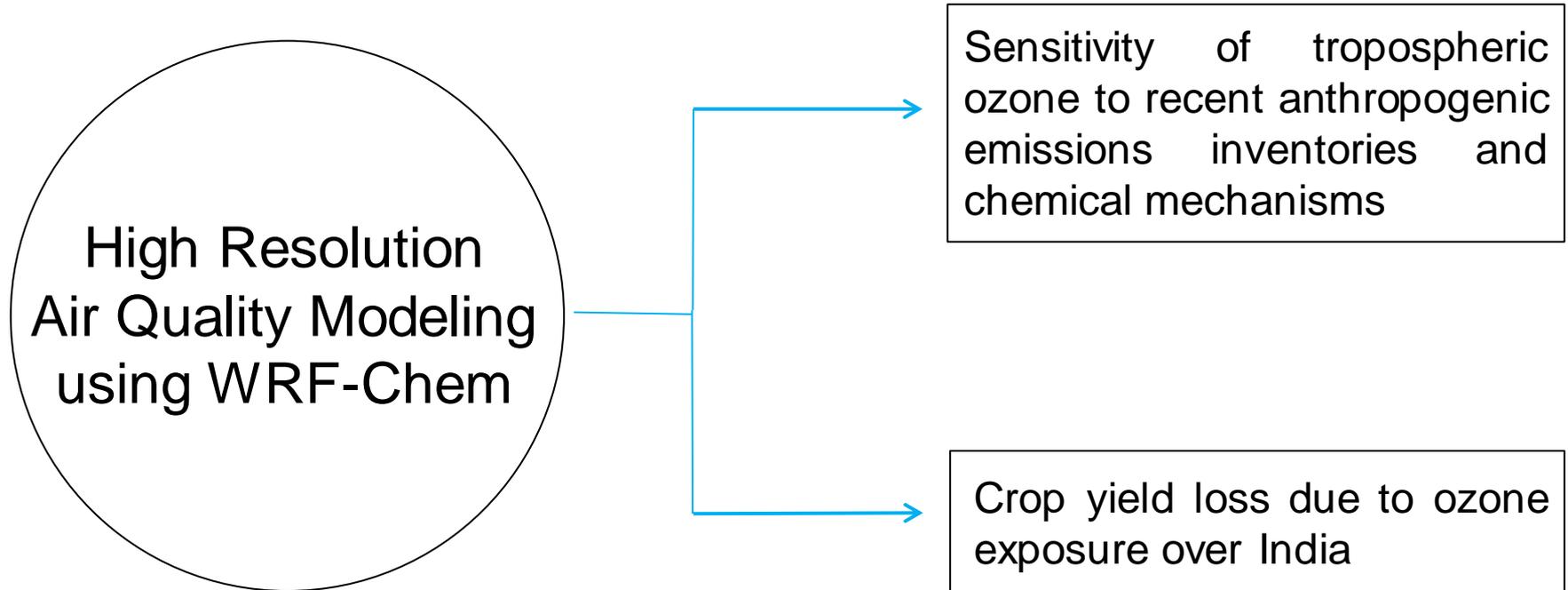
anthropogenic NO_x emissions (mol km⁻² h⁻¹)



Amit Sharma

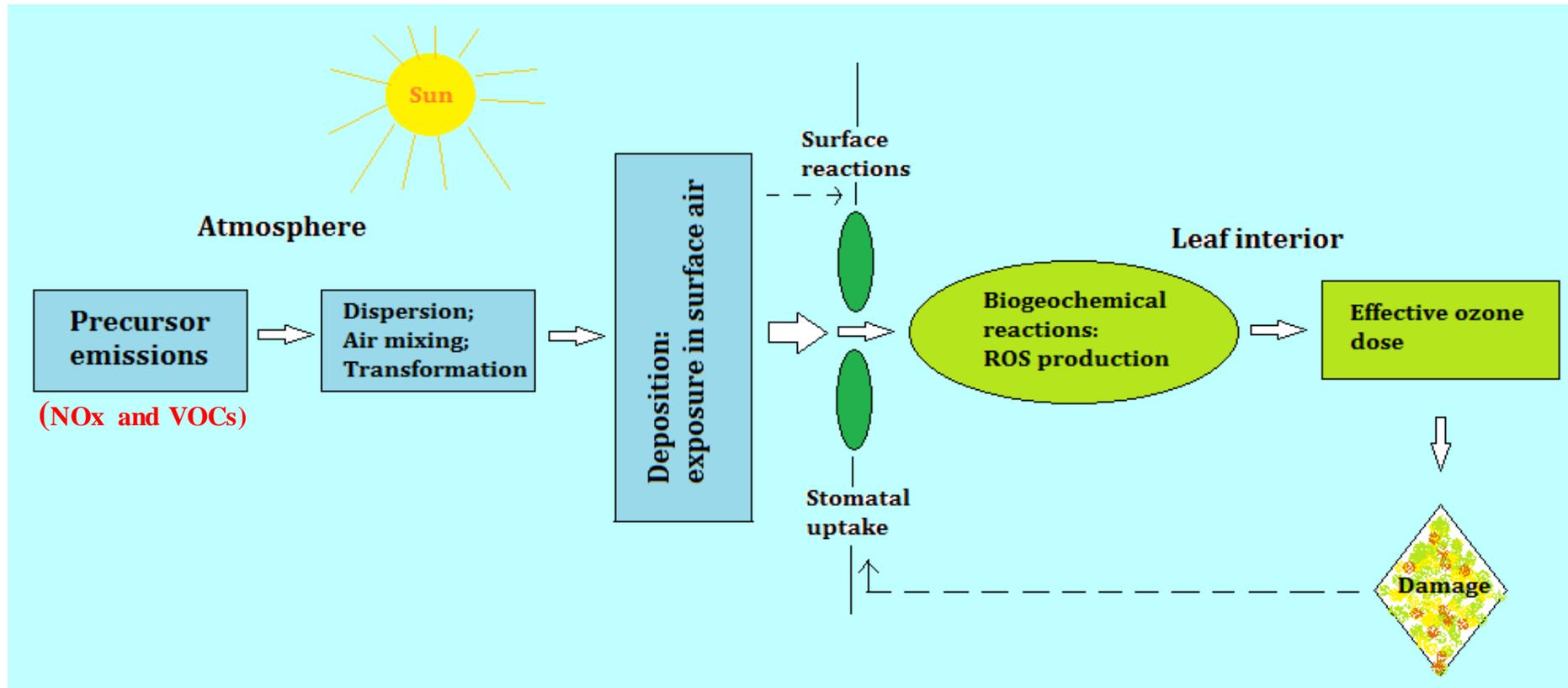
Currently at Laboratory for Atmospheric Research
Washington State University
Pullman, WA

Previous research work (PhD)



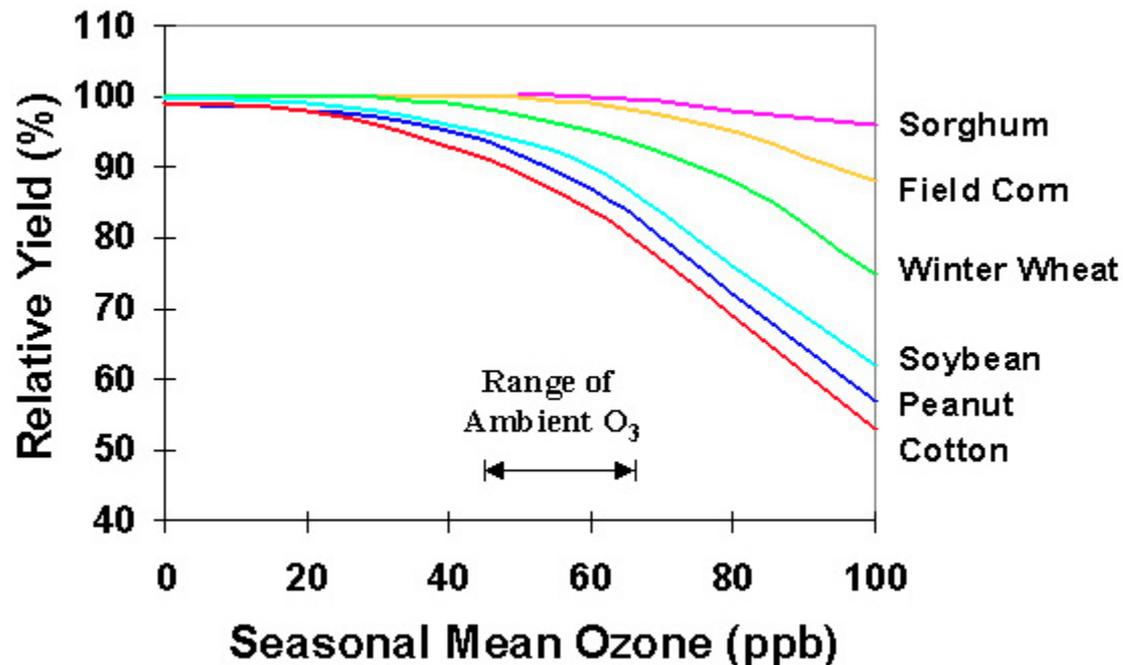
Ozone impact on vegetation

Simplified representation of ozone formation, dry deposition and plant damage process



Ozone impact on crop yield

- High levels of surface ozone phytotoxic with damaging impacts on agricultural crops resulting in reduced crop productivity.

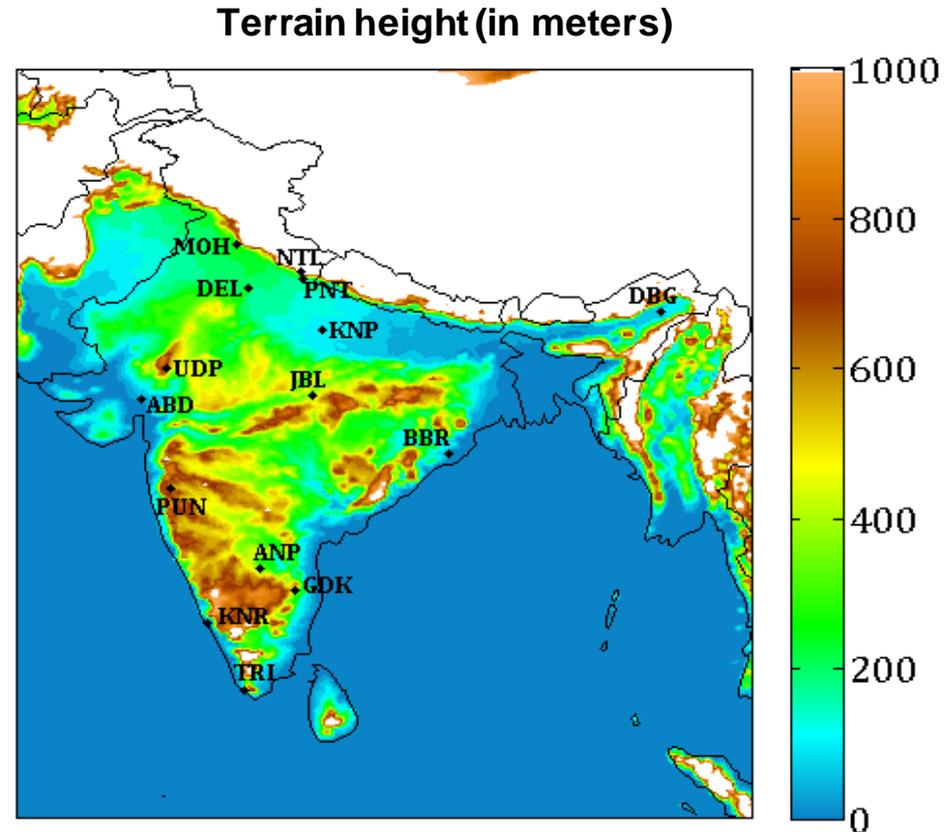


WRF-Chem Model Setup

- **12 km** horizontal resolution
- **March- May, 2013** simulation period
- **ERA-INTERIM reanalysis** for meteorological initial/ boundary conditions
- **MOZART-4/GEOS5 output** for chemical initial/boundary conditions
- **FINN** for biomass burning emissions
- **MEGAN** biogenic emissions

Anthropogenic emission inventories –

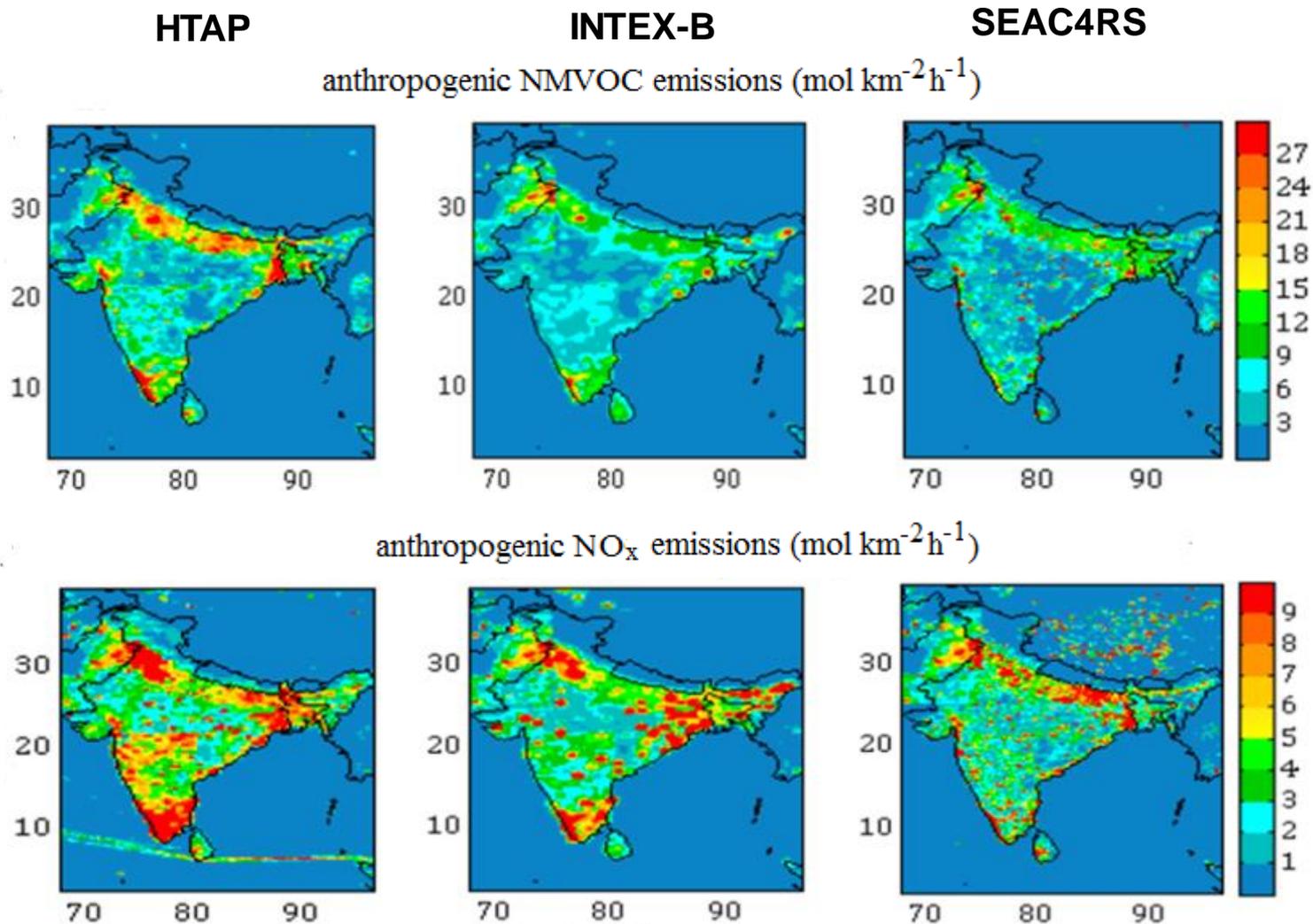
- **HTAP**- Hemispheric Transport of Air Pollution
- **INTEX-B** - Intercontinental Chemical Transport Experiment phase B
- **SEAC4RS** - Southeast Asia Composition, Cloud, Climate Coupling Regional Study



Sharma et al., Atmos. Chem. Phys., 2017

Results

Comparison of emission inventories: NO_x and VOCs



Results

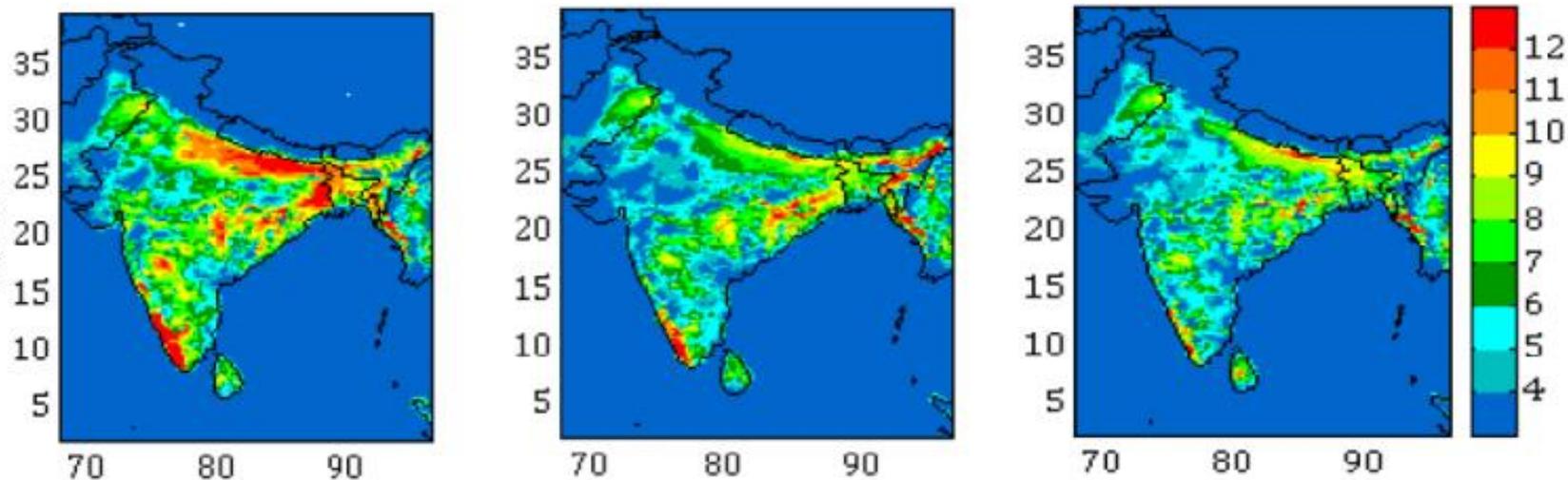
Comparison of surface ozone chemical tendencies

HTAP

INTEX-B

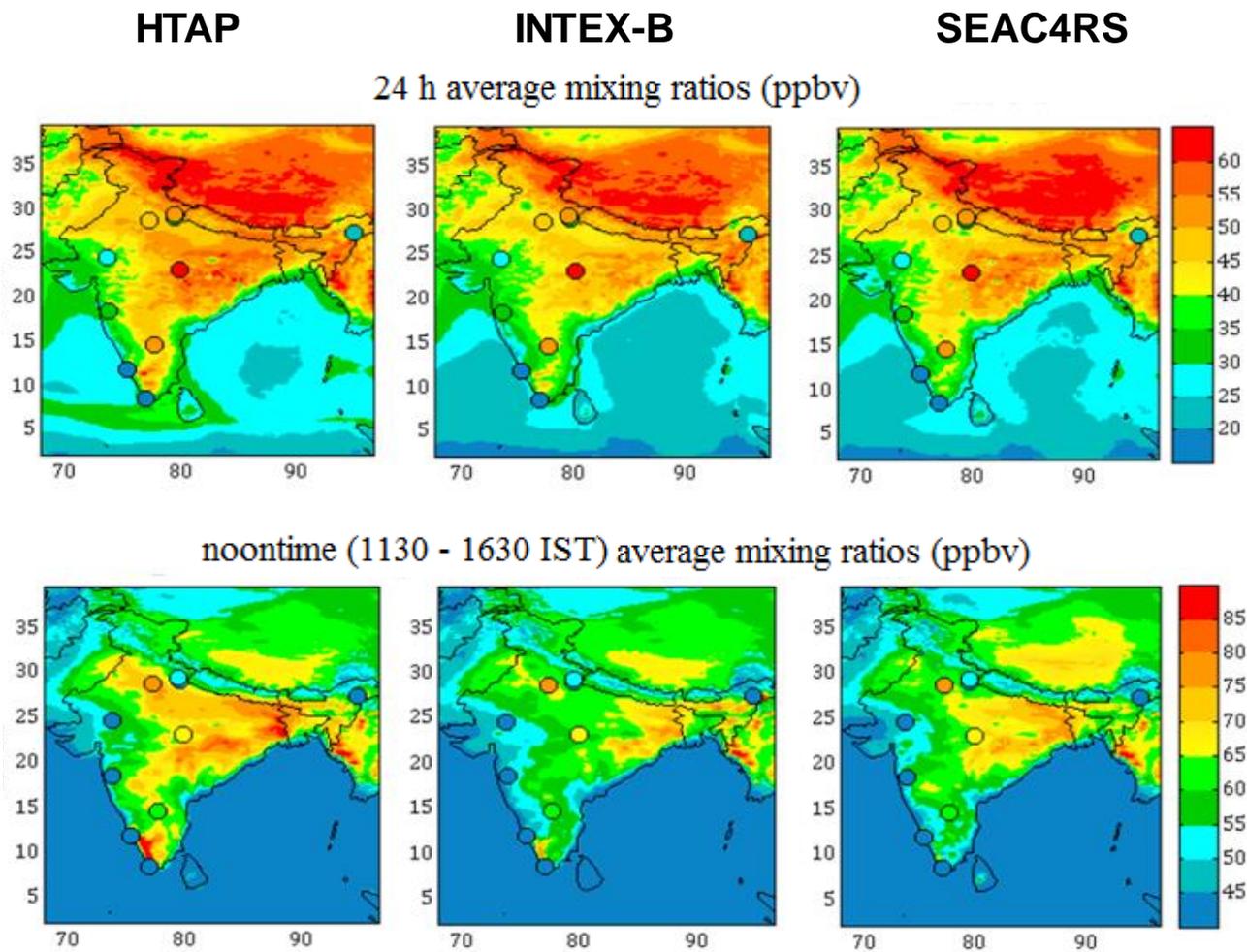
SEAC4RS

Net daytime surface ozone chemical tendency (in ppbv h⁻¹) for the month of April during 06:30-12:30 IST



Results

Effect of emission inventories on surface ozone: spatial

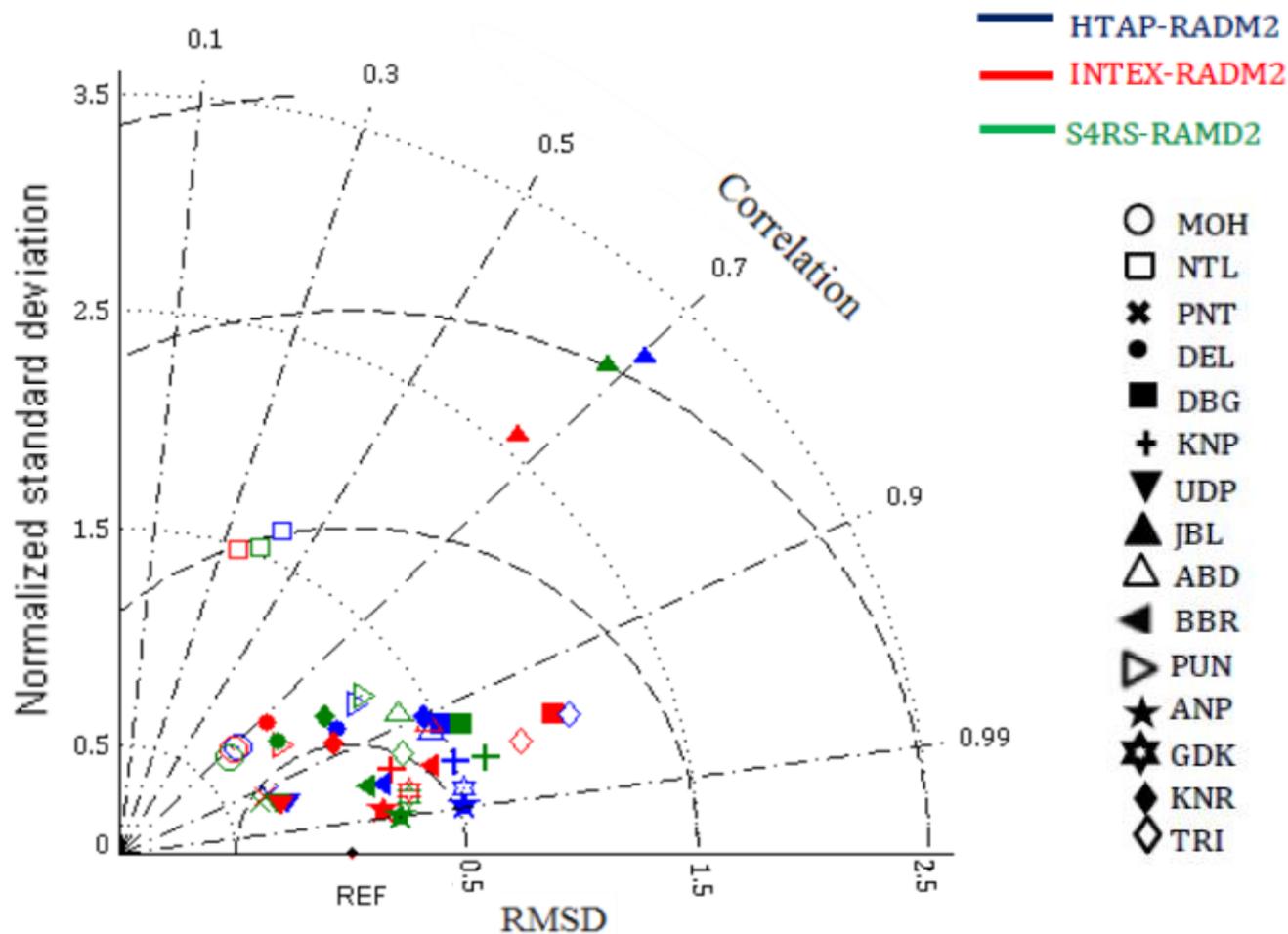


Noontime NMB: 9.7% for SEAC4RS, 11.5% for INTEX-B and 20.9% for HTAP

Results

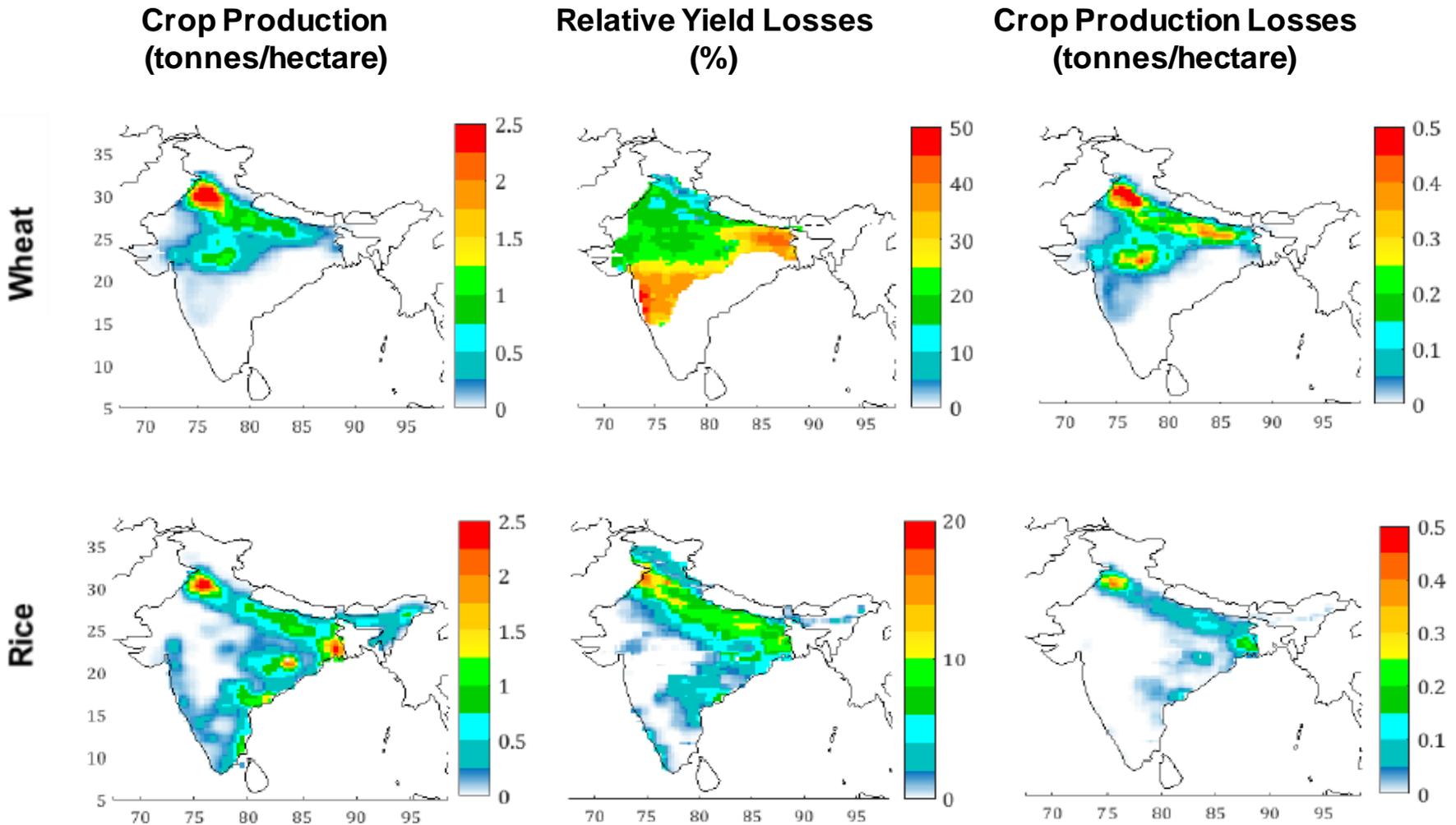
Effect of emission inventories on surface ozone: temporal

Taylor diagram with summary of model statistics (r , normalized standard deviation and RMSD) at all sites



Results

Crop yield losses (Wheat and Rice) due to ozone exposure



Nationwide losses : 21-26% for wheat and 6-8% for rice

Research output

Refereed Journal publications

1. **Sharma, A.**, N. Ojha, A. Pozzer, K. A. Mar, G. Beig, J. Lelieveld, and S. S. Gunthe (2017). WRF-Chem simulated surface ozone over south Asia during the pre-monsoon: effects of emission inventories and chemical mechanisms. *Atmospheric Chemistry and Physics* (open access Journal, **IF-5.5**), 17, 14393-14413.
2. **Sharma, A.**, N. Ojha, A. Pozzer, G. Beig, and S. S. Gunthe (2019).), Revisiting the crop yield loss in India attributable to ozone, *Atmos. Environ. : X* (open access mirror Journal of Atmos. Environ., **IF-3.7**), 1, 100008.

Ongoing Research at LAR: **Wildfire modeling**

(Dr. Yunha Lee & Dr. Joseph Vaughan)

WRF-WindNinja-FarSite combo system

(collaboration with Loren Atwood, Univ. of Utah)

- **WindNinja** downscales WRF data to provide high resolution wind fields
- **Farsite** predicts wildfire behavior and growth, with the high-resolution wind data from WindNinja
- This could provide a reliable wildfire growth prediction with less computing resources, compared to other high-resolution wildfire modeling such as WRF-SFire.

WRF-Chem for Western US

- AQ simulations over Western US
- Study the meteorology-chemistry interactions during wildfire season
- Provide boundary conditions for WRF-Chem-Urban simulation
- With AIRPACT, this can provide an ensemble member AQ forecasting

THANK
YOU!

