

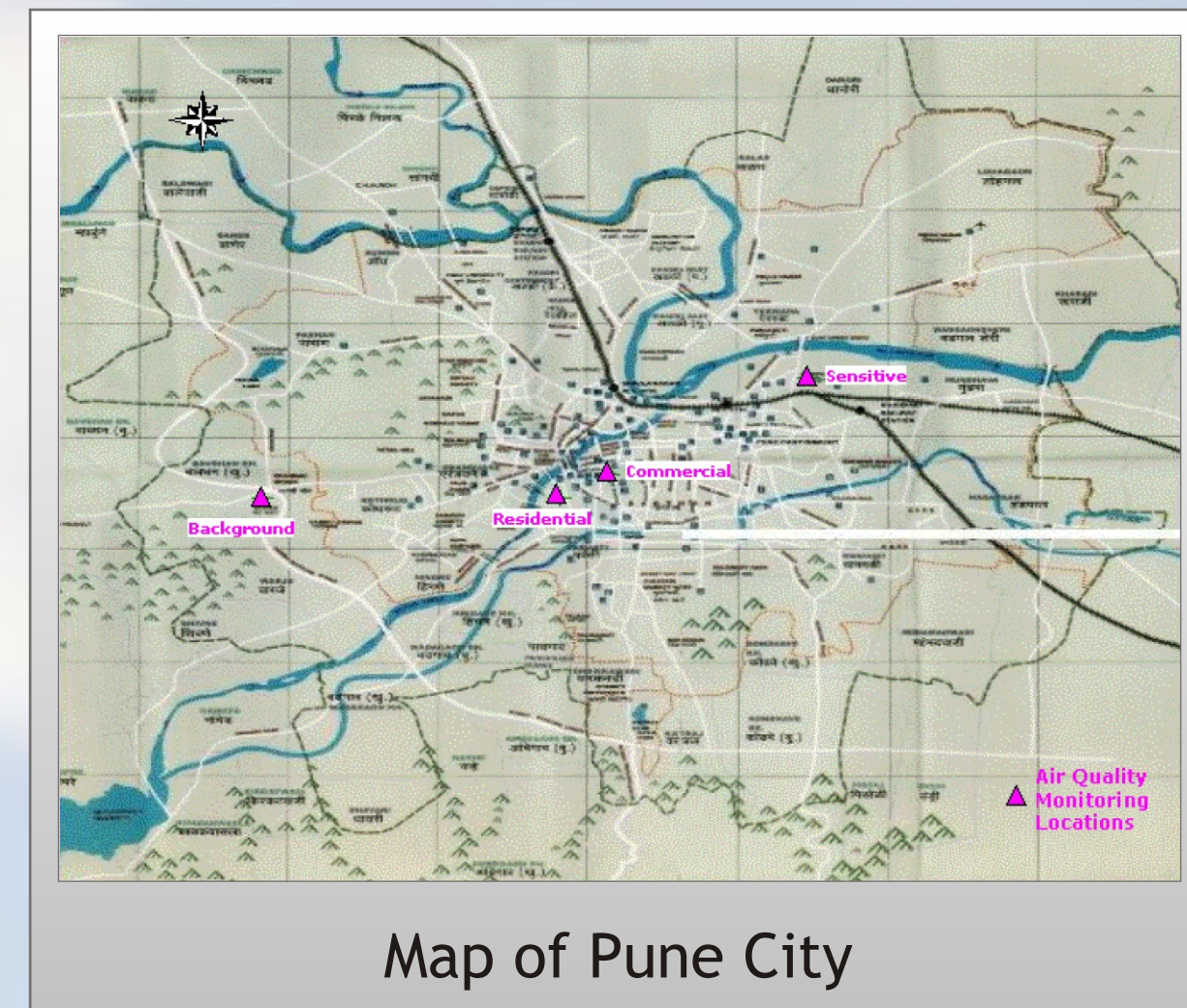
Coupling of WRF and AERMOD for Pollutant Dispersion Modeling

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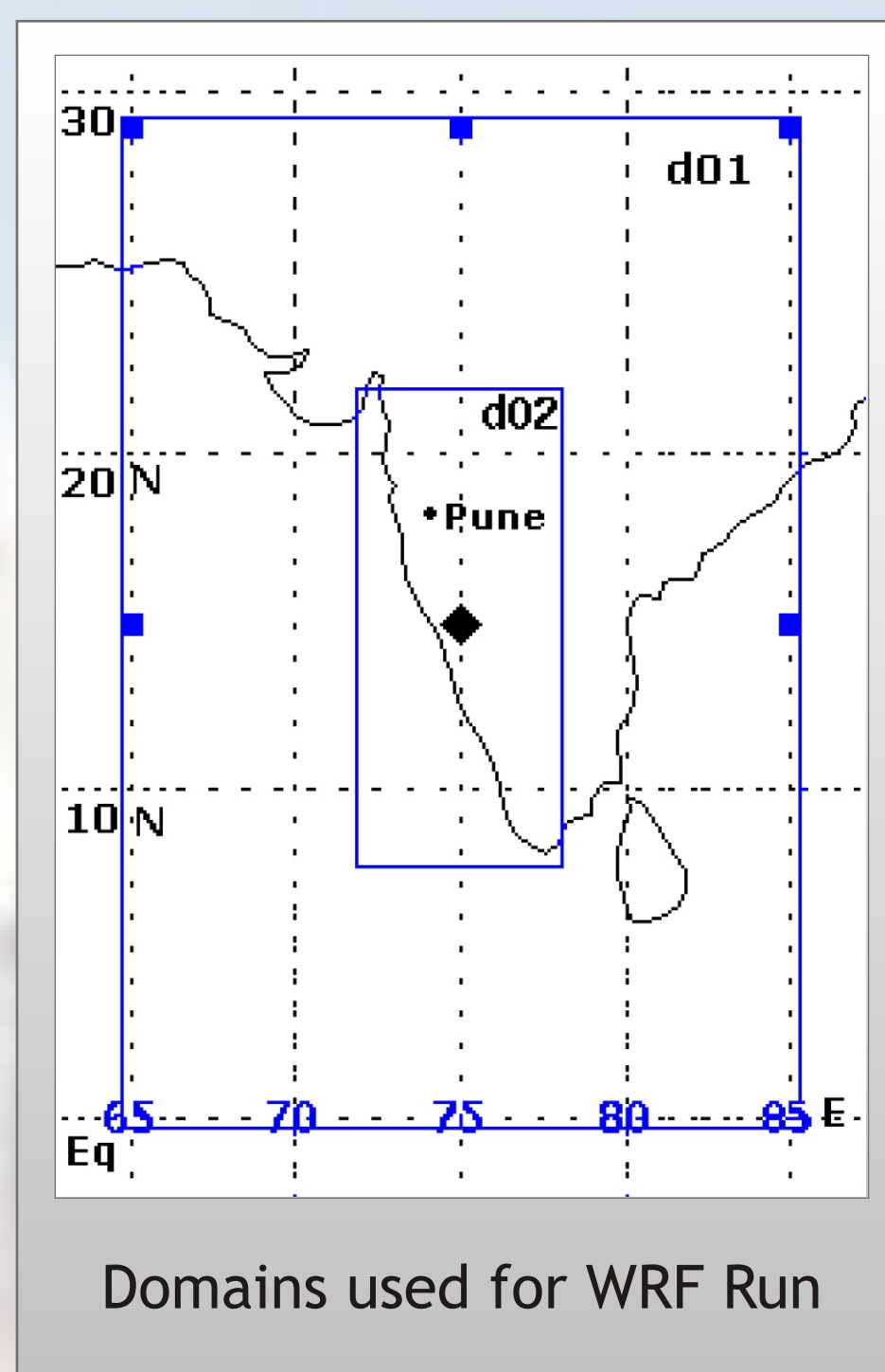
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Background

- ▷ Pune Air Quality Improvement Program under USEPA- MoEF (India) Initiative
- ▷ Initial focus on Pm10
- ▷ Proposal to use AERMOD model for simulating pollutant dispersion
- ▷ Issue: Unavailability of hourly meteorological observations for Pune (& most of India)
- ▷ Likely solution: Meteorological model (WRF) output used as (psuedo) observations for AERMOD

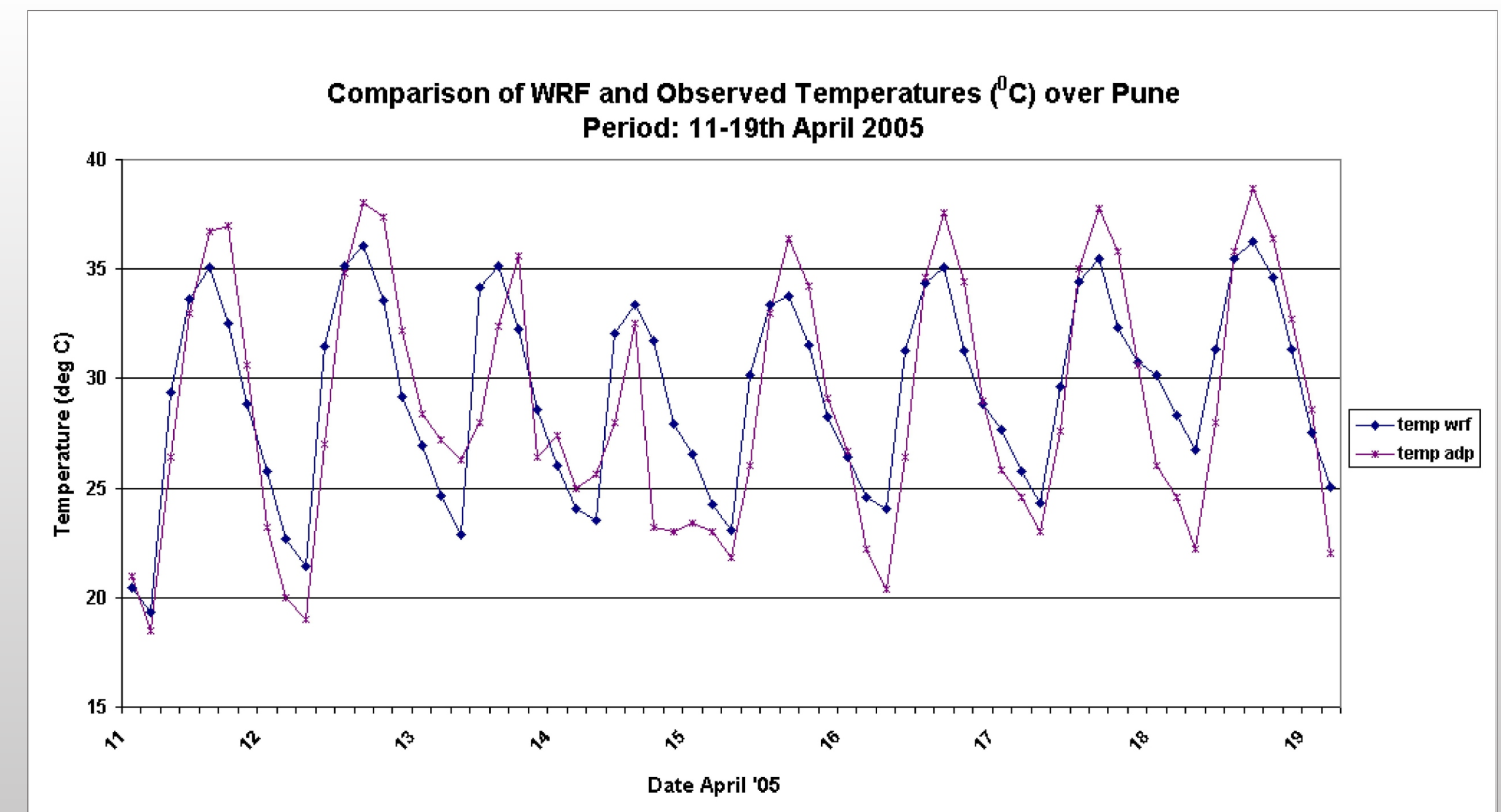


WRF Model Configuration



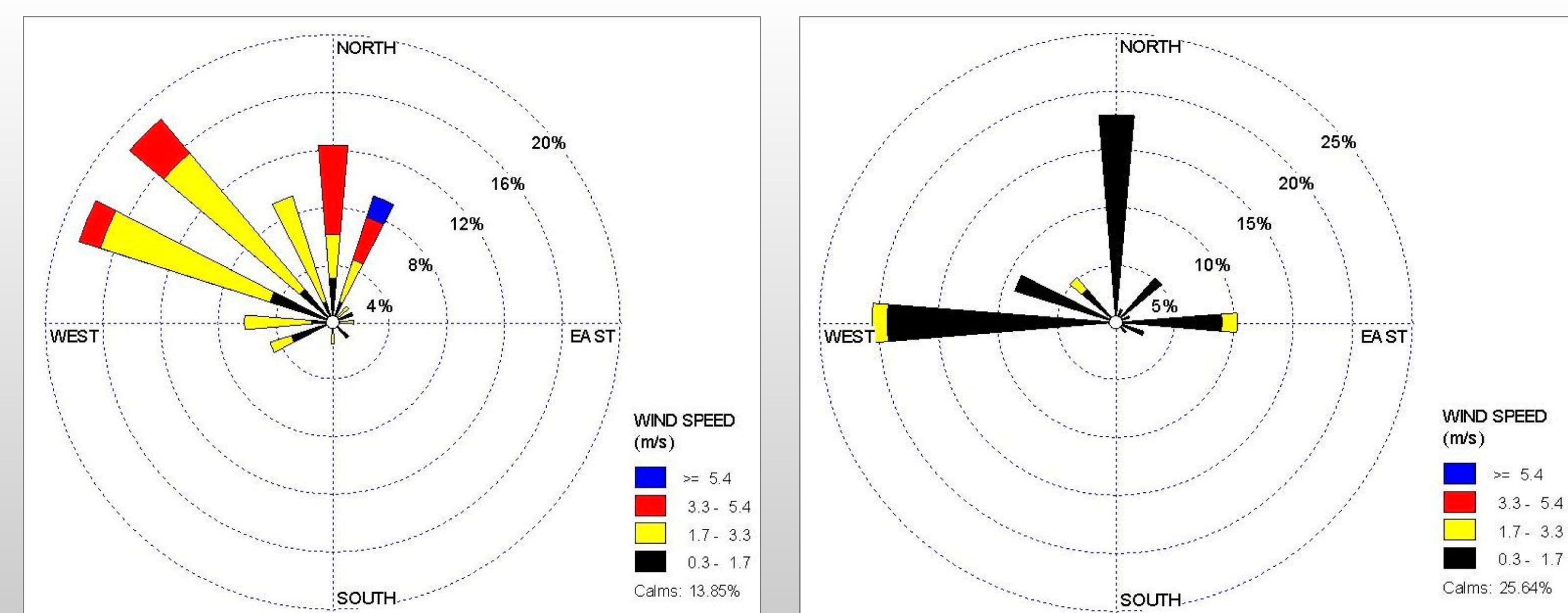
- ▷ Domains: 32 km-> 8 km 2-way nested
- ▷ Initialization: NCEP Final Analysis (FNL) data
- ▷ Microphysics: Lin et al
- ▷ Cumulus parameterization: Betts-Miller-Janjic
- ▷ Land Surface: Noah
- ▷ PBL parameterization: YSU PBL
- ▷ Time step: 180 sec.
- ▷ Period of simulation: 11-19 April 2005

Validation of WRF Outputs over Pune



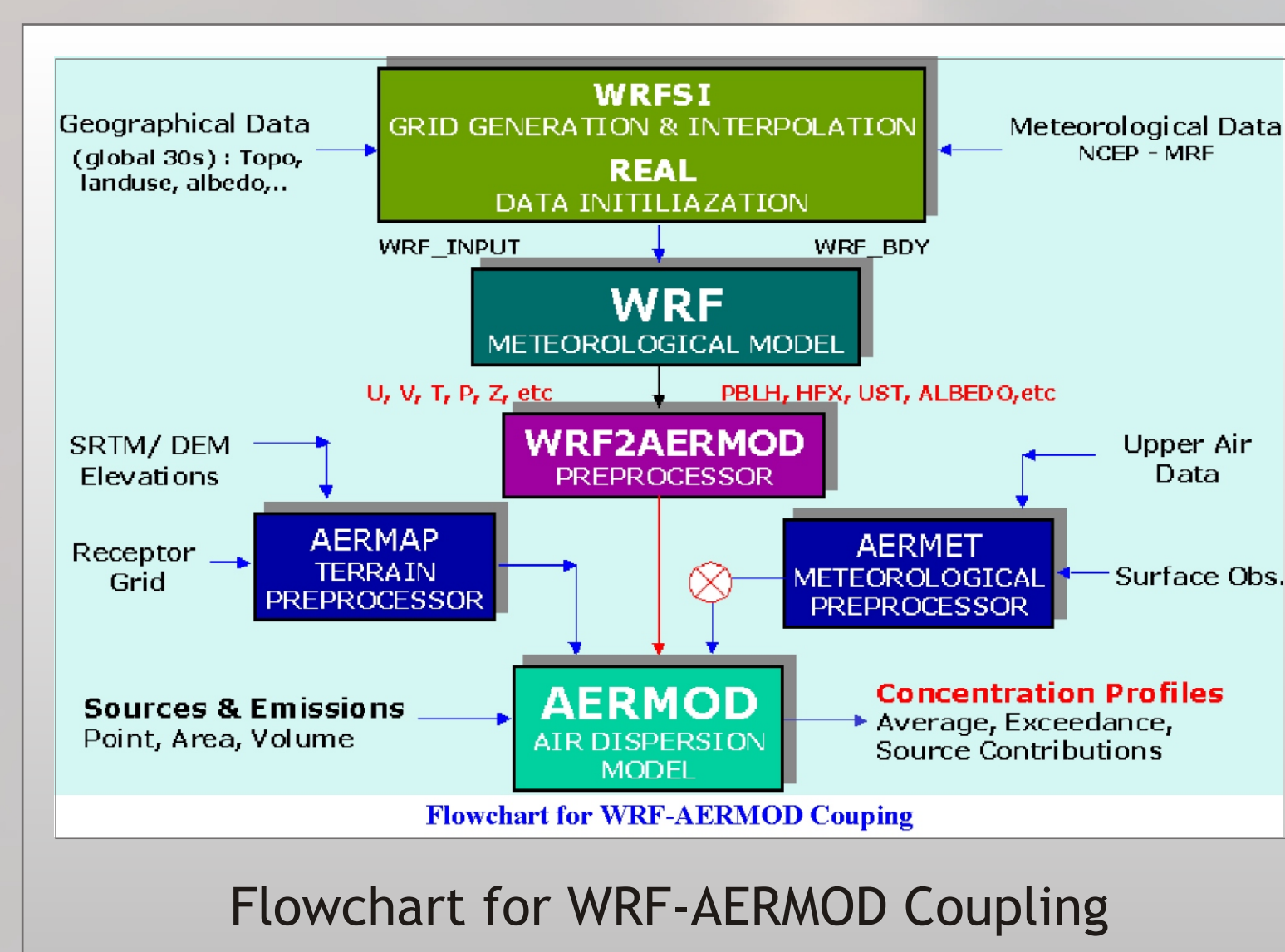
Comparison of WRF and Observed Temperatures (°C) over Pune

Deviation of WRF from Observed temperatures: - 4.35 to 8.35 °C
Standard Deviation : 2.46°C,
Correlation Coefficient : 91%

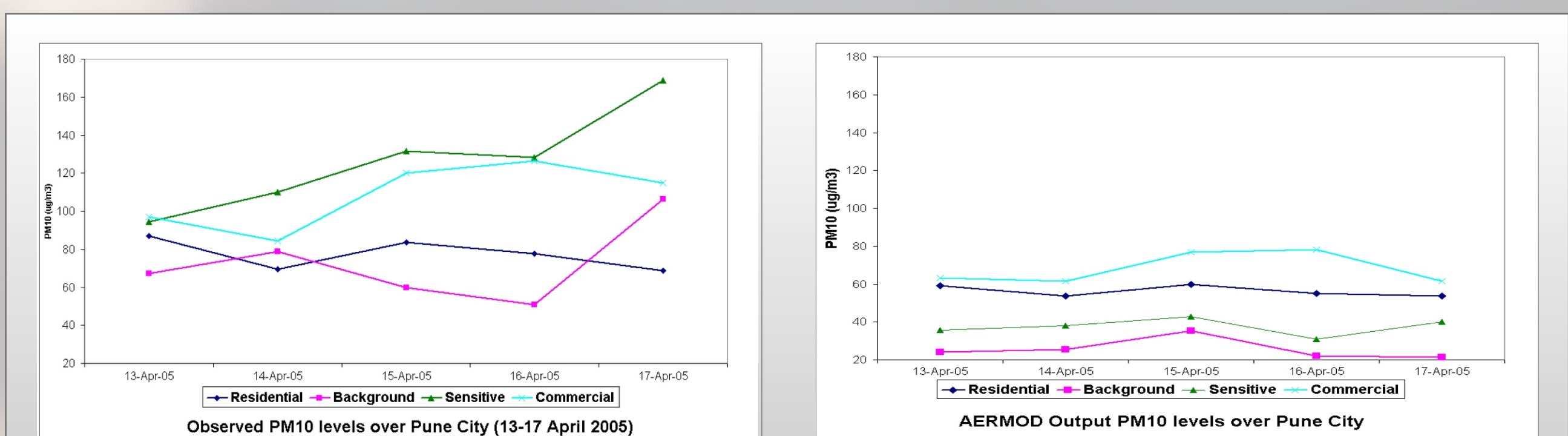


WRF-AERMOD Modeling System

- AERMOD:**
 - ▷ Developed by AMS/EPA Regulatory Model Improvement Committee (AERMIC)
 - ▷ Steady-state Gaussian model, improved PBL, urban heat flux parameterization
 - ▷ Emissions data : Inventory under Pune AQI Program
- WRF-AERMOD Offline Coupler**
 - ▷ Developed at C-DAC
 - ▷ Couples Regional weather prediction model with Gaussian dispersion model
 - ▷ Extracts surface and PBL parameters from WRF output;
 - ▷ Preprocesses WRF output to produce input for AERMOD
 - ▷ Bypasses need for AERMET preprocessor



Validation of Simulated PM10 Dispersion



Comparison of Observed and Simulated PM10 Dispersion

- ▷ AERMOD underestimates PM10 concentrations
- ▷ Possibly due to absence of "background" levels in model.
- ▷ Daily variations are better represented

Acknowledgments

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Highlights

- ▷ WRF output is able to provide realistic meteorological pattern for air quality models
- ▷ AERMOD underestimates PM10 at most of the locations
- ▷ Sensitivity to meteorology can be determined with different WRF parameterization schemes, preprocessing (use AERMET)
- ▷ Required detailed study with :
 - ▷ information on background levels of pollutants
 - ▷ improved emission inventory
 - ▷ Validation of hourly meteorological and air quality data