

ICARUS

Integrated Climate forcing and Air pollution Reduction in Urban Systems

Development of an integral modeling system to study air quality climatic trends in European urban areas

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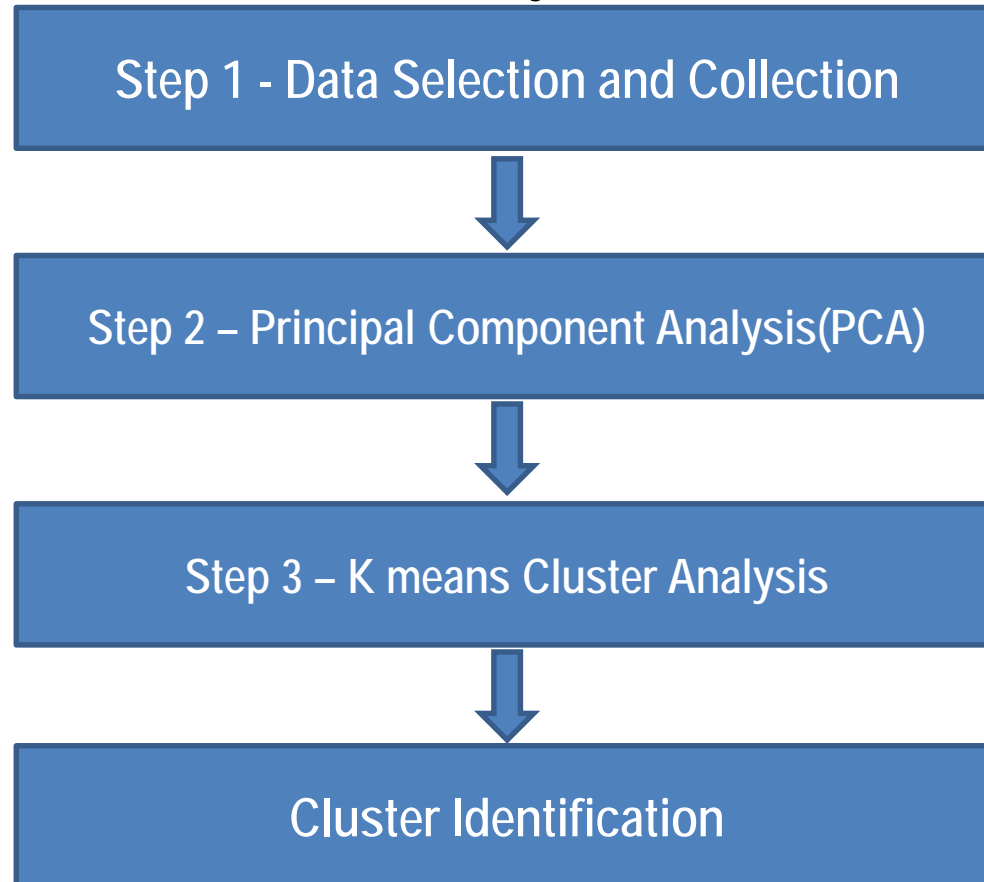
MAIN OBJECTIVE

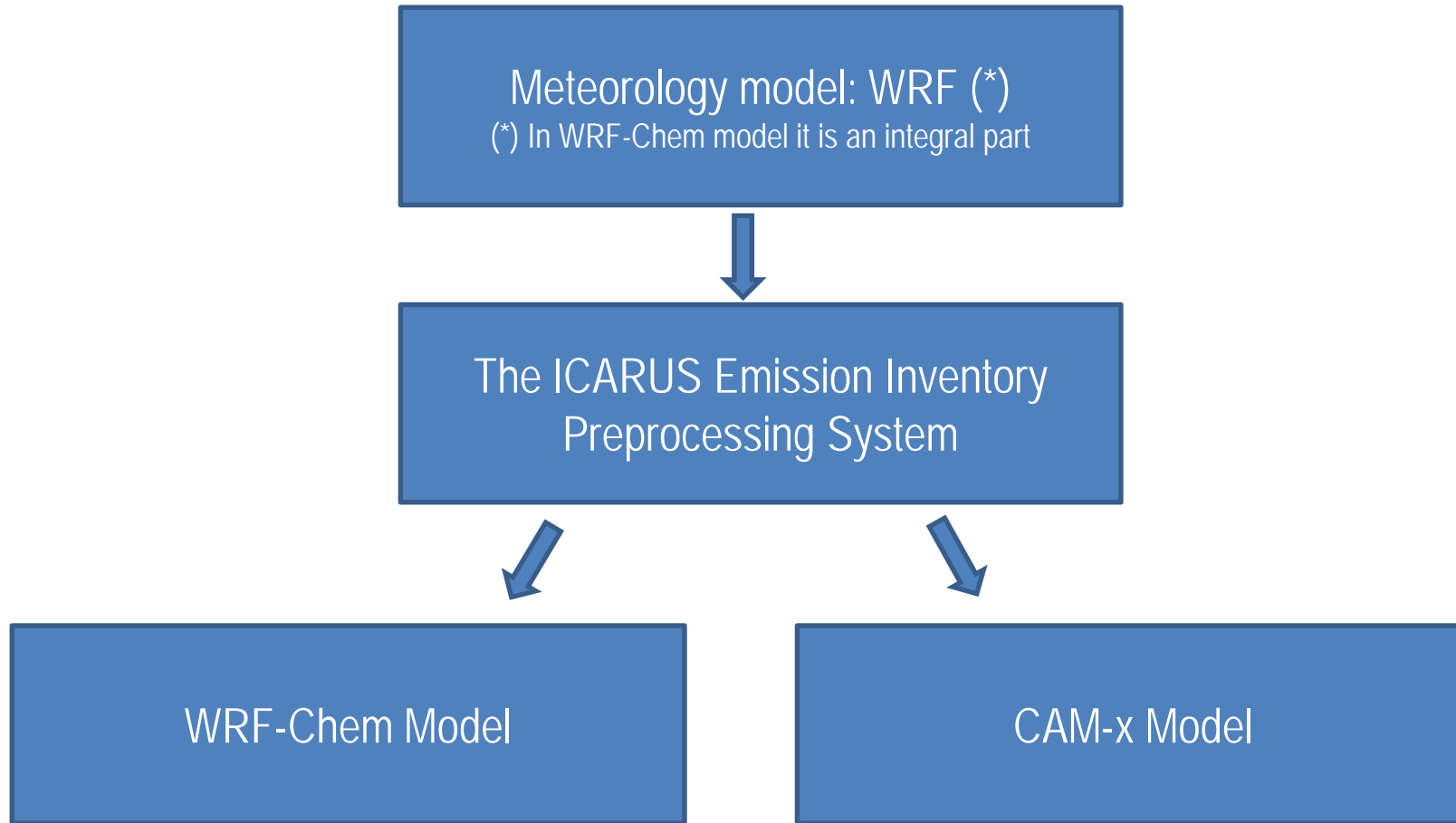
- Provide concentrations climatic trends on major air pollutants (PM_{10} , $PM_{2.5}$, NO_2 , O_3) in Europe, focusing on nine (9) cities (Thessaloniki, Athens, Madrid, Stuttgart, Ljubljana, Brno, Milan, Basel and Copenhagen) for the time period 2001-2050

METHODOLOGICAL STRATEGY

- Weather Clustering in each city
- Cluster representative day selection per 5yr period
- Detailed Atmospheric Modeling per representative day
- Representative Concentration Indicator per Pollutant per Time Period

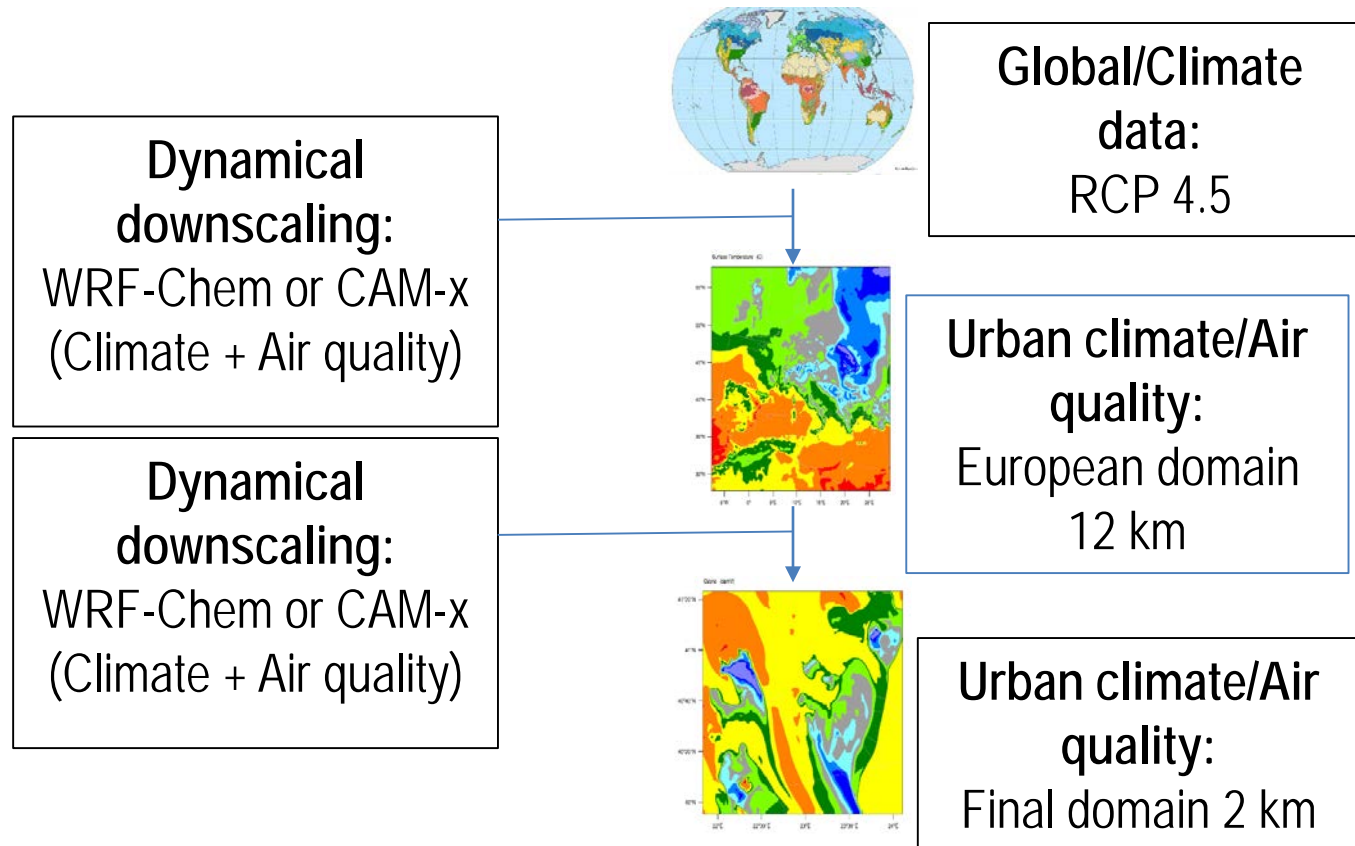
- Following the climatic scenario RCP4.5 and using the set of the EUROCORDEX daily data (spatial resolution ~10km) produced by INERIS-WRF331F model for the period 2001-2050, specific weather patterns have been identified called weather clusters for each ICARUS city focusing on a 50km x 50km area around the city centre.

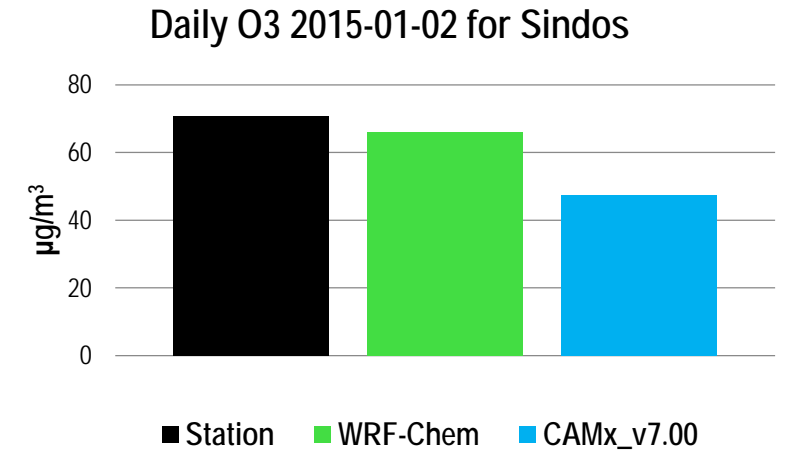
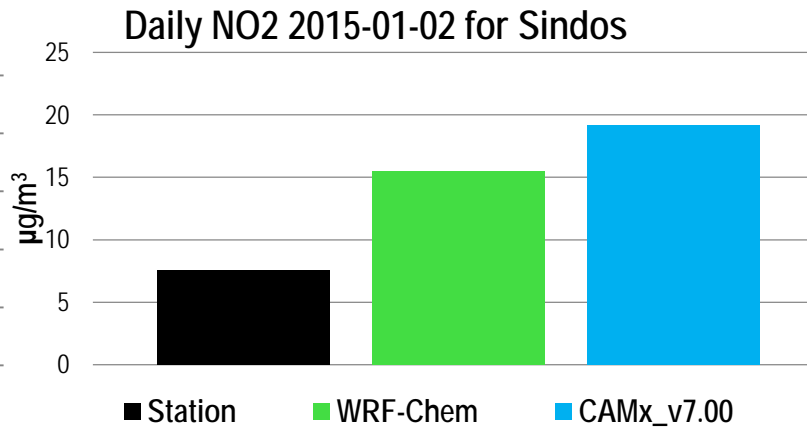
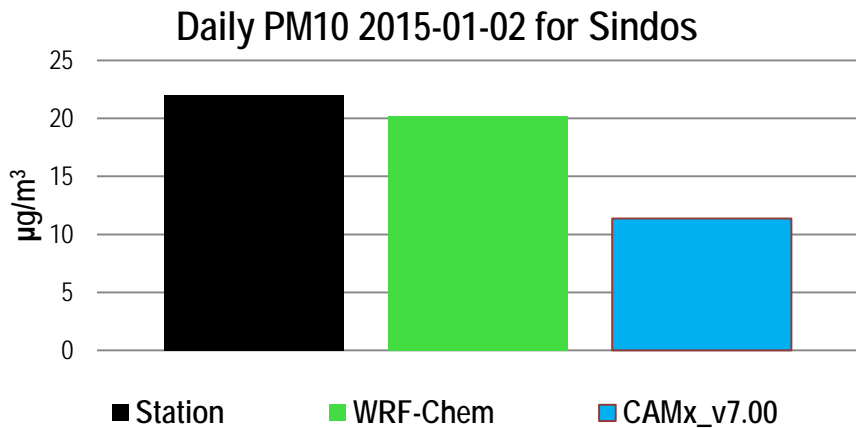
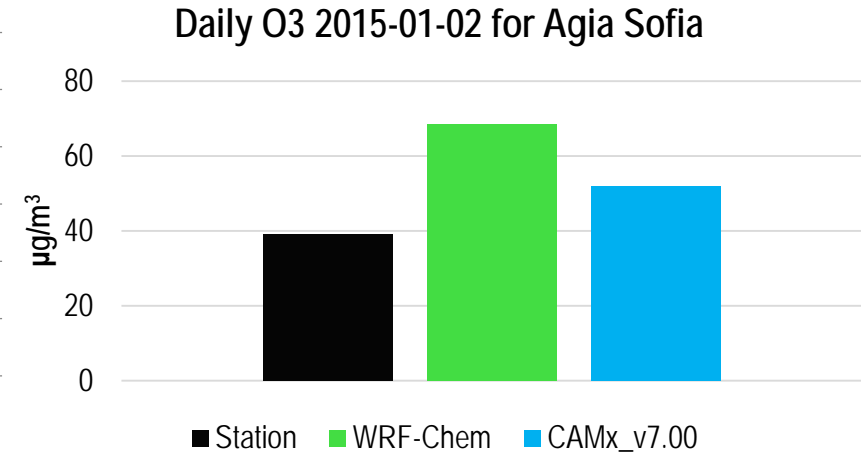
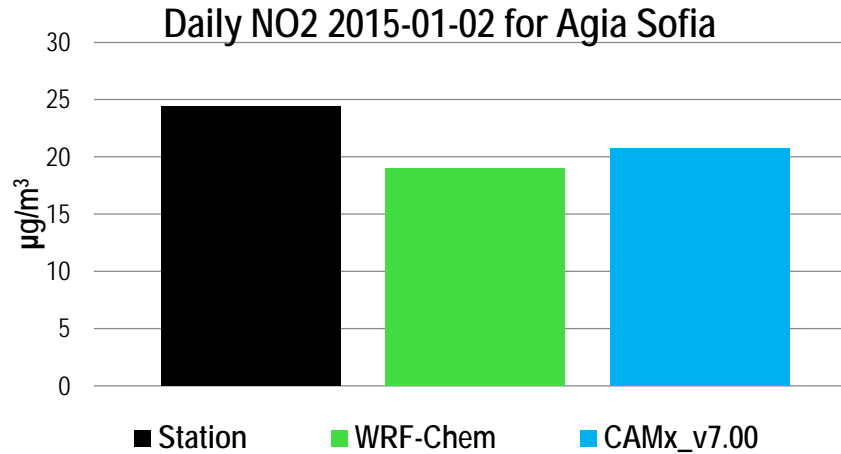




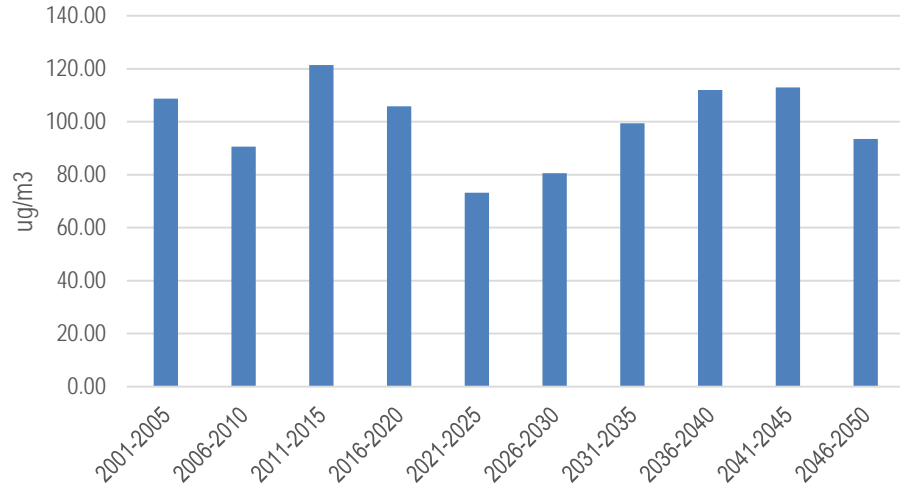
System Main Characteristics

- A new High-Resolution system (1km x 1km) compatible with the existing Air Quality Models such as:
 - WRF-Chem;
 - CAM-x;
 - Other.
- Built upon:
 - EDGAR HTAP Low Resolution (10km x 10km) Emission inventory;
 - the University of Stuttgart (USTUTT) High Resolution (1km x1km) **Top Down** Emission inventory;
 - the University of Stuttgart (USTUTT) High Resolution (1km x1km) **Bottom Up** scenarios.

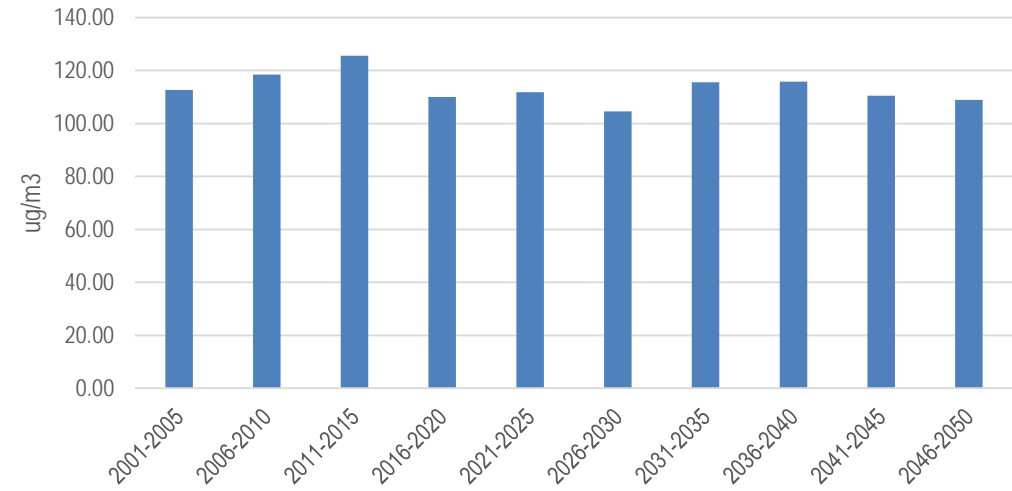




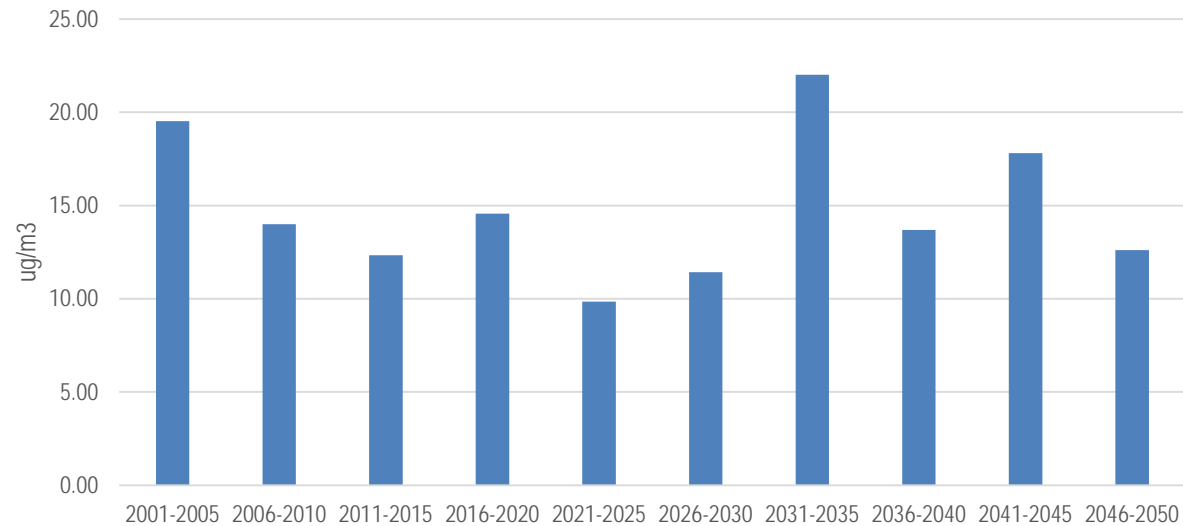
Thessaloniki : NO2 Hourly max concentrations (CR)



Thessaloniki : O3 Hourly max concentrations (CR)



Thessaloniki : PM2.5 Daily max concentrations



- The present study is introducing a novel approach in studying air quality trends under specific climatic scenarios using local scale weather clustering and detailed modeling;
- A integrated atmospheric modeling system has been developed with a new Emission Preprocessing system potentially adaptive to any urban scale air quality model;
- The present results illustrate the powerfulness of such an approach to produce meaningful results in a relatively efficient manner;
- Further studies are encouraged with more cases and more data for further improvements and refinements.