Modelling support for near-surface ozone pollution assessment for 2012 and 2013 - Poland

Application of Delta Tool for GEM-AQ model evaluation

Contract from the Chef Inspectorate for Environmental Protection (Poland)

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Main contractor: Warsaw University of Technology
Sub-contractor: EcoForecast Foundation

Dofinansowano ze środków Narodowego Funduszu Ochrony Środowiska i Gospodarki Wodnej

Outline

- GEM-AQ model
- Domains
- Emissions used in assessment
- Evaluation with DELTA tool
- 2012-2013 assessment results
- Other works

GEM-AQ description

Global Environmental Multiscale – Air Quality model built as part of a Canadian consortium MAQNet (2001-2008)

- Meteorological model GEM
  - Model developed by RPN
  - Canadian operational weather forecast
  - Grid configuration allows for calculations in variable resolutions
  - Built-in option of limited area domains– LAM (cascade consistent calculation)
  - An extensive library of parameterization of physical processes
  - Data assimilation cycle

GEM-AQ description

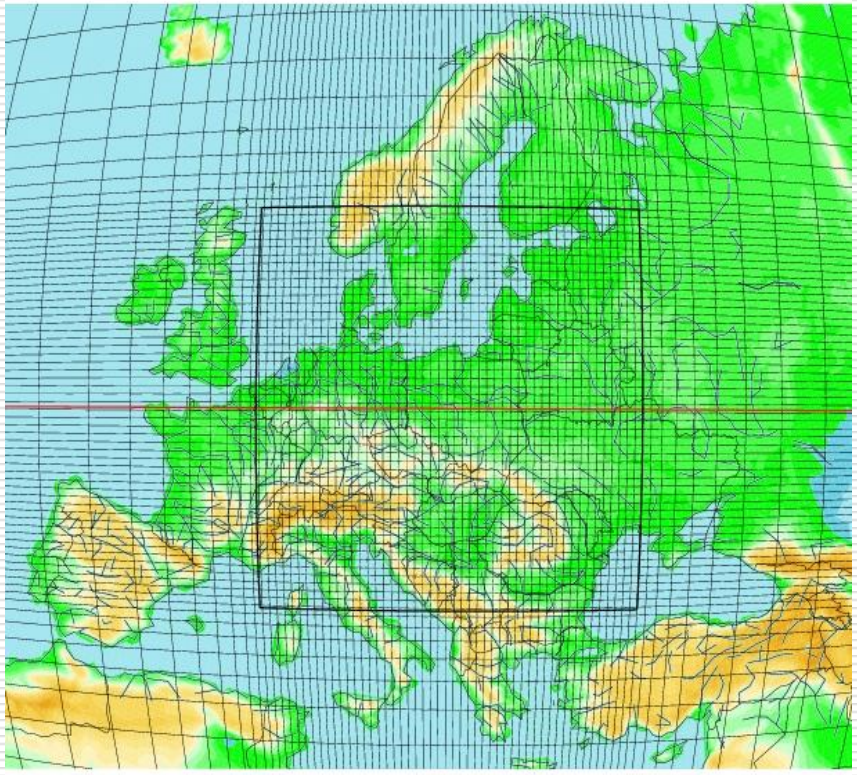
- Chemical module
  - On-line type
  - Tropospheric chemistry(extended ADOM II mechanism)
    - gas-phase chemistry – 50 species
    - Hydrocarbons aggregation(lumped molecular approach)
    - 116 chemical reactions, including 19 photochemical reactions – reaction constants dependent on temperatue and pressure
    - chemical transformations typical of the troposphere
  - Dry deposition and washout

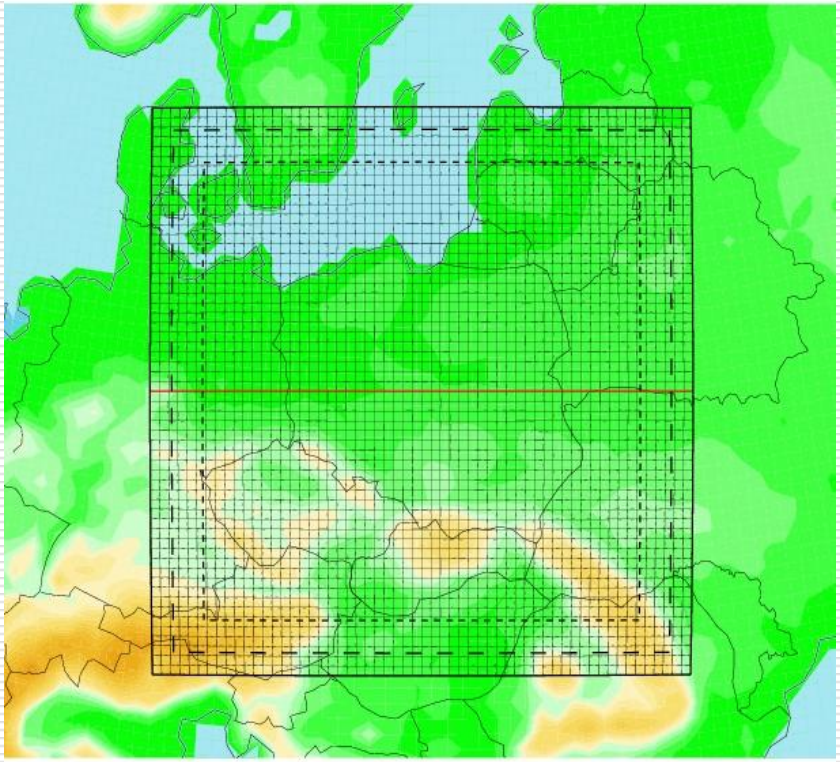
GEM-AQ description

- Chemical module cd…
  - Aeorosols chemistry and physics – based on CAM (Gong, 2003)
    - 12 size intervals: 0.005 - 20.48 μm
  - Heterogeneous chemical reactions
  - Horizontal advection and diffusion

- Biogenic and anthropogenic emissions
  - Possibility of area emission insertion for several gaseous pollutants
  - Different height of emission sources
  - Biogenic emissions
  - Aerosol precursors
  - Sea salt aerosol emissions generated on-line based on wind speed

Modelling domain

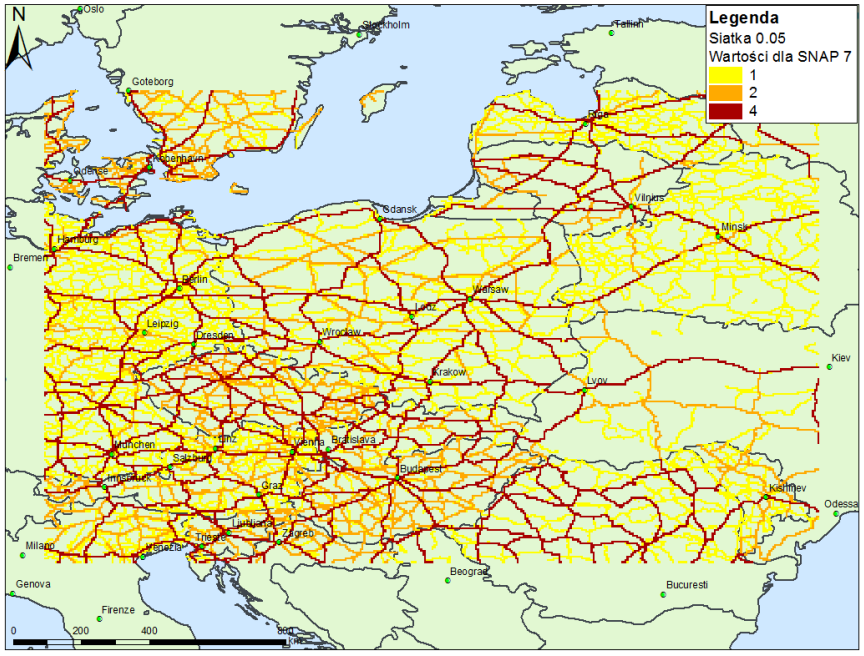




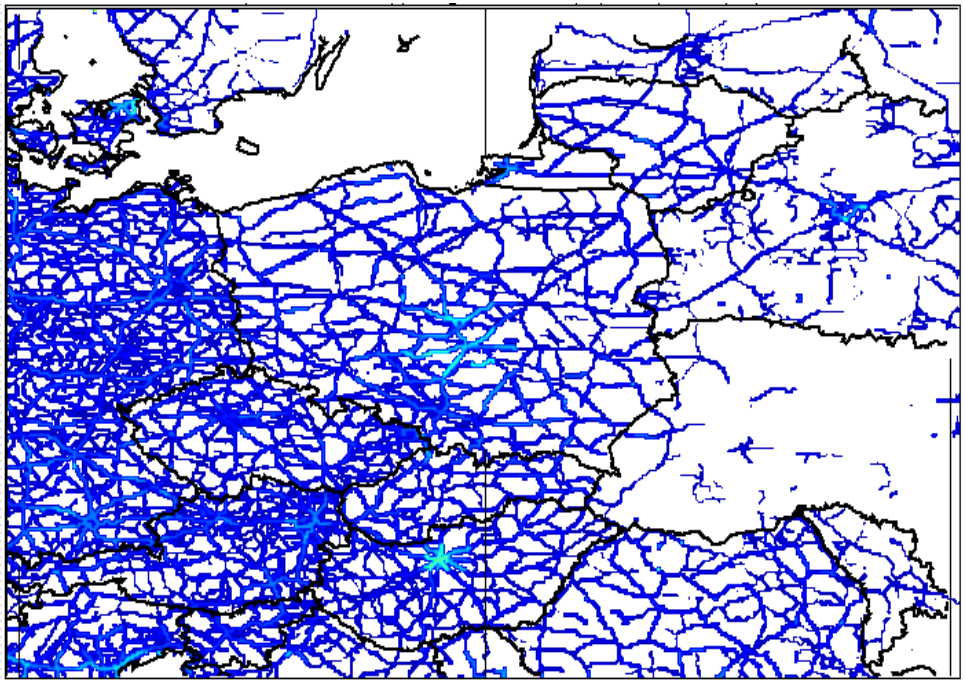
Emission data

- EMEP inventory (valid 2010/2011)
- Emission 0.5x0.5 Mercator relocated to 0.125x0.125 and 0.05x0.05 based on GIS information
- Relocation masks separate for each SNAP category
- Temporal variability and vertical distribution for each SNAP category

EMEP inventory - relocation



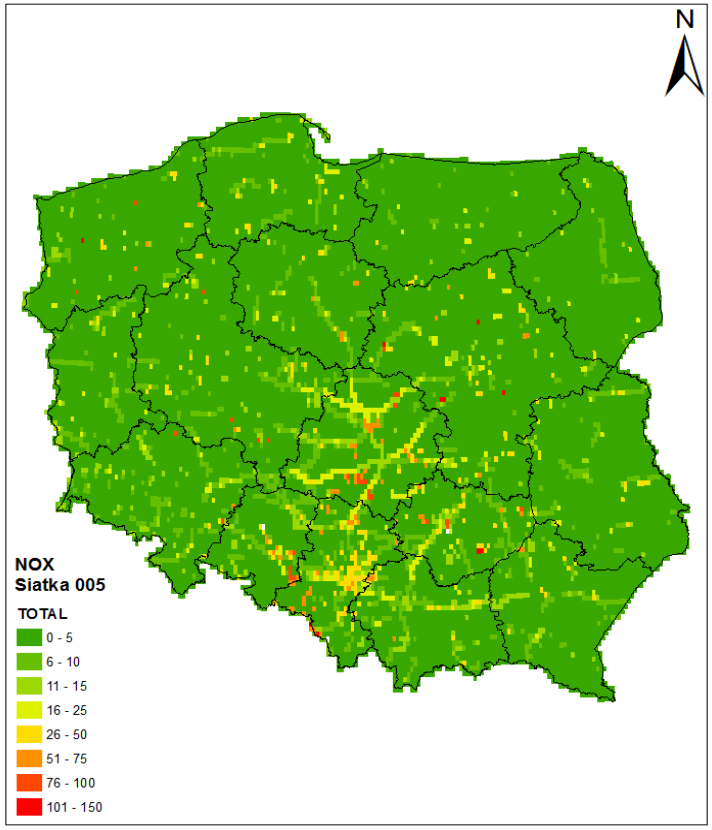
Relocation mask

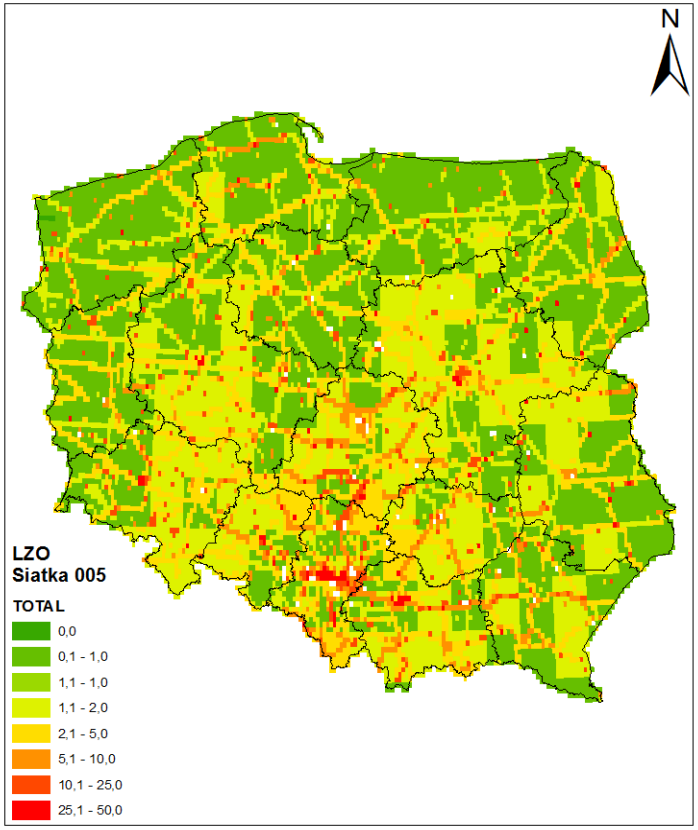


Final emission flux

NOx SNAP07

Total NOx and VOC

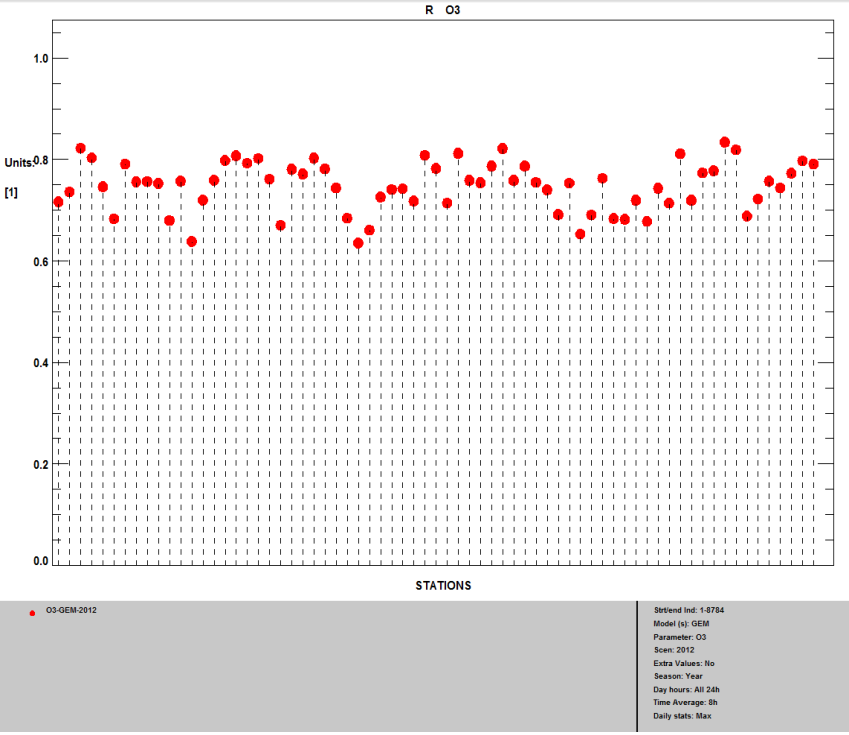




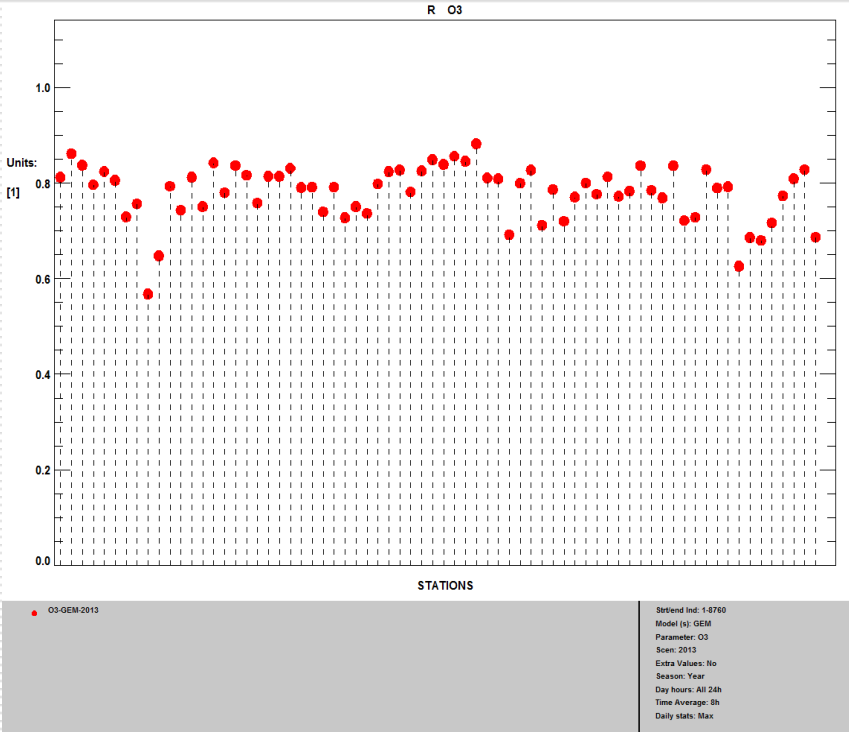
Delta tool aplication for Poland

Correlation coefficient - barplot

2012

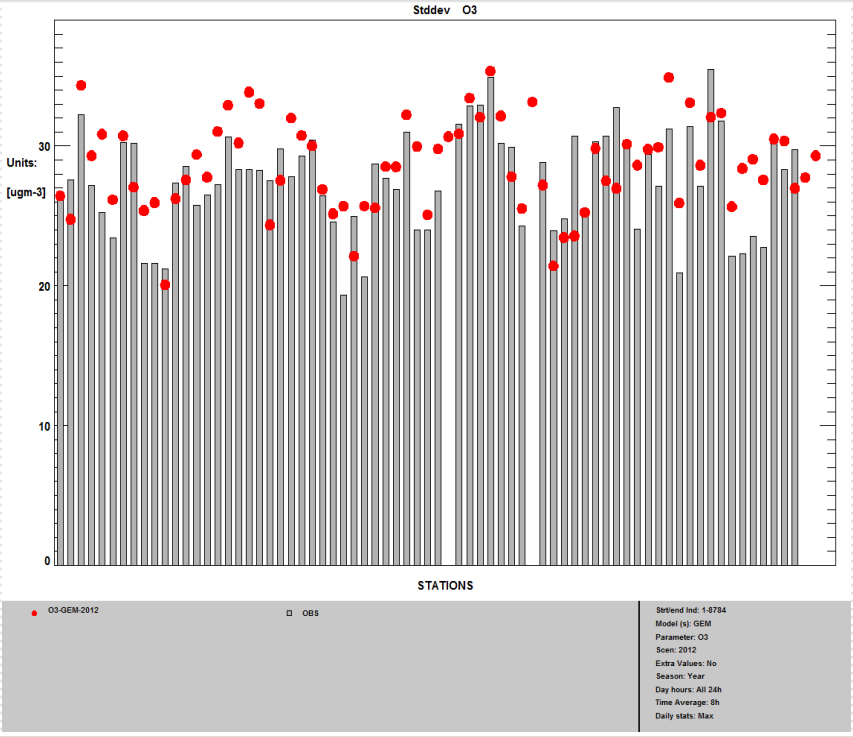


2013



Normalized mean standard deviation-barplot

2012



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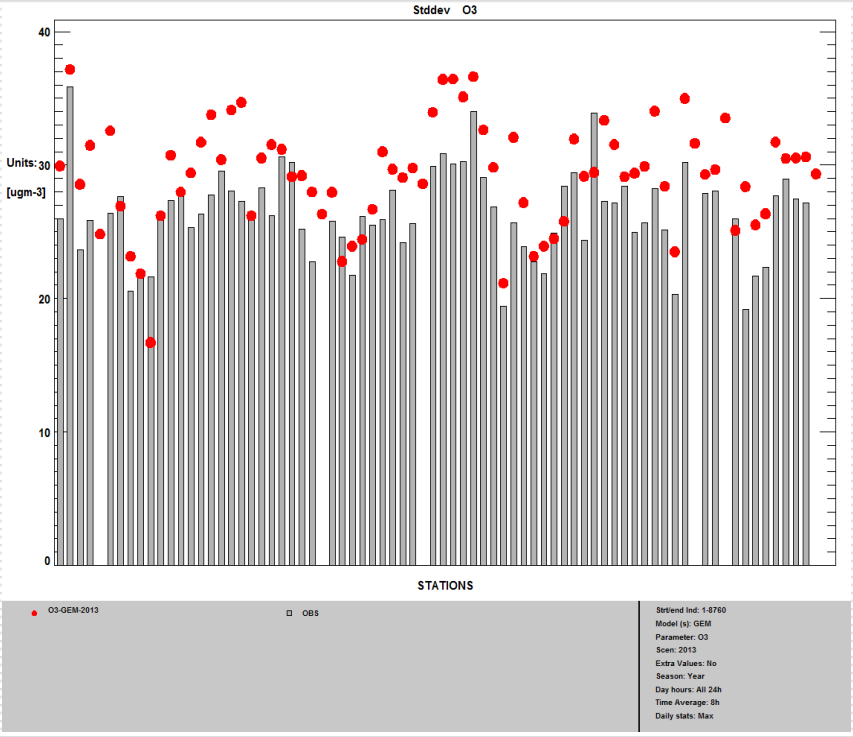
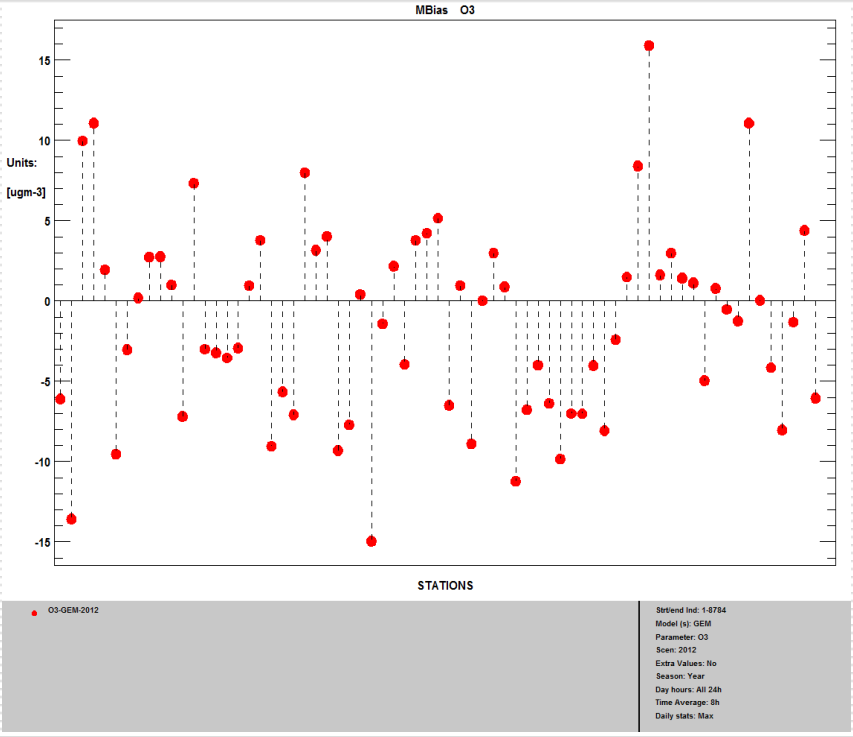


Normalized mean bias- barplot

2012



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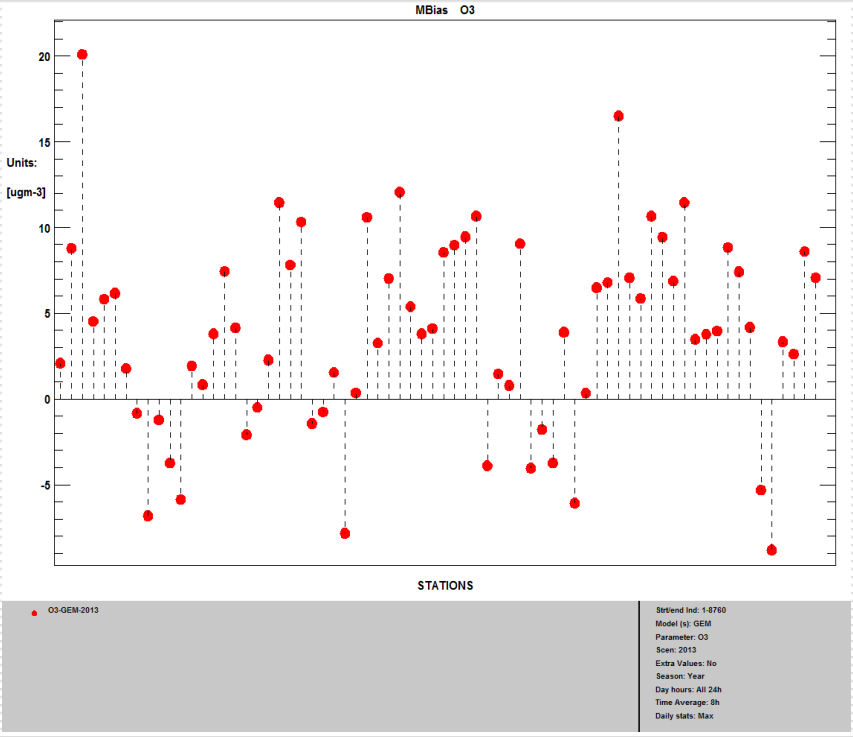
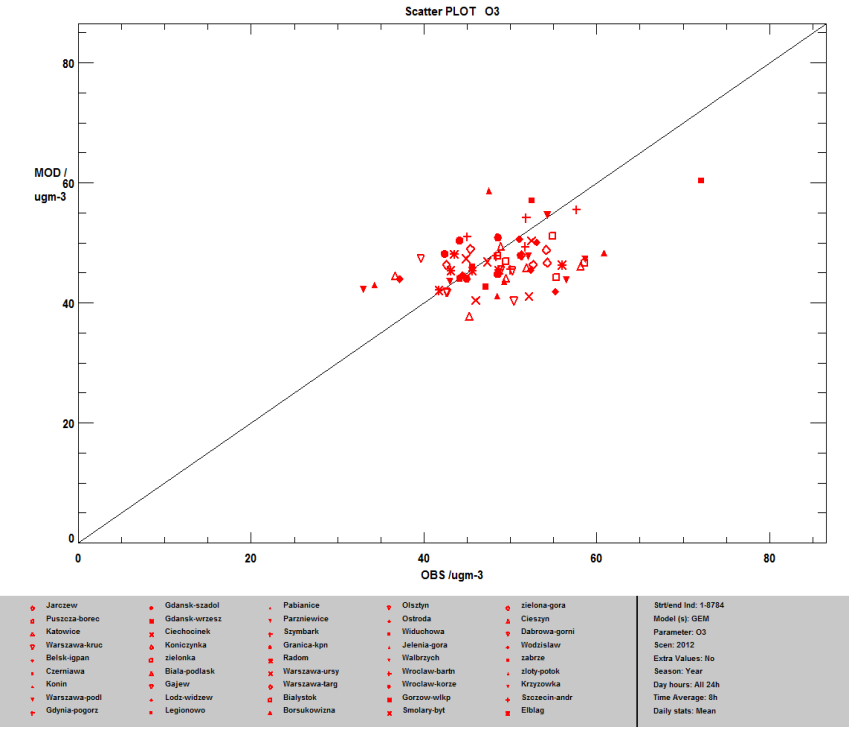


Scatter plot – 8h mean

2012



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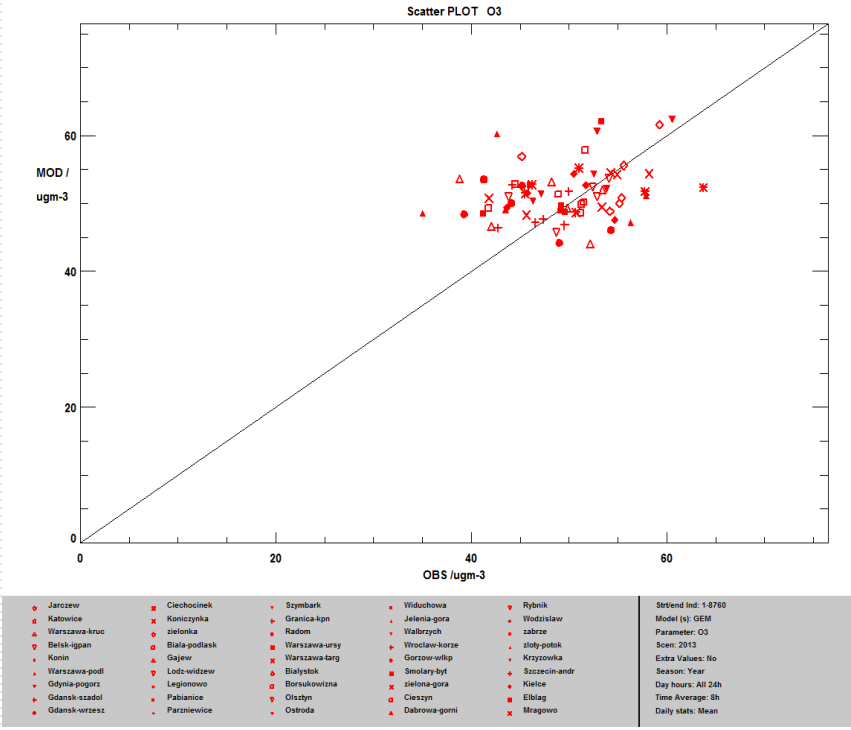
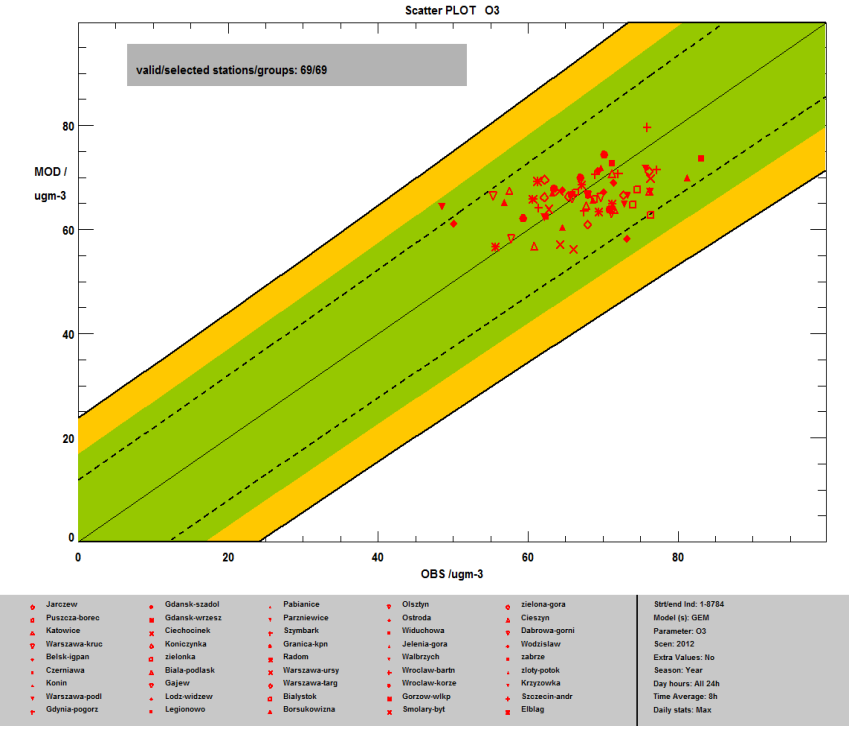


Scatter plot – max value

2012



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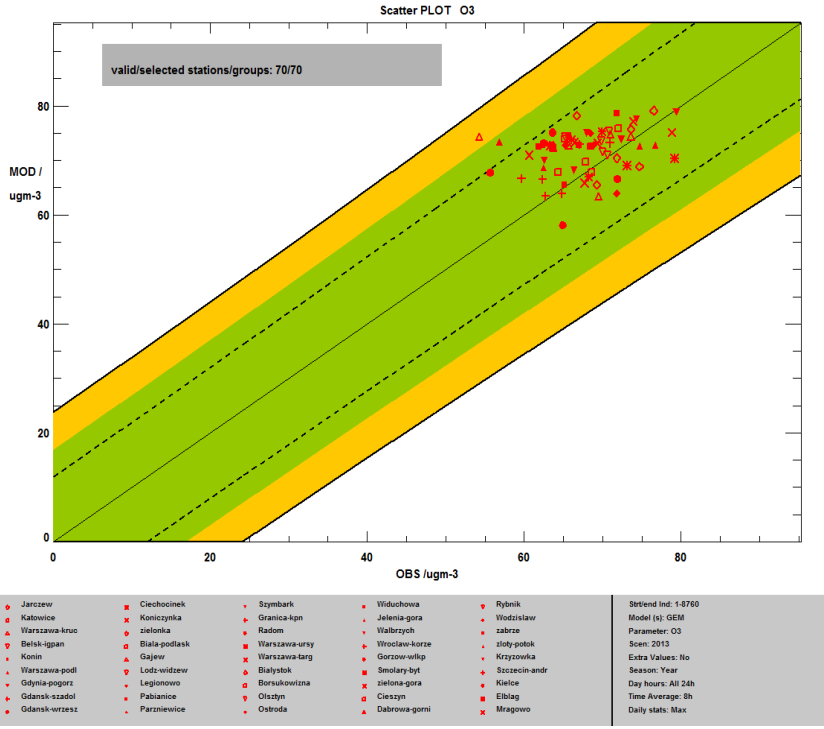
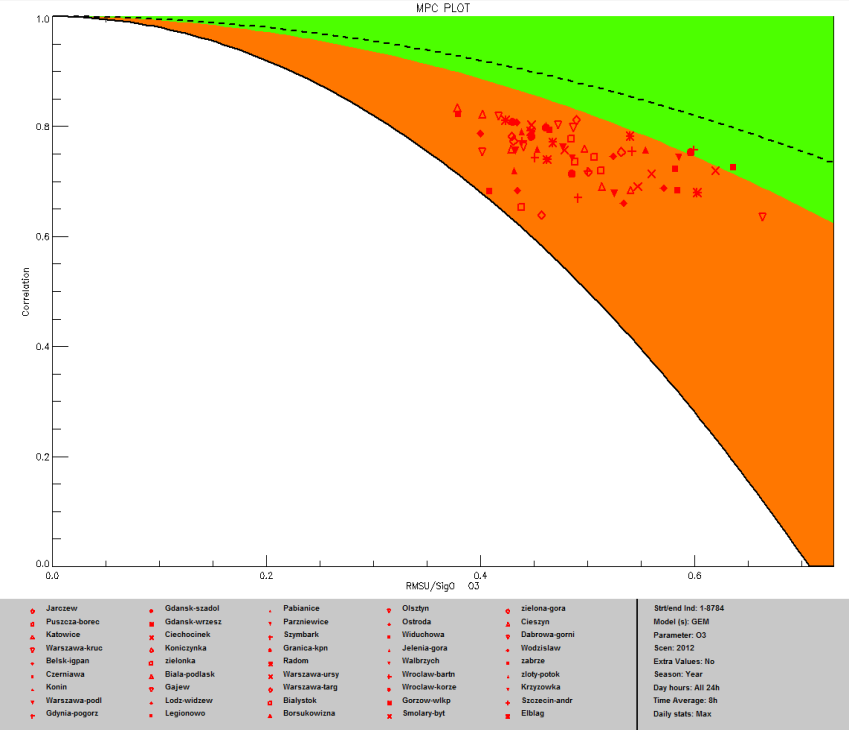


MPC – correlation

2012



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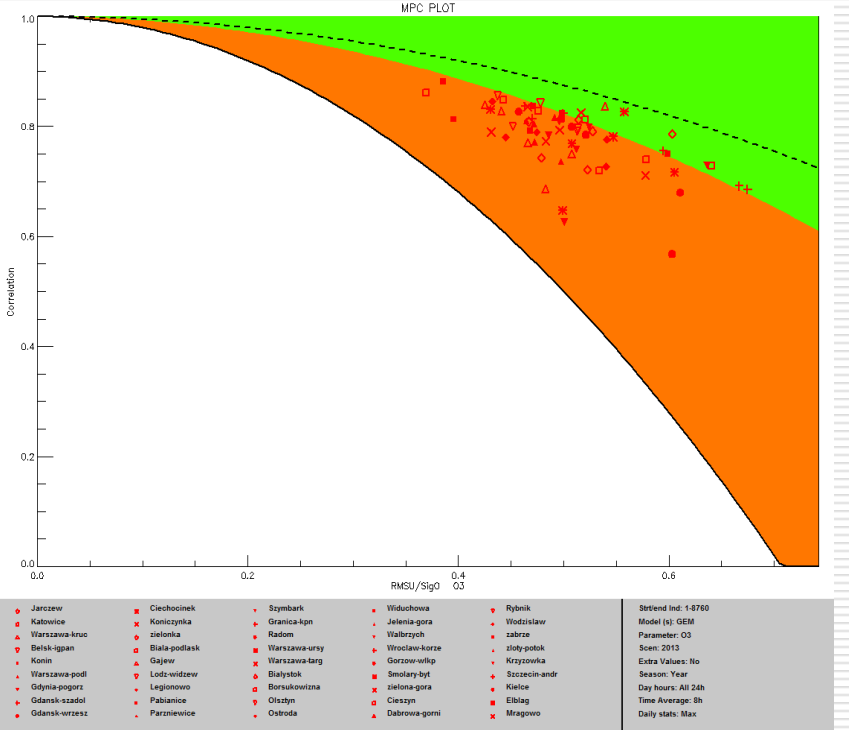
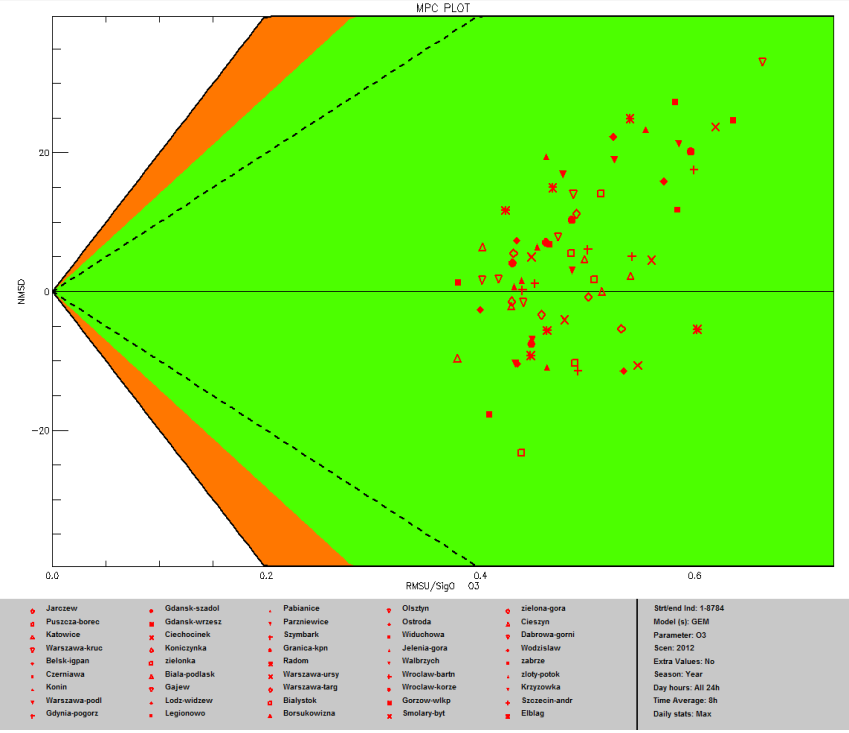
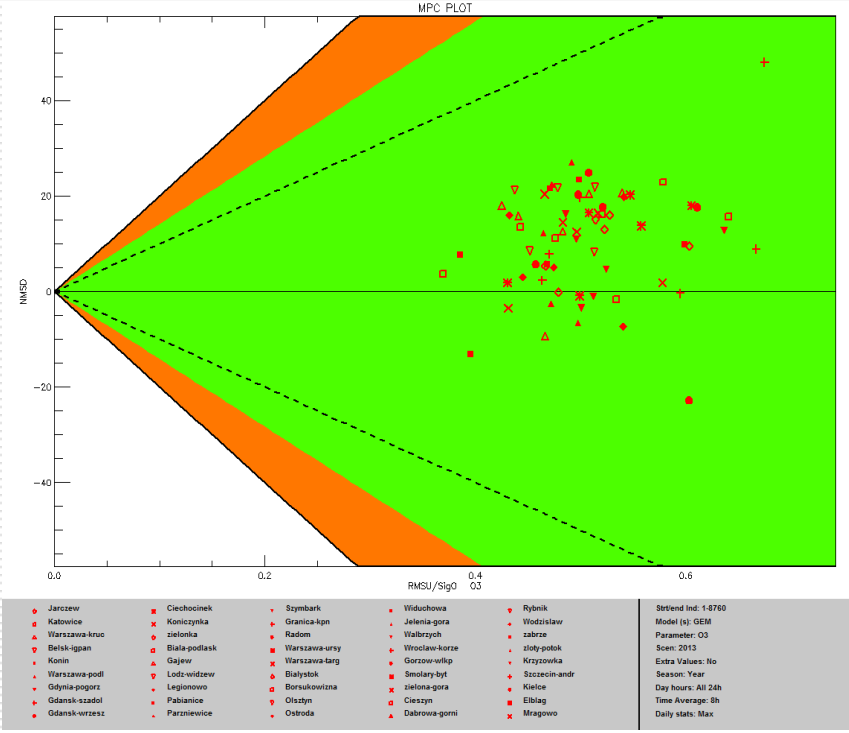


MPC – standard deviation

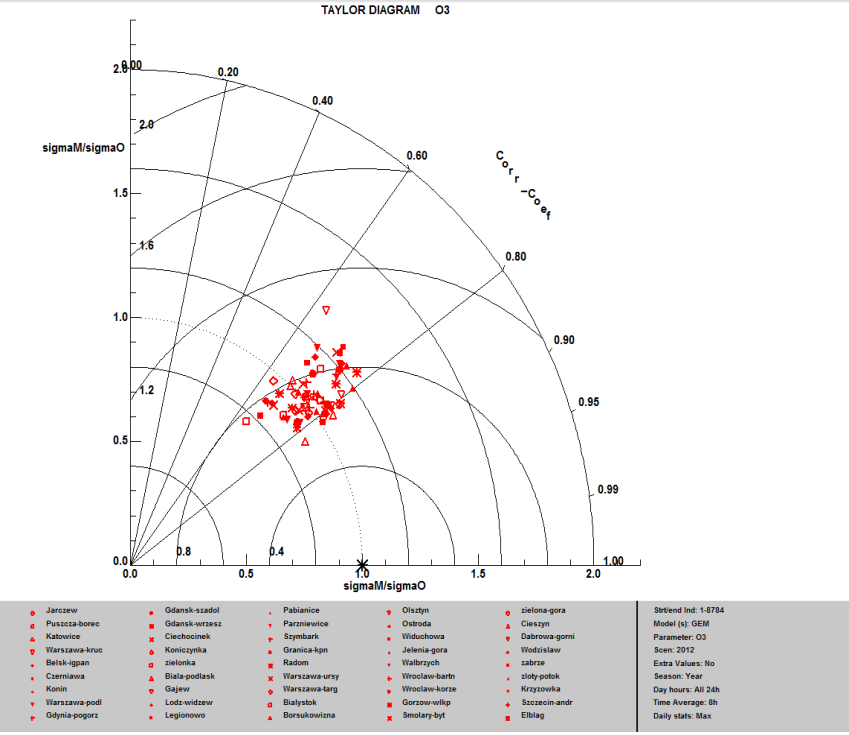
2012 **2013**





Taylor diagram

2012



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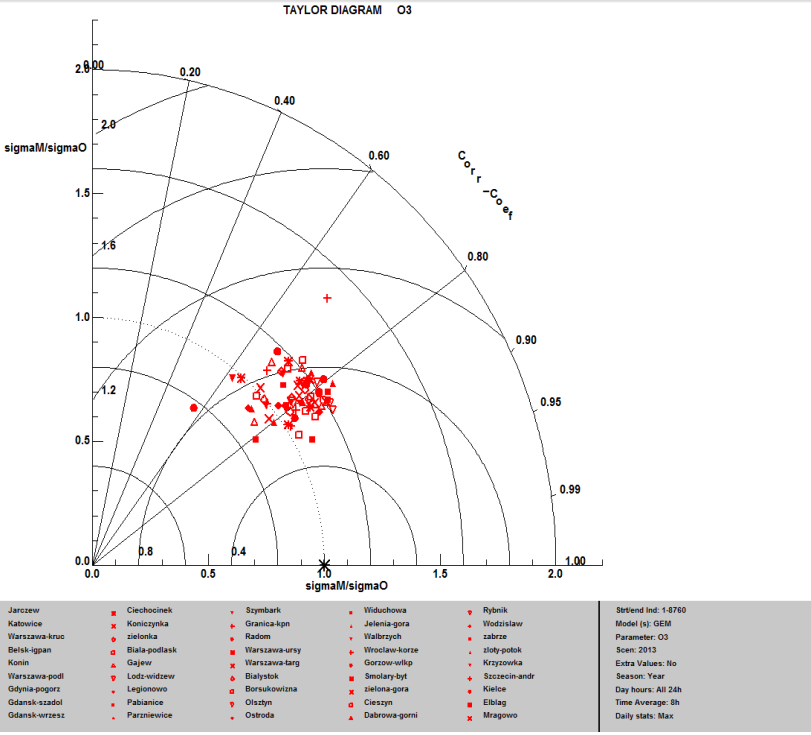
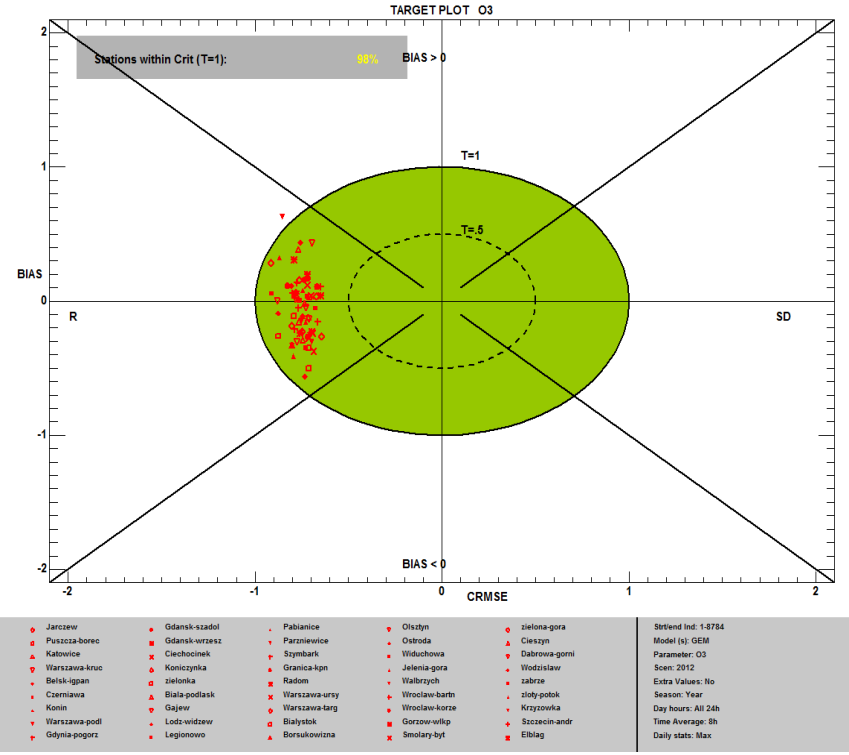


Target plot

2012



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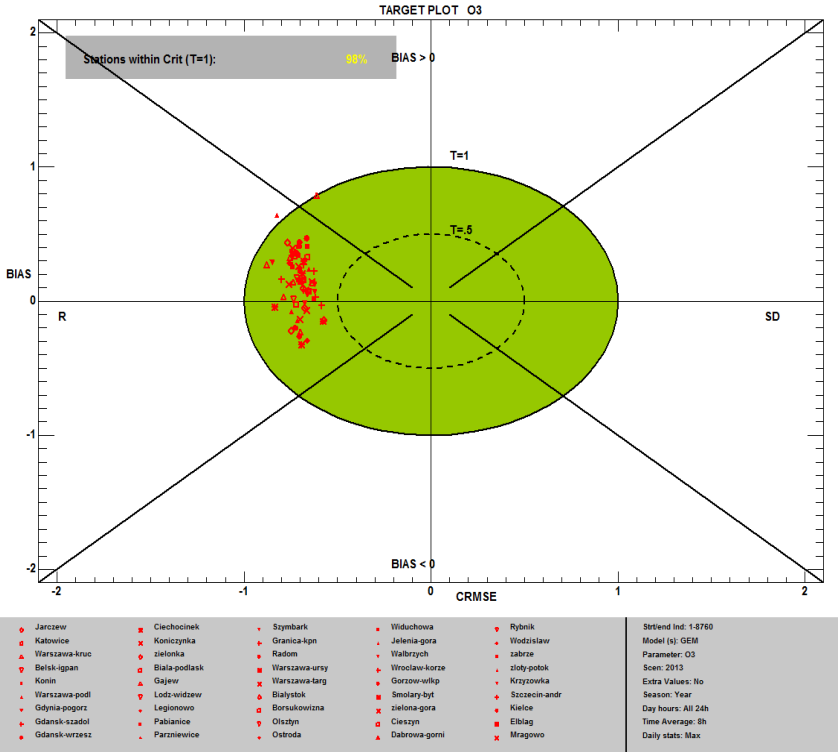
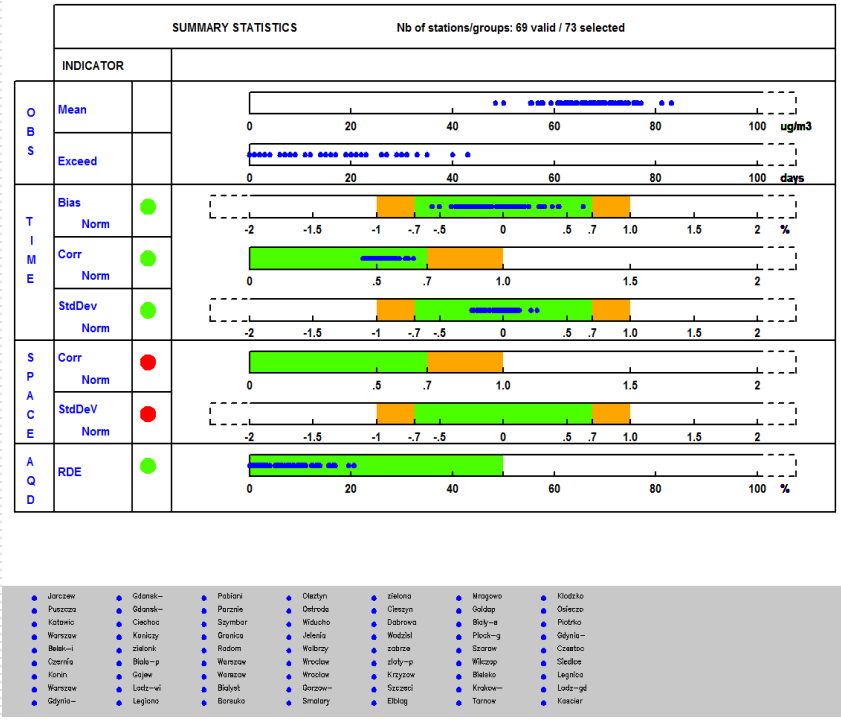


Summary report

2012



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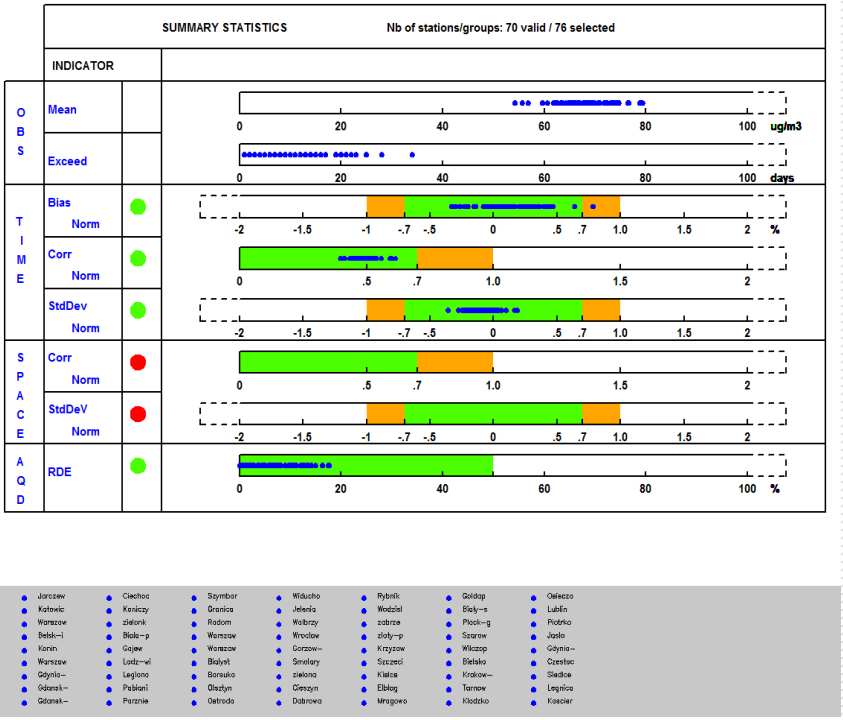
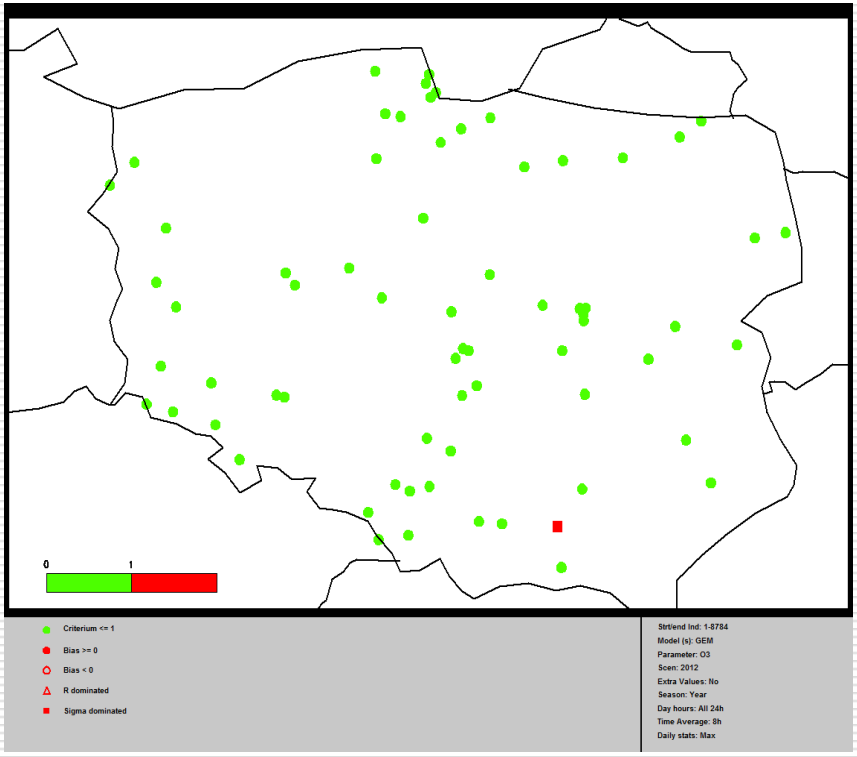


Map of stations

2012



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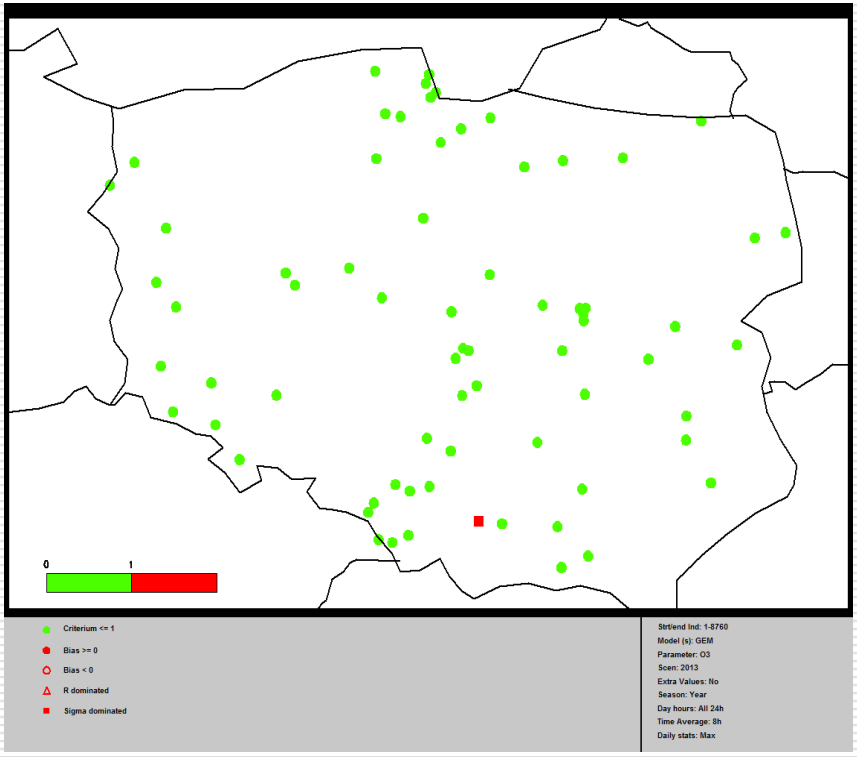
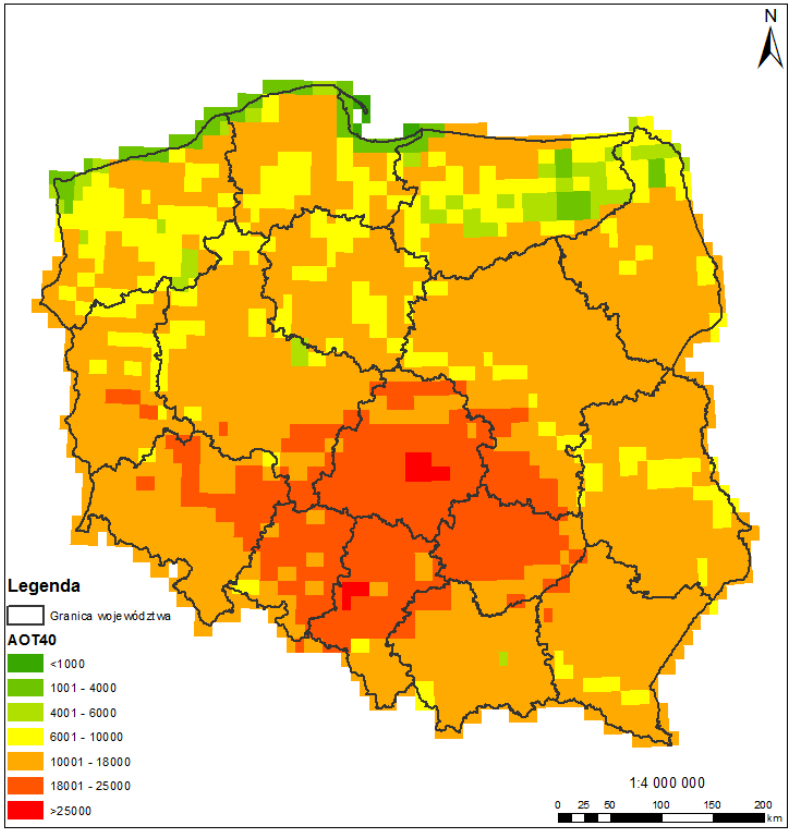
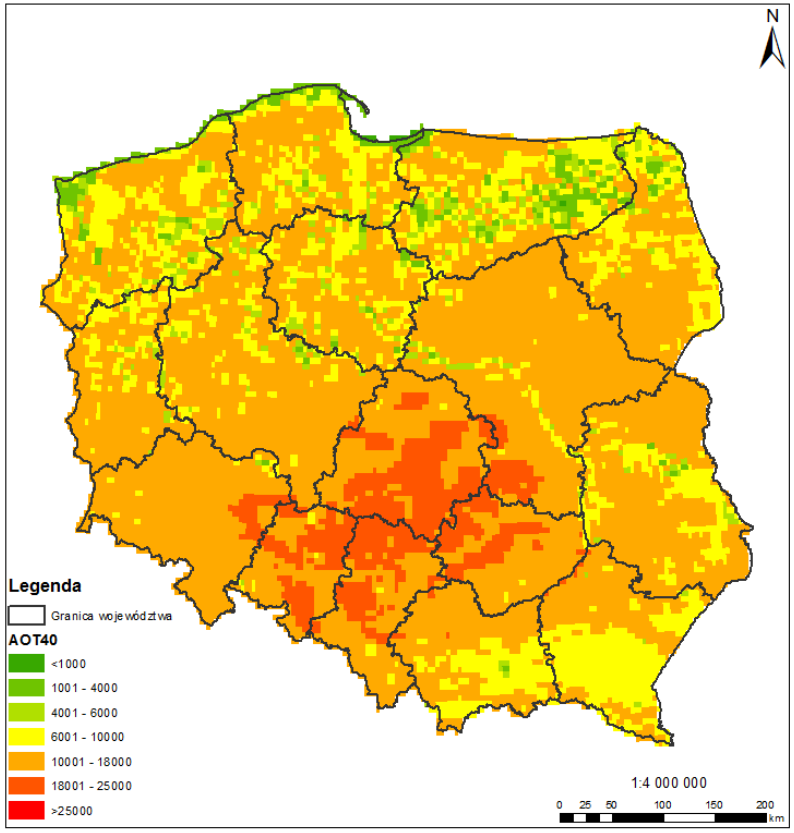
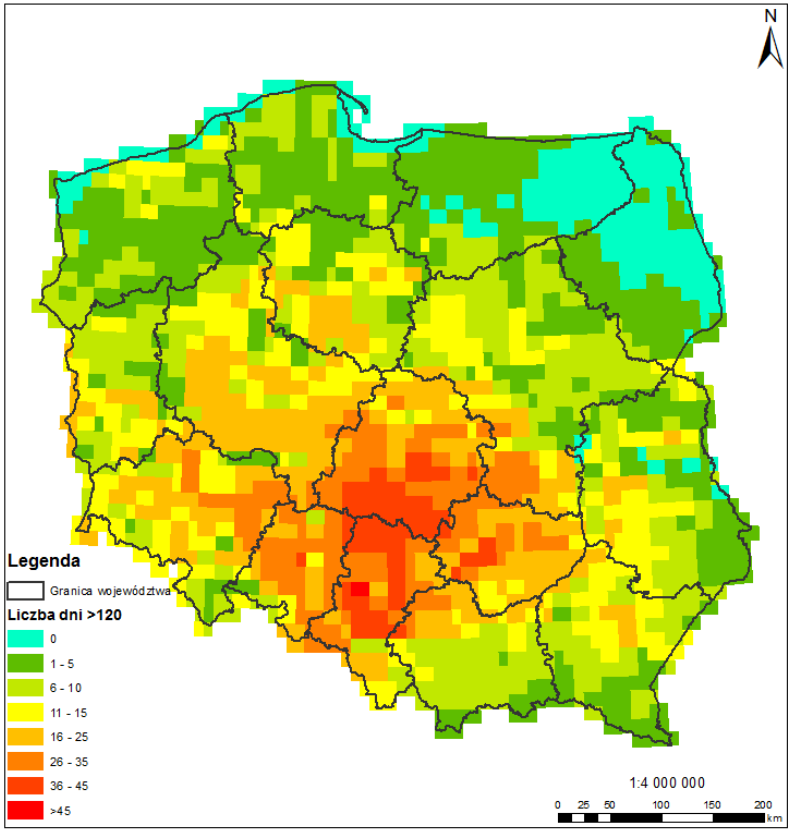


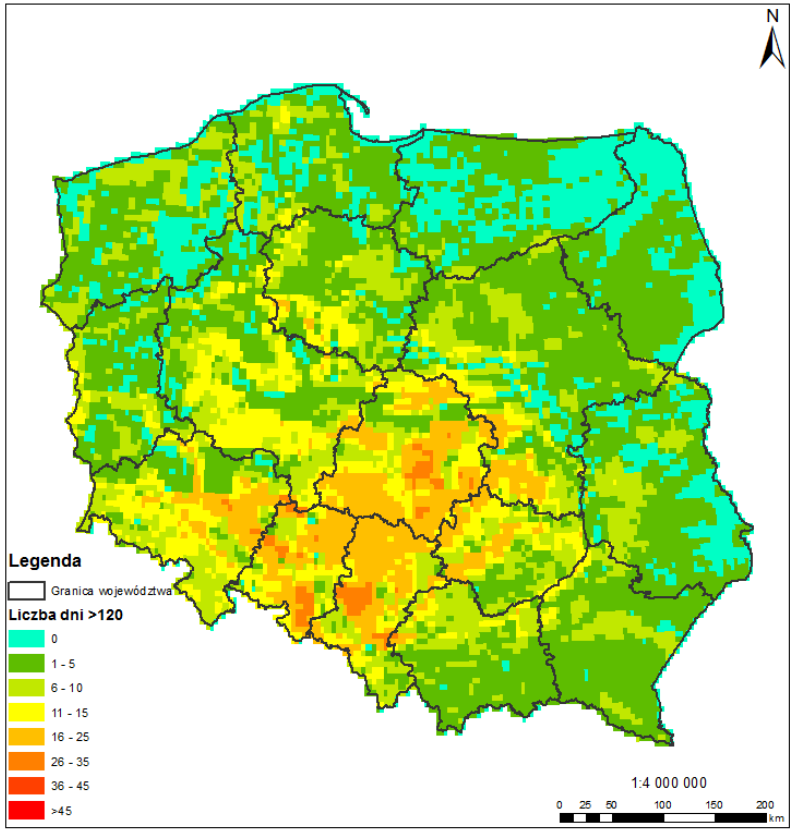
2012 assessment results – AOT40



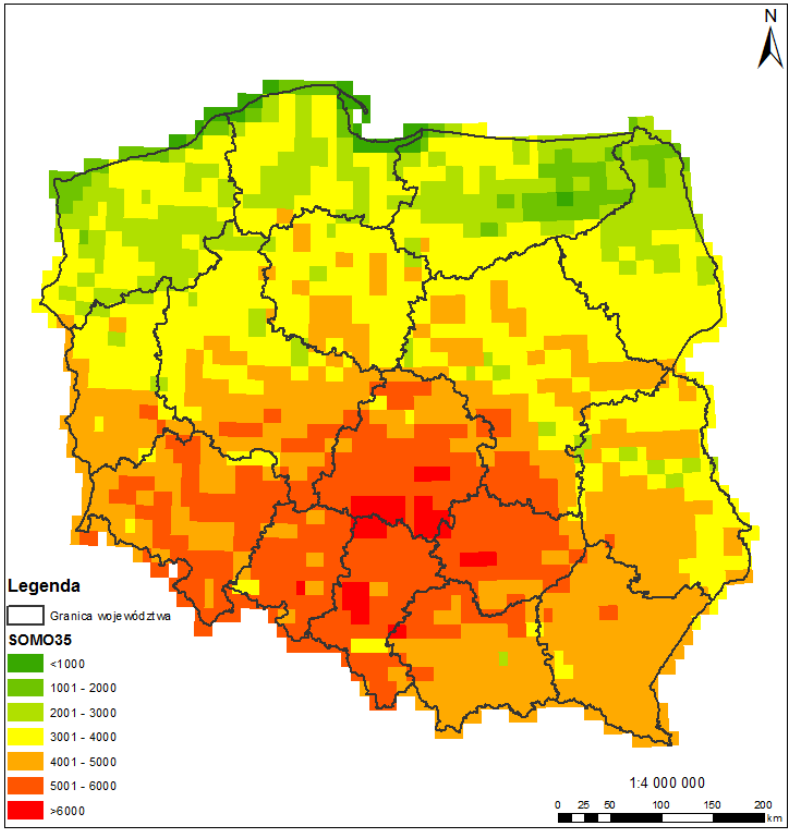


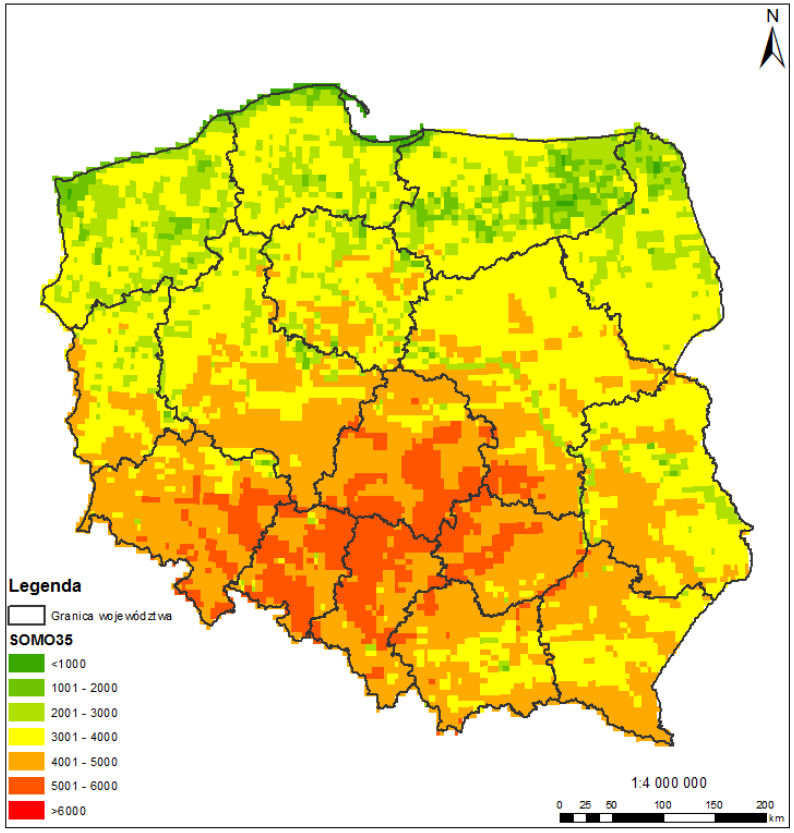
2012 assessment results – >120





2012 assessment results – SOMO35





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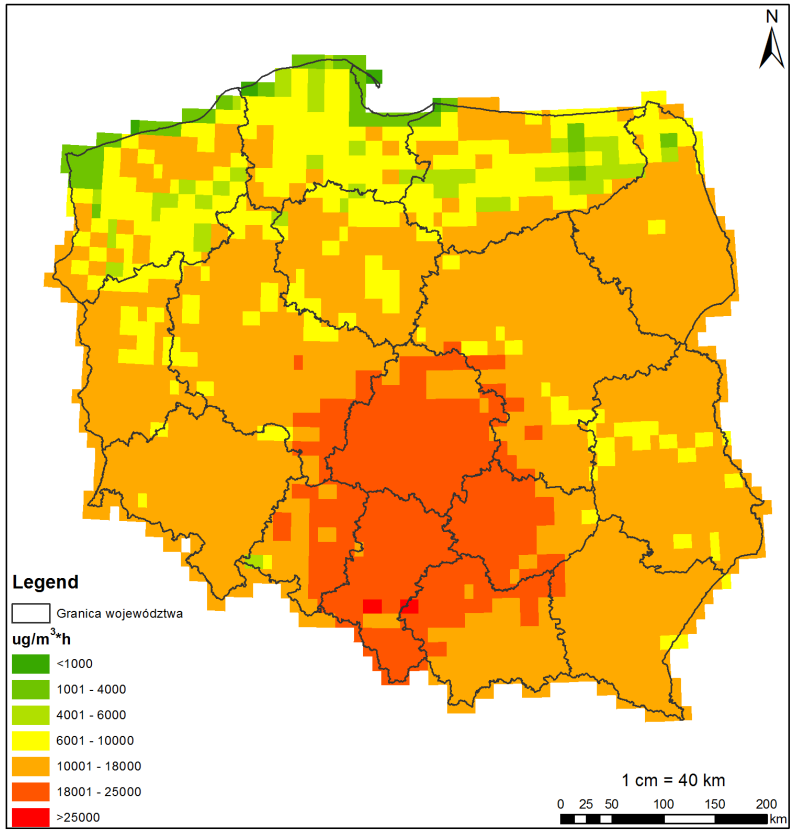
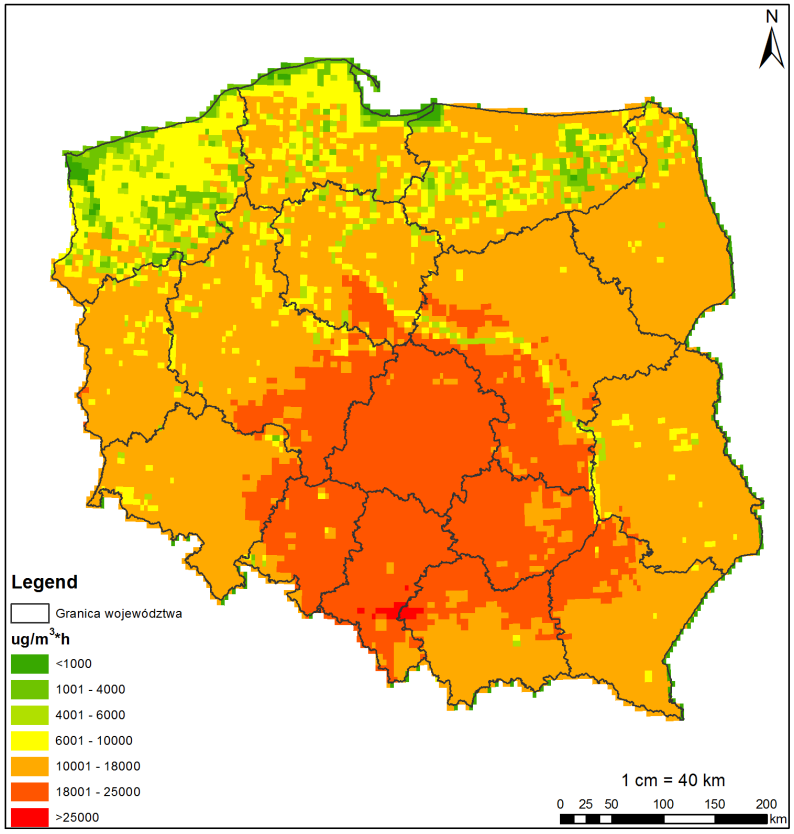
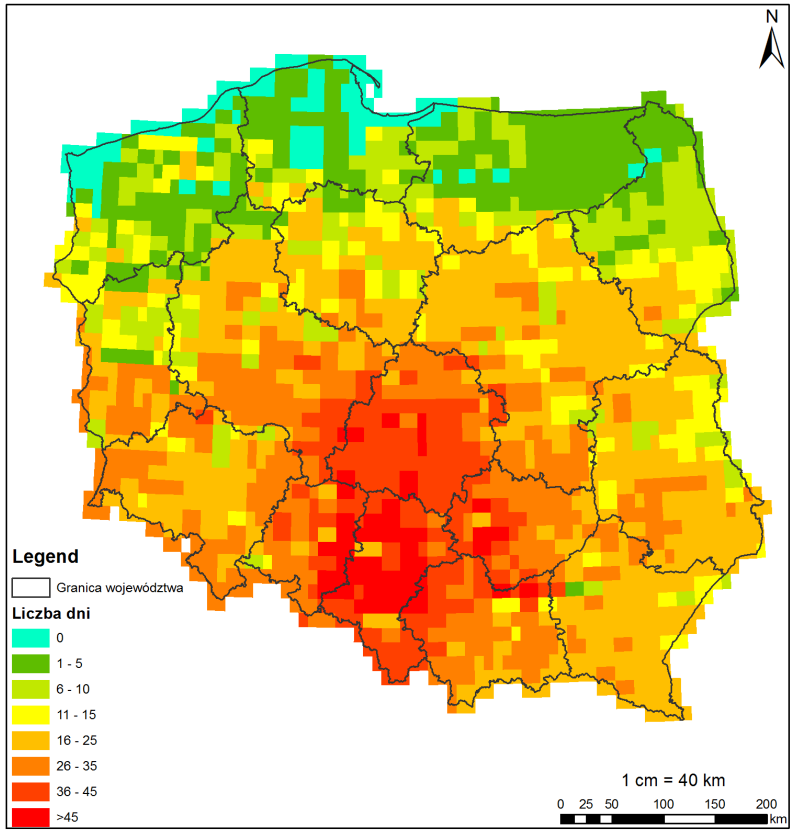
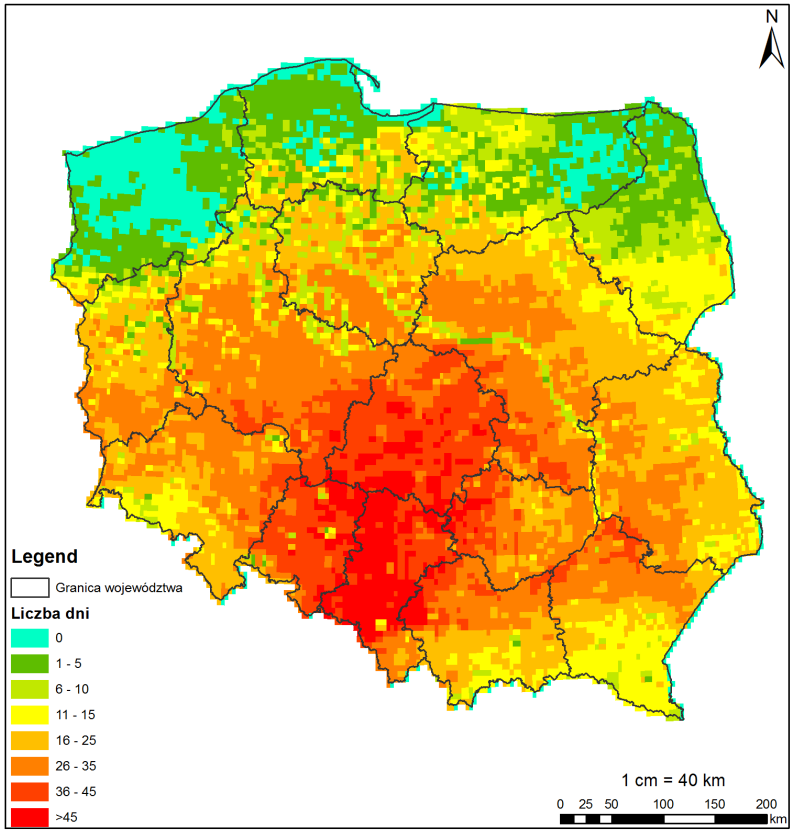


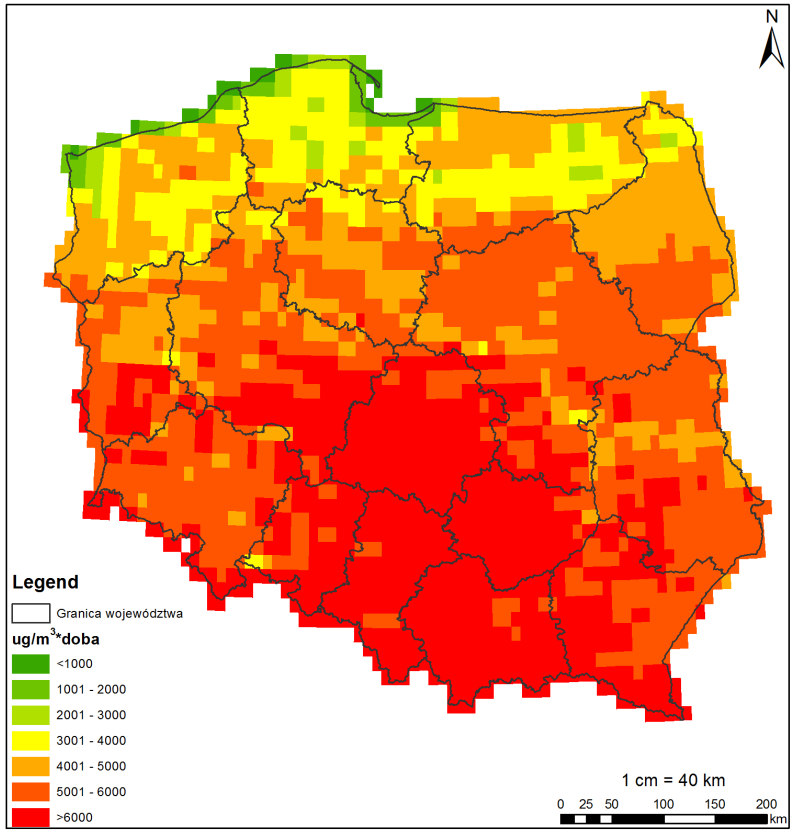


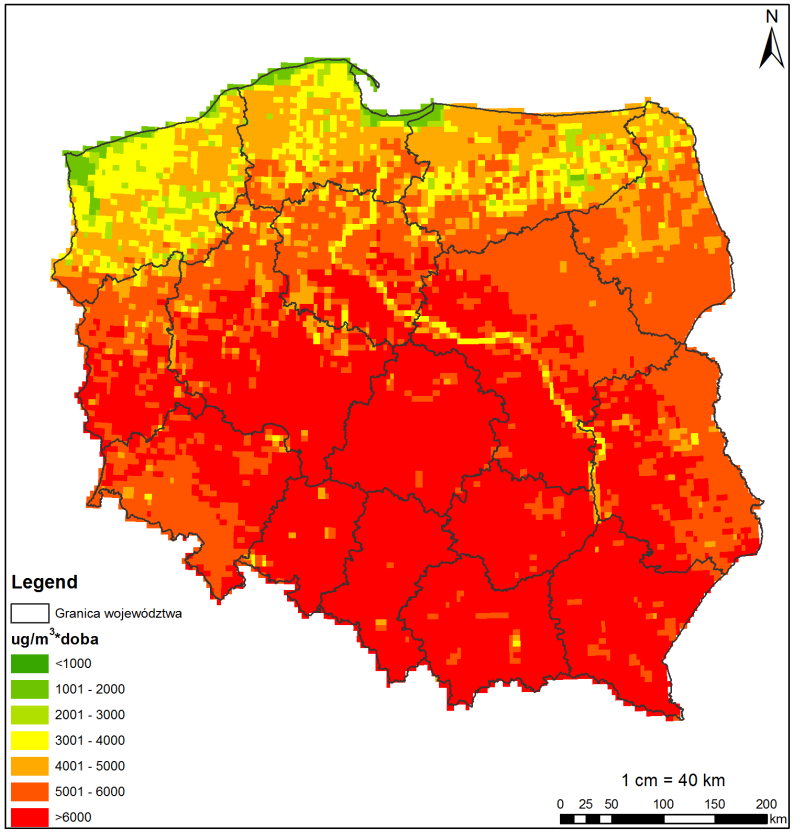
2013 assessment results – >120





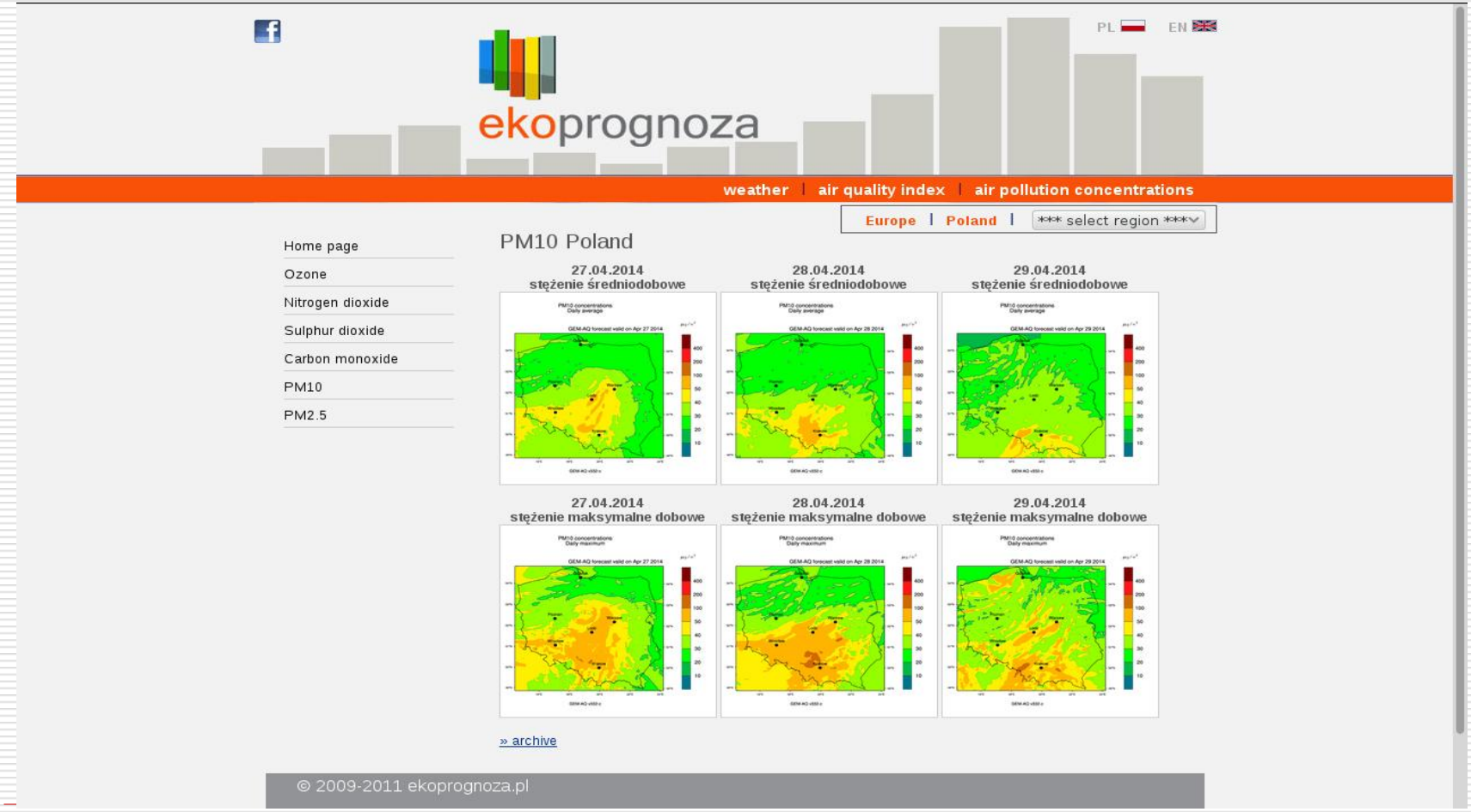
2013 assessment results – SOMO35





National near-surface ozone forecast 2013 - 2015

EcoForecast Foundation air pollution forecasts 2009 – 20??



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THANK YOU!