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Application of satellite observations for the evaluation of the GEM-AQ model operational forecast

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EcoForecast.eu is a semi-operational air quality forecasting system based on the GEM-AQ model (Kaminski et al., 2008). The model is run on a global variable resolution domain with the uniform resolution of 0.22 deg over Europe. A nested high resolution ($\sim$ 5km) limited area forecast was launched over Southern Poland in November 2010. In addition to daily forecast the modelling system is used for surface ozone assessment in Poland in 2010 and 2011 (implementation of 2008/50/EC Directive).

Operationally, modeling results are evaluated against meteorological and air quality measurements from the surface in-situ stations (Kaminski and Struzewska, 2011; Regulski et al., 2011; Struzewska and Kaminski, 2010). The comparison provides information on model performance in terms of station representativeness at a given resolution. However, it does not allow for validation of spatial distribution of the modelled parameters. Evaluation based on satellite observations allows for more coherent representation of model performance over the entire domain. Also, it might be used for quality control of climatological, geophysical and emission input fields.

Availability of satellite data that can be used in the evaluation of surface results from the GEM-AQ model is strongly limited by meteorological conditions (Szymankiewicz et al., 2011). Because of frequent frontal passages over Central Europe associated with large scale frontal cloud systems, especially during autumn and winter months, satellite observations of surface parameters cannot be retrieved.

We will present modelling results for a three-week period from January 20th to February 10th, 2012. Evaluation results for several days for which high quality satellite datasets are available will be shown. At the end of January 2012, a stationary high pressure system formed over Europe. This synoptic condition resulted in a prolonged period of winter antycyclonic weather with low temperature and almost clear sky conditions. We will compare model results from the high resolution operational forecast for Southern Poland with selected satellite observations. In the meteorological context, land surface temperature (LST) and cloud cover from MODIS (MODerate Resolution Imaging Spectroradiometer) will be used for model evaluation. Also, we will discuss the impact of snow cover on model results. Air quality in terms of aerosol optical depth (AOD) will be analyzed based on OMI (Ozone Monitoring Instrument) products.