Implementation of ATMOSYS modules for Croatia in the framework of the AIRQ project

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ATMOSYS is a LIFE + Environmental Policy and Governance project co-financed by European Commission. Within the AIRQ project, implementation of ATMOSYS modules will be done for Croatia. The main objectives are: (1) Near real-time air quality maps based on the observations, (2) Air quality forecasts for the whole territory of Croatia up to 3 days ahead, (3) Historical air quality maps service for Croatia including a high-resolution assessment for the city of Zagreb.

For the first objective, RIO mapping module is used allowing to derive real-time, daily and yearly concentration maps from air quality monitoring network. It is able to account for the local character of the air pollution phenomenon at locations where no monitoring stations are available. As input RIO requires spatially representative concentration measurements together with metadata, geospatial data as proxy data in the mapping (CORINE land cover data, population data, road network data, altitude information). So far annual maps for O_3, PM_{10} and NO_2 are calculated. For ozone, we can observe the regional scale decrease of concentration values from seaside towards inland. Local decreases in O_3 are noticeable for some urban areas such as Zagreb and Kutina. In terms of PM_{10}, the lower concentration values towards the sea are still noticeable, but the major variability occurs at local scale with visible peaks in Zagreb, Kutina, Sisak and several other eastern cities. As for NO_2, the most variability occurs in densely populated cities like Zagreb or Split.

For the second objective OVL forecast module with neural network is trained with concentration measurements from January 2016 to June 2017. In almost all test cases, the NN outperforms the chemical transport models from CAM services.

For the third objective, ATMO-Street chain model is used. It combines a traffic emission model (FASTRACE) and a Gaussian dispersion model coupled to a street-canyon module (IFDM-OSPM). The final outputs are 10 m resolution maps. Traffic input data for Croatia were used from COPERT model. In addition, 24 emission point sources are taken into account as well as 3D buildings model that allows street canyon dispersion calculations. Meteorological data are used from ALADIN numerical model on a 2 km wind field resolution. Results show that the highest concentrations are observed around the city centers of Zagreb and Split. In addition to the higher background concentrations in the urban areas (modelled by the RIO model), the effect of the road traffic emissions on the air quality is clearly visible, both in rural areas and around the city centers. Much higher concentrations are observed in the modelled street canyons: whereas the open street concentration close to the mean roads reaches 45 μgm^{-3}, the highest values in the street canyons are above 55 μgm^{-3}. This highlights the importance of applying a street canyon module such as OSPM in combination with Gaussian dispersion model (IFDM).

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