CITYZER – a platform and an ecosystem for services based on environmental data

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The CITYZER project develops a new digital platform and, around it, an ecosystem of services based on the provided environmental data. The platform links seamlessly and securely observations, modeling, and applications. The platform architecture is designed to be scalable and modular.

Within the project, a CityzerDEMO test implementation of the platform is constructed. At the core of the platform there are models for generating high-resolution precipitation nowcasts (and air quality forecasts for the Helsinki metropolitan area, Finland. Online demo applications are then constructed to provide the model data to the users.

As input data, RAVAKE uses sequences of weather radar data from the national C-band weather radar network operated by the Finnish Meteorological Institute (FMI). Construction of the nowcast is a two-step process. First the image sequence is analyzed to generate a motion field. At this stage, high-quality images are required, filtered from all non-meteorological echoes. In the second step, the temporal evolution of precipitation field is solved through extrapolation by combining the motion field with the observed precipitation. Uncertainties in the direction and speed of the motion are incorporated by use of deviation ellipses. Ensembles of 100 simulations are used to derive the probability distribution of precipitation for each location within the modeled area. In principle, different set of images can be used for each step, e.g. based on different filtering settings.

The FMI-ENFUSER is a model that combines statistical air quality modelling, Gaussian dispersion modelling techniques and information fusion algorithms (Johansson et al, 2015). The use of data fusion algorithms makes it possible to assimilate data from multiple sensors and measurement stations with variable quality standards. Further, the key meteorological parameters and emission output rates can be fine-tuned so that the modeling output aligns with the measurement evidence as well as possible. In CITYZER, the model has been coupled in real time with the regional chemical transport model (SILAM), the local air quality (AQ) monitoring network, and several sources providing meteorological data (HIRLAM, ECMWF). An existing traffic volume mapping with temporal variations separately for vehicles, trucks and buses is also used, and real-time traffic congestion information utilized. For residential heating the inventory from local authorities is used and coupled with ambient temperature modifications.

The key aim of the CITYZER project is to create a platform tool around which an ecosystem of different services could be built. To allow for third-party services and applications, the output data are intended to be open and free. In case of the test implementation that provides precipitation and air quality predictions, the services would be directed to users whose lives or enterprises are affected by rain or air quality. There are a wide variety of such usersfrom logistics and construction businesses to tourism or individuals suffering from respiratory ailments. By providing data on near-future conditions instead of observations, the decision-making processes is better served, allowing better mitigation of human distress, reduction in losses or damages in infrastructure, better route planning and safety, reduced exposure to pollution, et cetera.