The potential of Sentinel 2 and PROBA-V images for supporting early warnings of particulate matter pollution episodes in Ploiesti urban area

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One of the major air quality stressors in the urban area is particulate matter (PM). PM includes dust, dirt, soot, smoke, and liquid droplets emitted into the air by various sources such as vehicles, factories, and construction activities. PM has been linked to asthma and other respiratory illnesses. Inner-city residents need timely access to air quality synthetic indicators for protecting their respiratory health. Access to air quality forecasts and real-time data can allow residents, especially children and elders, to reduce their exposure when PM levels in conjunction with other pollutants are of potential concern. Ploieşti city is an important industrial center, which experienced a rapid economic growth in the last decade. Its industrial activity is concentrated especially on the oil production and refining industry. Ploiesti is the only city in Europe surrounded by four oil refineries. Monitoring campaigns were carried out in 12 sampling points during the "rush" hours (7.00-12.00 a.m. and 3.00-7.00 p.m.) to assess the potential exposure to high PM levels using an optical portable monitoring system, which is measuring fine and submicrometric fractions with a laser beam (DusttrakTM DRX 8533EP with environmental enclosure). Inverse distance weighting algorithm was used to obtain potential isolines of concentrations at town's scale in GIS environment.

NOAA Hybrid Single-Particle Lagrangian Integrated Trajectory model (HYSPLIT), respectively the backward trajectory type, was used to overview the contribution of long range transport from the most probable source region of the significant episodes characterized by PM rising of concentrations.

Extraction of radiometric indicators from historical databases with multispectral images allowed the spatiotemporal characterization of land use and cloud distribution i.e. Sentinel 2 and PROBA-V (allowing specific characterization of NDVI, which provided canopy and surface reflectance in the pilot area). Resulted data were overlapped on the GIS thematic layers of the Ploiesti city area to develop the integrated system of PM movement prediction. All thematic layers were referenced to the same coordinate system using local 1970 stereographic projection and Dealul Piscului 1970 geographic coordinate system. The meteorological inputs used in experiments included long term time series recorded at local station. We combined these multiple datasets to find potential correlations that can be used for improving the prediction of particulate matter pollution episodes in Ploiesti urban area with latest state-of-the-art satellite imagery support.