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Multitemporal Monitoring of the Air Quality in Bulgaria by Satellite Based Instruments

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Nowadays the effect on climate changes on the population and environment caused by air pollutants at local and regional scale by pollution concentrations higher than allowed is undisputable. Main sources of gas releases are due to anthropogenic emissions caused by the economic and domestic activities of the inhabitants, and to less extent having natural origin. Complementary to pollutants emissions the local weather parameters such as temperature, precipitation, wind speed, clouds, atmospheric water vapor, and wind direction control the chemical reactions in the atmosphere. It should be noted that intrinsic property of the air pollution is its “transboundary-ness” and this is why the air quality (AQ) is not affecting the population of one single country only. This why the exchange of information concerning AQ at EU level is subject to well established legislation and one of EU flagship initiatives for standardization in data exchange, namely INSPIRE, has to cope with. It should be noted that although good reporting mechanism with regard to AQ is already established between EU member states national networks suffer from a serious disadvantage – they don’t form a regular grid which is a prerequisite for verification of pollutants transport modeling. Alternative sources of information for AQ are the satellite observations (i.e. OMI, TOMS instruments) providing daily data for ones of the major contributors to air pollution such as O_3, NOX and SO_2. Those data form regular grids and are processed the same day of the acquisition so they could be used in verification of the outputs generated by numerical modeling of the AQ and pollution transfer.

In this research we present results on multitemporal monitoring of several regional “hot spots” responsible for greenhouse gases emissions in Bulgaria with emphasis on satellite-based instruments. Other output from this study is a method for validation of the AQ forecasts and also providing feedback to the service that prepares them. The following sources of in-situ data for the different types of gases and dust particles have been used – the National Institute of Meteorology and Hydrology of Bulgaria (NIMH) and National System for Environmental Monitoring managed by Bulgarian Executive Environmental Agency (ExEA). Both authorities provide data for concentration of several gases just to mention CO, CO_2, NO_2, SO_2, and fine suspended dust (PM10, PM2.5) on monthly (for some data on daily) basis. Considered satellite-based instruments for data provision are OMI instrument aboard EOS-Aura satellite and from TROPOMI instrument which is basic payload for the future Sentinel-5P mission.