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An integrated approach for the validation of Sentinel-5P with annual observation

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Validation campaign for satellite missions requires efforts in terms of planning, logistics and depends on the weather for its execution. Furthermore, passive instrumentation is more sensitive at the weather, since requires special atmospheric conditions (e.g., cloud-free sky) for optimum performance. In this paper are presented activities regarding the preparation of Sentinel 5P validation in Romania, activities funded by ESA that involve ground-based (fixed and mobile – by DOAS sensors), and airborne measurements.

Research aircraft is based on a Britten-Norman BN-2 Islander platform, custom modified to accommodate, within the cabin, instrumentation for in situ measurements of aerosols (e.g., an Aerosol Particle Sizer and a nephelometer), trace gases (e.g., Picarro, and NO₂ CAPS), and NO₂, SO₂ and H₂CO column measurements (e.g., custom made DOAS whiskbroom imager for high-resolution mapping). The aircraft modification, already certified by EASA, include also the installation of an air inlet for the in-situ measurements, a nadir window for the remote sensing, and a GPS antenna for the IMU.

Measurements are planned to start in the spring of 2021 and to last until the end of the year. Region of interest is Bucharest metropolitan area, a city affected by infringement from the EU regarding poor air quality. The strategy is to perform seasonal measurements for mapping the variability of all pollution sources, e.g.: higher production from the local power plants (providers for hot water and heating for the residential population) in winter, car traffic concentrated towards the north, east or west (depending by the season).

This variability is observed also from the TROPOMI measurements, more precisely in the NO₂ column concentration. During the spring and summer, the maximum is concentrated within the city centre, while for the autumn and winter, the area is more extended. Maximum values are recorded during the winter, as are shown from the 2019 and 2020 data. Moreover, the amount of S5P measurements during the winter is fewer compared with the summer, due to the presence of

clouds, thus planning and execution of a campaign during wintertime being more challenging.