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EnMAP airborne soil Greece campaign 2019

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In the frame of the science preparation activities for the upcoming German hyperspectral satellite mission EnMAP, an airborne survey took place in September 2019 with hyperspectral VNIR-SWIR-LWIR data using the HySpex sensor and the newly acquired Hyper-Cam LWIR camera from the GeoResearch Center Potsdam (GFZ) mounted on the airborne platform Cessna-T207A from the Free University Berlin (FUB). Although logistically complex conditions with several teams distributed in different locations, all the sites in central and northern Greece could be successfully acquired under clear sky conditions, and all data could be demilitarized providing 45 flight stripes covering a total area of 300 km².

This abstract is focusing on the Amyntaio soil site in northern Greece, an agricultural area of variable soil composition from carbonate rich to clay/silt content to organic carbon rich fields around the lignite mine south of the area, over which 11 flight stripes could be acquired. The science goals of the Amyntaio soil campaign were: (a) Simulation of hyperspectral satellite imagery and demonstration of the potential of upcoming spaceborne hyperspectral sensors (EnMAP, CHIME) for global soil mapping and monitoring; (b) Large test and validation for existing soil algorithms such as the HYSOMA / ENSOMAP software tools for the prediction of top-soil quantitative surface properties; (c) Data validation and comparison of soil products with recent relevant satellite sensors (e.g. S2, PRISMA, ECOSTRESS); (d) Enlargement of global soil spectral libraries with harmonised standards and testbed for their use as calibration-validation data for soil spectral models.

Simultaneous to the airborne survey, an intensive ground-based campaign took place in the area focusing on the acquisition of soil data, VNIR-SWIR and LWIR in-situ data with field spectroradiometers (PSR+, ASD FieldSpec3, MEMS, Handheld FTIR), fractional vegetation cover with

RGB and UAV RGB data, soil moisture, infiltrometer and spectral data in undisturbed soil crust with the SoilPRO device, and Cal-Val data acquisition at the same time than the overflight (Temperature-loggers, ASD VNIR-SWIR, handheld FTIR) over bare soils and black/white thermal targets.

We present the project objectives, selected field, airborne, satellite data, with preliminary analyses that show the high data quality and the potential of multi hyperspectral airborne campaigns as a support for basic science developments and satellite mission preparations. The results represent how more sensor flexibility can bridge the gap from in-situ to satellite scale. Further airborne flights and carefully designed in situ campaigns will allow testing and iterative improvement of new observational modalities for soil monitoring based on the integrated information from satellite platforms with the one provided by in-situ systems on the ground and air.