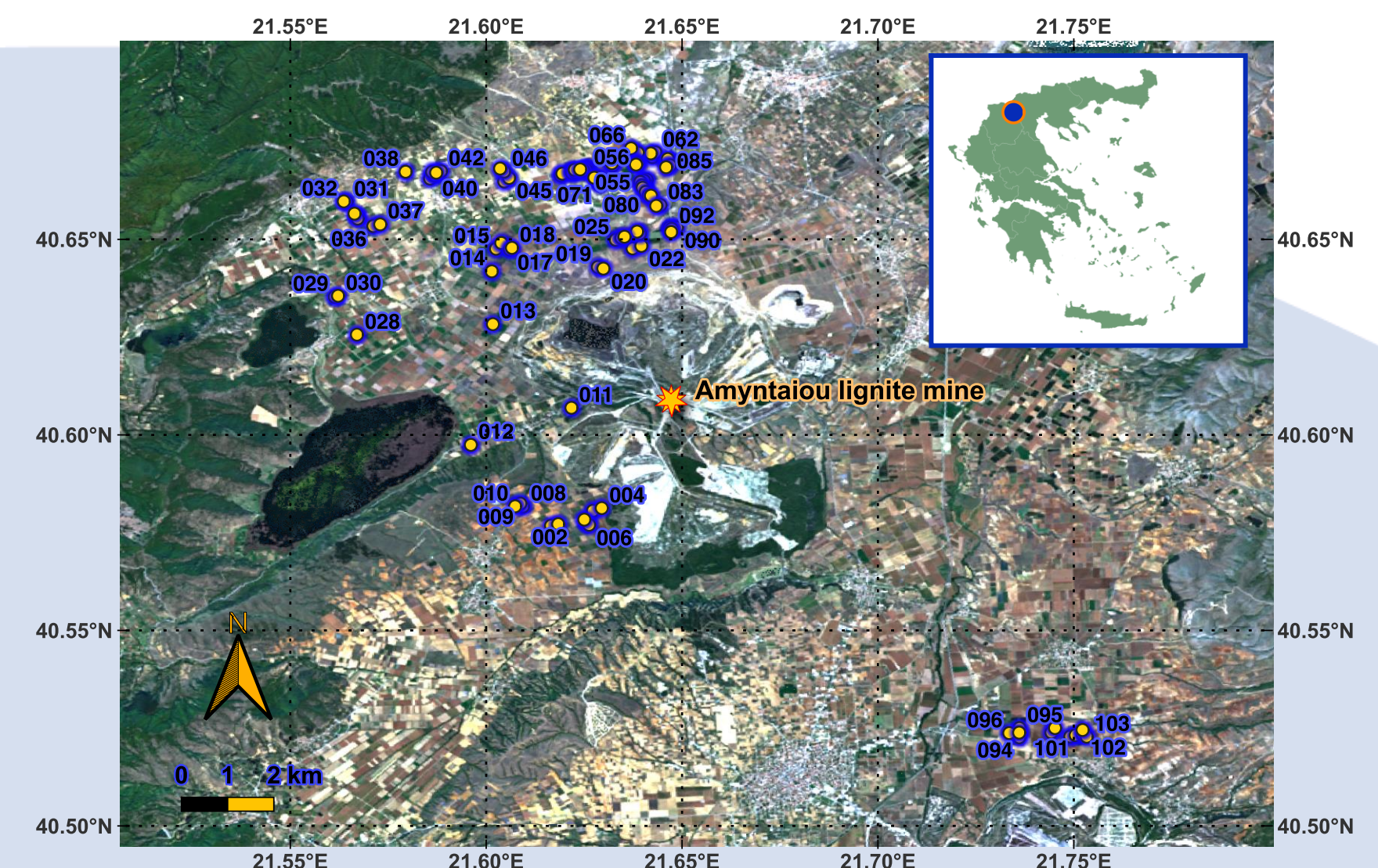
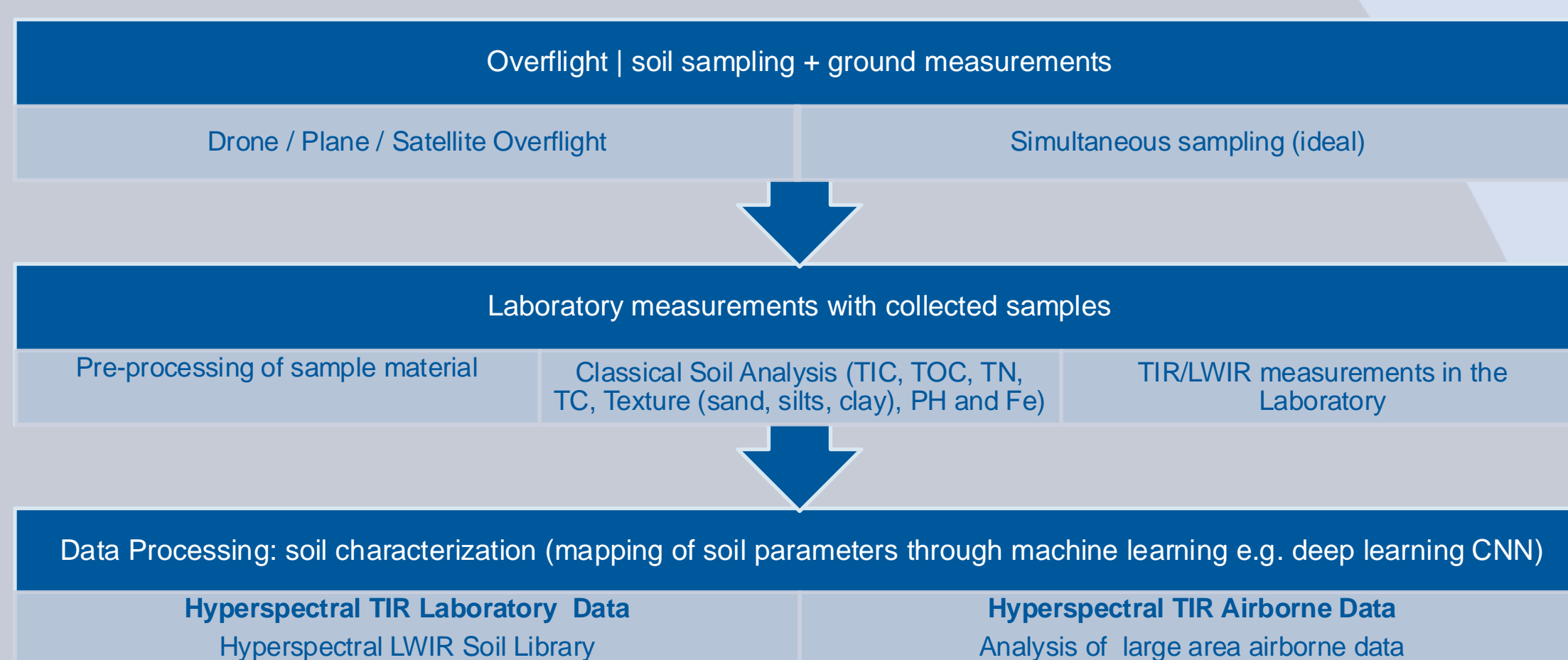


Introduction & Background

The European Commission and the MOSES project advocate soil quality mapping and monitoring to address food security and climate change challenges. Our soils, are one of the largest terrestrial carbon reservoirs, and are vital to the health of our ecosystems. For this study we are utilizing thermal hyperspectral sensors to evaluate the properties of topsoils. Our objective is to establish reference databases and validate airborne applications for soil property estimation using these sensors in a laboratory setting. As part of our study, we combined field measurements of bare soil pixels with lab measurements and chemical analysis of various soil samples. Our main study sites are located in Northern Greece (Western Macedonia) in the intensively agricultural used areas around the Amyntaio lignite mine which is around 100 Km west of Thessaloniki. More than 250 soil samples were collected in several field campaigns from 2018 to 2023 covering the highly variable soils of the region. In 2019 an airborne survey acquired a hyperspectral dataset with a Neo HySpex VNIR and SWIR, and a Telops Hyper-Cam LW (LWIR) sensors covering the study site.



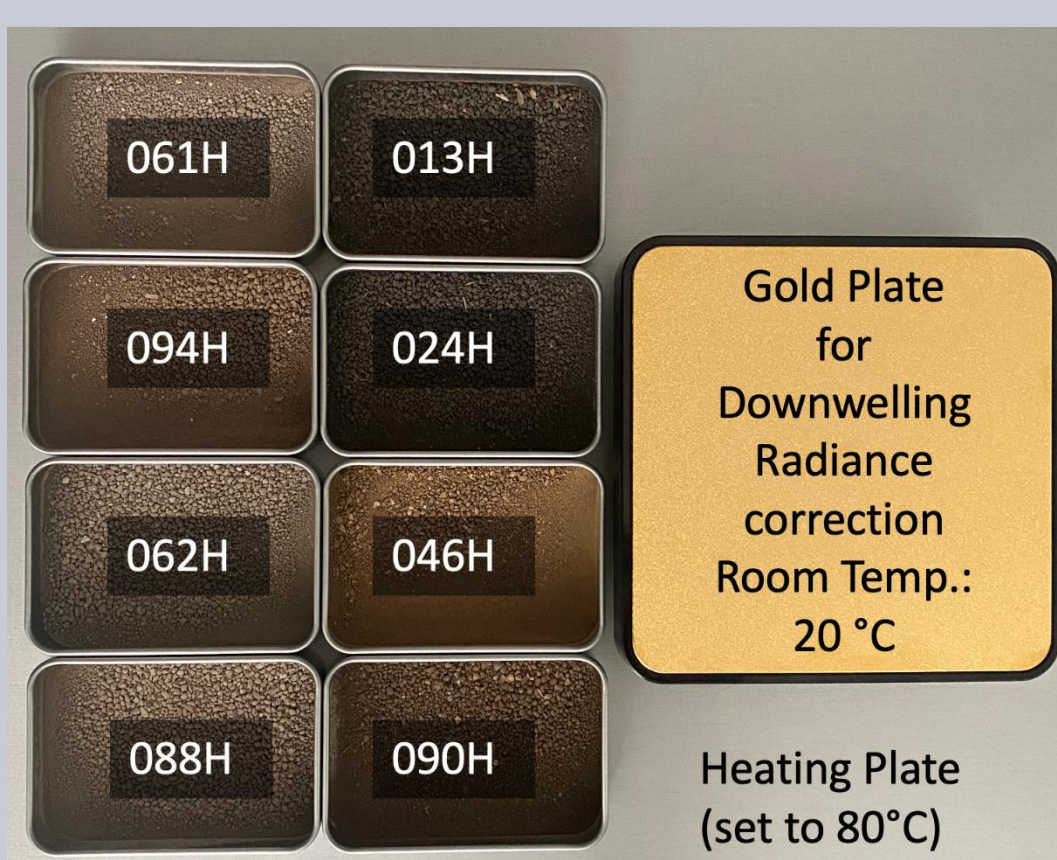
Workflow for Soil Sampling and Measurement



Sensor	Telops Hyper-Cam LW (FTIR)
Spectral Range (µm)	7.7 -11.8
Spectral Resolution (cm ⁻¹)	Up to 0.25
Spatial Resolution	320x256 (Full Frame)
FOV (Degrees)	6.4 x 5.1
Typical NESR (NW/CM ² SR CM ⁻¹)	20
Radiometric Accuracy (K)	< 1.0
Calibration	2 internal Blackbodies



Example: Soil Samples and Spectral Emissivity (LWIR)



Sample ID	TOC [%]	TC [%]	TIC [%]	TN [%]
013H	2,60	2,64	0,04	0,24
024H	3,32	3,40	0,08	0,33
046H	0,41	0,70	0,30	0,00
061H	1,58	8,58	7,00	0,06
062H	1,90	8,46	6,55	0,15
088H	1,88	8,10	6,22	0,11
090H	0,77	1,19	0,42	0,05
094H	2,06	7,23	5,17	0,14

Laboratory Temperature Emissivity Separation (TES)

