

constellr HiVE – a satellite constellation for monitoring land surface temperature and supporting food security

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FORMAT: TALK

Keywords (5): Earth Observation, Thermal Remote Sensing, LST constellr HiVE, Environmental Monitoring

Plant stress, a persistent natural phenomenon, presents a significant threat to global agriculture and food security. As changing climate patterns lead to more frequent and severe drought, pest, or disease occurrences, the demand for innovative and precise approaches to evaluate and monitor plant stress in agriculture grows. In this context, a new generation of thermal remote sensing data emerges as a valuable tool. It has the potential to provide the necessary data not only to analyze and understand the impact of stress caused by different factors on crops but also to detect it promptly, allowing for timely mitigation.

constellr develops a constellation of state-of-the-art high-resolution thermal infrared (TIR) as well as visible and near-infrared (VNIR) sensors, planned for launch by the end of 2024, to monitor land surface temperature (LST). The HiVE (High-precision Versatile Ecosphere monitoring mission) constellation comprises micro-satellites in the 100 kg class, with orbits in a sun-synchronous plane at an altitude of 550 kilometers. With a remarkable 1-day temporal resolution reached starting 2026 with 5 satellites in orbit, 30 meters spatial resolution for the TIR bands, and up to 10m for the VNIR bands, HiVE is uniquely equipped to provide accurate and timely data optimized for agricultural needs.

We will present the technical specification, status of the HiVE mission, and the added value of these data for agricultural practice. Thus, constellr is currently performing different proof of concept studies to quantify the added value of thermal data for identifying plant stress. Firstly, LST time-series are analyzed to detect trends and anomalies as a proxy for crop stress in time and space. Secondly, LST data are exploited to derive actual evapotranspiration, which in turn is used to quantify the drought stress. Besides that, an outlook on further LST-based products relevant to agriculture based on LST will be shown.