

IAF EARTH OBSERVATION SYMPOSIUM (B1)  
Assessing and Mitigating the Global Freshwater Crisis (6)

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HIVE, A LAND SURFACE TEMPERATURE MONITORING MISSION, ADDRESSING THE  
SUSTAINABILITY OF WATER SUPPLY IN AGRICULTURE.

**Abstract**

constellr GmbH is a space data and services company leading the way in delivering daily, global land surface temperature (LST) data for smart farming. Using its constellation of infrared monitoring satellites called HiVE (High-precision Versatile Ecosphere Monitoring Mission), constellr will precisely measure the actual temperature of crops at a sub-field level daily and across the full globe. The primary goal is to provide global LST imagery optimized for high-precision agriculture and sustainable water management. Agriculture must become more efficient to sustainably feed 10 billion people by 2050. With water availability driving food production through irrigation, the efficient use of freshwater is increasingly vital to bridge the impending food gap. The path to optimising agricultural efficiency is to supplement and replace traditional methods with predictive and smart agriculture. To precisely and timely assess crop water needs, companies in the smart farming market rely on a key environmental variable, evapotranspiration (ET), which is most robustly derived from temperature measurements. Through the LST data, an immediate measurement of crop health can be derived, as the plant becomes stressed, by identifying plant transpiration changes from leaf temperature. Critically, this provides days or weeks advance warning so that remedial action can be taken by farmers earlier and before irreversible damage occurs, resulting in far lower risk of crop loss, more efficient use of scarce resources, and improved crop yield forecasting capability. While ground-based and aerial solutions cannot be scaled globally in an economically feasible way, there is also a gap in currently available remote sensing solutions at the required thermal infrared wavelengths and low latencies. As a result, no available plant temperature sensing solution can provide the correct combination of timely, accurate, field-scale measurements fit for the purpose of smart water management today. The HiVE Mission aims at delivering LST and derived ET data to users at a 1-day global temporal resolution, 30 meters spatial resolution and 1K temperature resolution. To this end, a constellation of micro-satellites in the 100 kg class, flying in constellation in the same sun-synchronous orbital plane at an altitude of 550 kilometres will be used. The first flight model and the prototypes for an operational ground segment, are being developed in collaboration with OHB and ESA, via the InCubed commercialisation Program. This paper describes the end-to-end system architecture, performances and deployment roadmap as well as the downstream services enabled by the mission and provided to the agriculture industry.