

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

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HIVE, A COMMERCIAL EARTH OBSERVATION SYSTEM MEASURING TEMPERATURE AND  
WATER FROM SPACE, FOR BETTER RESOURCE ACCOUNTABILITY IN AGRICULTURE AND  
BEYOND.

**Abstract**

As a leading provider of space-based water, carbon and temperature insights, constellr's mission is to advance understanding of the planet's ecosystems, enabling a more equitable and sustainable future governance of global resources. 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 optimizing agricultural efficiency is to supplement and re-place traditional methods with predictive and smart agriculture. Central to constellr's mission is the provision of a robust data basis to drive 'more crop per drop': using its constellation of infrared monitoring satellites called HiVE (High-precision Versatile Ecosphere Monitoring Mission), constellr precisely measures the actual temperature of crops at a subfield level, daily and across the full globe. The primary goal is to provide global land surface temperature (LST) imagery optimized for high-precision agriculture and sustainable water management. With temperature readings, the system can monitor vegetation, soil health, derive insights on water and monitor industrial activities with unprecedented accuracy. 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 as water, 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 for smart water management today. HiVE is going to fill this gap starting 2024. 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. A final outlook is given on the overall socio-economic impacts that the system can deliver, such as water and CO2 savings as well as end-users economic benefits.