Hyperspectral and in situ data fusion for the steering of plant production systems

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Plant production systems are governed by biotic and a-biotic factors and by management practices. Some of the relevant parameters have already been identified and incorporated as inputs into existing models for production assessment, early-warning, and process management. These parameters originate nowadays primarily from in-situ measurements and observations. Non-invasive remotely sensed data, the diagnostic tools of excellence where it concerns the interaction of solar energy with biomass, have seldom been included and if so, mostly to support yield assessment and harvest monitoring only. The availability of new-generation hyperspectral/hypertemporal signatures will greatly facilitate their integration into full-fledged plant production model either via direct use, forcing, assimilation or re-initialization strategies.

The main objective of IS-HS (Integration of In Situ data and HyperSpectral remote sensing for plant production modeling) is to set up a multidisciplinary research platform to deepen our system understanding and to develop production-oriented schemes to steer capital-intensive vegetation scenarios. Real-time steering in a 10-15 year timeframe is envisaged, where current system state is monitored, and steered towards an ideal state in terms of production quantity and quality. IS-HS focuses on hyperspectral sensor design, time series analysis tools for remote sensing data of vegetation systems, on the establishment of two stream communication between satellite and ground sensors, on the development of citrus plant production systems, and on the design of in-situ data sensor networks. The general framework of this system approach will be presented.

In time, this integration should allow to cross the bridge from post-harvest assessment to near real-time potential and actual yield monitoring in terms of crop.