**Retrieval of physiological plant traits using airborne imaging spectroscopy and thermal data: physical vs. data driven methods**

Pablo J. Zarco-Tejada[1]

[1] The University of Melbourne

Progress made in hyperspectral remote sensing methods over the last 20 years has enabled the development of new spectral traits linked to plant functioning, including the quantification of the solar-induced fluorescence. New developments in sensor miniaturization and physical modelling techniques have enabled a fast progress in the estimation of such plant traits and on the early detection of stress as part of precision agriculture and plant breeding efforts. Although a tremendous push in hyperspectral and thermal technology has been achieved, proper interpretation of the spectral signatures is required to quantify traits linked to plant photosynthesis and transpiration. Empirically-based data-driven methods have re-emerged as part of new artificial intelligence algorithms offering new capabilities for the analysis of large spectral datasets. Nevertheless, limitations of these empirical methods exist as they lack proper understanding of the photon-vegetation interactions and the physiological drivers underlying such non-linear relationships. The use of these physiology-based spectral plant traits along with deep-learning algorithms will be described, discussing the successes and limitations for the operational use in plant breeding and precision agriculture.