HIGH PERFORMANCE DUAL FIELD OF VIEW SPECTRORADIOMETER WITH NOVEL INPUT OPTICS FOR, AUTONOMOUS REFLECTANCE MEASUREMENTS OVER AN EXTENDED SPECTRAL RANGE

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Abstract:

In field spectroscopy the bi-directional reflectance values from plant canopy or ground surface requires a measurement of the downwelling irradiance and the upwelling radiance. Accurate radiance measurements can be achieved with a uniform and well defined field-of-view, with irradiance measurements requiring the input optics to have a true cosine response. In addition the two measurements are required to be near simultaneous to minimise the effect of variations in ambient lighting levels. Many of the spectroradiometer systems in use today adopt a single field of view and reflectance panel to take sequential reference (irradiance) and target (radiance) measurements. In this setup, manual and repetitive measurements are required to minimise the uncertainty due to known or unknown ambient light fluctuations. In addition to these uncertainties, the known anisotropies of reference reflectance panels lead to further, significant irradiance and reflectance uncertainties across the spectral range of the instrument.

We will present a new field spectroradiometer with novel dual field-of-view input optics for repetitive autonomous reflectance measurements across the V-SWIR spectral range (400 to 1700nm). Careful attention to the optical design of the system has minimised uncertainties by ensuring a uniform and well defined field-of-view and a high accuracy cosine corrected irradiance fore optic across the full spectral range of the measurement.

The system design includes just one set of silicon and InGaAs array based spectrometers to provide the dual field of view operation, saving on cost, weight and power consumption. Care has been taken when selecting the spectrometers and detector arrays to maximise their performance for linearity, thermal stability and low stray light levels. An internal microprocessor provides full stand alone control and automation to capture daily timed measurements sequences throughout a measurement trial or season.