

Novel techniques and technologies for polarimetric remote sensing

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I will provide a quick overview of new ways of measuring polarization that we are exploring in our group. Depending on time, this may include: 1) We have developed a range of SPEX instruments for use on the ground, in space, and on smartphones, which are based on spectral polarization modulation for highly accurate multi-angle spectropolarimetry for aerosol characterization. 2) We are currently investigating the development of a “spectropolarimeter on a chip” by implementing micropatterned spectral and polarization filters on top of detector pixels. By also invoking with the dark art of compressive sensing we aim to build a heavily miniaturized and generic spectropolarimetric imaging sensor. 3) For the TreePol instrument, we have combined a classical dual-beam approach with rapid liquid-crystal temporal modulation for high-sensitivity circular spectropolarimetry of biological samples in the lab and in the field. 4) We have been capitalizing heavily on the new opportunities offered by patterned liquid-crystal retarders. One revolutionary new liquid-crystal component is the Polarization Grating, that splits circular polarization states in diffraction orders ± 1 with extremely high efficiency over a large spectral range. We have, for instance, applied a PG in a spectropolarimetric integral field unit. 5) We have prototyped a so-called “polychromatic modulator” that offers full-Stokes temporal modulation in a very chromatic way with close-to-optimal polarimetric efficiencies for all Stokes parameters over an extreme wavelength range of 300-2500 nm.