Vegetation indices detecting the effect of climate change on vegetation

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"INCREASE" infrastructure (funded by EU 7th Framework Programme) is designed for studying long-term effects of climate change on shrubland vegetation by field experiments. Climate manipulation techniques involve experimental drought and warming treatments in field conditions using sensor-controlled curtains. Plastic curtains controlled by rain sensor are used for extended summer drought, and night-time warming is achieved by covering the vegetation with IR-reflective curtains at night (controlled by a light sensor).

We conducted reflectance measurements in Porto Conte experimental site (Italy) during April 2011 and in Mols site (Denmark) in August 2011. Canopy level reflectance was measured from nadir at 1 m height above the canopy with Field Portable Spectroradiometer SVC HR-1024 using fiber optics (FoV 8 deg.).

Majority of vegetation indices we tested were capable to detect differences between treatments at canopy scale. Vegetation on control plots appeared less stressed than in drought and warming treatment plots by Photochemical Reflectance Index (PRI). Plant Senescing Reflectance Index (PSRI) also suggested that carotenoids to chlorophyll ratio was lower on control plots than treatment plots. Drought treatment plots had lower Anthocyanin Reflectance Index (ARI) and higher Normalized Difference Nitrogen Index (NDNI) values.