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Relationship between PRI-MODIS and LUE in a Mediterranean deciduous forest under water stress condition

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In this study the relationship between ecosystem-level light-use efficiency (LUE) obtained from eddy covariance data and MODIS-derived values of PRI (Photochemical Reflectance Index) for a Mediterranean Quercus cerris L. forest site (Roccarespampani, Viterbo , Italy) in two different years was investigated. The years considered are contrasting in temperature and rainfall conditions (i.e. 2003, dry, and 2004, wet). The PRI relates LUE to the de-epoxidation xanthophyll state which is linked to the biochemical mechanism down-regulating photosynthesis to prevent photo-oxidative damage in leaves. It is based on the reflectance at 531 and 570 nm, according to the following relationship PRI = (R531 – R570) = (R531 + R570). The aim of this study is to investigate the relationship between LUE and a scaled PRI (sPRI) for a Mediterranean Quercus cerris L. forest site (Roccarespampani, Viterbo, Italy) in two different years. Variations in canopy reflectance related to the xanthophyll cycle were detected using MODIS sensor ocean band 11 centered at 531 nm and band 12 (551 nm) was used as reference. Strong correlation between MODIS-sPRI and LUE were found, only during the wet year (2004), and only for backscattering scenes. Future studies could be investigated to test whether physiological reflectance signals are affected by sun position, heterogeneous landscape or atmospheric interfaces.