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Combination of hyperspectral measurements of forest structure and biochemistry with the Hydrall process model to estimate the carbon exchange of a Mediterranean forest

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The carbon exchange of vegetation is strongly affected by the structure and biochemistry of the plant canopy; whilst light interception is a direct function of canopy closure and LAI, leaf and canopy photosynthetic potentials and respiration are known to be directly related to leaf nitrogen content.

In the present study, images of a Mediterranean forest were obtained with two hyperspectral scanners (MIVIS and VIRS) on an aerial platform and combined with ground truth from a variety of vegetation types and age and fertility classes. The indices best related to canopy LAI and leaf nitrogen concentration were consistent with previous laboratory and field reports. The resulting maps of canopy structure and biochemistry were combined with the Hydrall process model to simulate the carbon exchange of the forest in the period of the overflight, and compared with flux data from an eddycovariance tower located within the scene. The relevance of accounting for different vegetation types and for actual canopy structure and biochemistry was explored by means of the model.