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Sediment connectivity and vegetation in contrasting Mediterranean catchments: an essential ecogeomorphological framework

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Soil-plant interactions at ecological scale are one of the most exciting challenges to let us understand the complex relationship between the biotic and abiotic components of the ecosystems. Connectivity, defined as the transfer of matter between two different landscape compartments, is used as a synthetic approach linking ecology, hydrology and geomorphology. Little research explicitly recognizes the different scales over which hydrological connections are made and how are investigated in relationship with plant communities behavior. It is necessary to develop investigations to examine how central themes can be useful at a range of scales. New technologies and methodologies with improved spatial and temporal resolution represent a good opportunity to monitor the vegetation evolution as well as the erosion and transport processes across different spatial and temporal scales. The remote sensing approaches on geosciences research has seen during the last two decades a revolution in topographic data measurement, with both a substantial increase in the rate at which it is possible to acquire precise, three-dimensional terrain data and the ease with which associated methods can be applied. In conjunction with remote sensing technologies, there is a possibility to develop hybrid approaches using developments in a range of technologies together to achieve a better approximation of processes. Therefore, geomorphological models that explicitly include biotic effects are necessary to explore how intrinsically small-scale biotic processes can influence the form of entire landscapes, and to determine whether these processes create a distinctive topography. A previous survey developed by the research team showed a local significant relationship between the sediment connectivity index and the plant vigor through the Blue Normalized Vegetation Index (BNDVI) using high-resolution imagery obtained from an Unmanned Aerial Vehicle (UAV) in a micro-catchment. We plan to up-scale this relationship using satellite imagery from a range of contrasting Mediterranean catchments as typical examples of drylands ecosystems. The utility of this methodology to study the local relationship between sediment connectivity and vegetation patterns will be further discussed for the assessment of ecosystem dynamics and management.