64. EO4Des: From Earth Observation to Decision Support for Desertification Risk Management in Mediterranean Landscapes

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Desertification monitoring in Mediterranean environments requires the interpretation of land-surface responses generated by interacting climatic forcing, vegetation dynamics, soil conditions and land management. The resulting spectral and thermal signals vary with season, spatial support and observation conditions, which limits the reliability of approaches based on isolated indicators or direct aggregation of heterogeneous satellite variables. The Earth Observation for Desertification project develops a process-based multivariate framework in which Principal Component Analysis constitutes the proposed integration mechanism. The methodological design constrains each candidate variable according to its physical relationship with the degradation process, temporal representativeness, spatial support and reference conditions before multivariate analysis is performed. Standardized observations are represented in a common feature space in which component loadings describe the contribution of the original variables to the dominant covariance structures, whereas component scores characterize the multivariate state of each observation. The resulting latent gradients are intended to support the identification of recurrent environmental stress configurations, whose relevance to land degradation must subsequently be tested against independent information on soil condition, vegetation functioning, water availability and land management. Project activities in Sicily and Apulia provide empirical evidence of the temporal and reference-condition controls required before multivariate integration. The proposed geospatial infrastructure preserves analytical provenance throughout processing and dissemination. The contribution therefore defines the methodological basis for a multivariate transition from satellite observations to independently corroborated evidence of land stress and, subsequently, to desertification susceptibility assessment; a project-wide multivariate solution is not presented because the harmonized analytical dataset is still under development.