B061-0012 - Land surface phenology and climate identify forests of different functional characteristics in Southern Patagonian, Argentina

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Abstract

Mapping forest resources is essential for biodiversity conservation, and remote sensing is the most efficient way to do so over large areas. Yet mapping forest types is still a challenge, when different types have similar spectral signatures, and when ground reference data is lacking. Remotely-sensed images can capture differences in the phenology among forest types and species, which is important for mapping complex forest type gradients and ecosystem functions. Our goal was to identify forests of different functional characteristics in Southern Patagonia, Argentina, through a non-supervised cluster classification. Specifically, we compared two datasets for characterizing forest groups (1) land surface phenology alone, and (2) land surface phenology combined with climate data. For phenology, we fitted a harmonic EVI (enhanced vegetation index) annual curve based on Sentinel 2A and Landsat 8 surface reflectance, and calculated a) a harmonic amplitude metric, b) the peak of the growing season, c) EVI 90th and d) 10th percentile. For climate, we calculated land surface temperature (LST) from Band 10 of the thermal infrared sensor (TIRS) of Landsat 8, and precipitation from Wordclim (BIO12). We performed the cluster analysis based on Xmeans algorithm followed by hierarchical clustering analysis. The resulting clusters based on phenology, LST and precipitation outperformed the clusters based on phenology alone, and clearly distinguished 5 forest groups: (i) ecotonal forests dominated by *Nothofagus antarctica* and under the influence of the Atlantic Ocean, (ii) inner island broadleaved forests, (iii) forests dominated by *N. pumilio*, (iv) mixed evergreen forests (i.e. *N. betuloides* and *N. pumilio*), and (v) mountain environments with broadleaved and mixed evergreen forests. Our results highlight the potential of integrating remotely sensed phenology, land surface temperature and precipitation as input data for cluster analysis to map forests with different traits and ecosystem functions. Our maps facilitate the inclusion of a functional ecology perspective into sustainable forest management and conservation strategies at the landscape level.

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