

Current Distribution of Ecosystem Functional Types in Temperate South America

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Abstract.

We described, classified, and mapped the functional heterogeneity of temperate South America using the seasonal dynamics of the Normalized Difference Vegetation Index (NDVI) from NOAA/AVHRR satellites for a 10-year period. From the seasonal curves of NDVI, we calculated (a) the annual integral (NDVI-1), used as an estimate of the fraction of photosynthetic active radiation absorbed by the canopy and hence of primary production, (b) the relative annual range of NDVI (RREL), and (c) the date of maximum NDVI (MMAX), both of which were used to capture the seasonality of primary production. NDVI-1 decreased gradually from the northeastern part of the study region (southern Brazil and Uruguay) toward the southwest (Patagonia). High precipitation areas dominated by rangelands had higher NDVI-1 and lower RREL values than neighboring areas dominated by crops. The relative annual range of NDVI was maximum for the northern portion of the Argentine pampas (high cover of summer crops) and the subantarctic forests in southern Chile (high cover of deciduous tree species). More than 25% of the area showed an NDVI peak in November. Around 40% of the area presented the maximum NDVI during summer. The pampas showed areas with sharp differences in the timing of the NDVI peak associated with different agricultural systems. In the southern pampas, NDVI peaked early (October-November); whereas in the northeastern pampas, NDVI peaked in late summer (February). We classified temperate South America into 19 ecosystem functional types (EFT). The methodology used to define EFTs has advantages over traditional approaches for land classification that are based on structural features. First, the NDVI traits used have a clear biological meaning. Second, remote-sensing data are available worldwide. Third, the continuous record of satellite data allows for a dynamic characterization of ecosystems and land-cover changes.