



Characterising the Land Surface Phenology of Mediterranean Pinus species using the MODIS NDVI time series

Victor Rodriguez-Galiano (1), David Aragonés (2), Rafael M. Navarro-Cerrillo (3), and Jose A. Caparros-Santiago (1)

(1) Physical Geography and Regional Geographic Analysis, University of Seville, 41004 Seville, Spain, (2) Remote Sensing and Geographic Information Systems Lab (LAST-EBD), Estación Biológica de Doñana, C.S.I.C., 41092 Seville, Spain, (3) Department of Forestry Engineering, ETSIAM, University of Córdoba, Agrifood Campus of International Excellence (ceiA3), 14071 Córdoba, Spain

Land surface phenology (LSP) can improve the monitoring of forest areas and their change processes. The aim of this work is to characterize the temporal dynamics in Mediterranean Pinus forests. The different experiments were based on 679 mono-specific plots for the 5 native species in the Iberian Peninsula: *P. sylvestris*, *P. pinea*, *P. halepensis*, *P. nigra* and *P. pinaster*, which were obtained from the Third National Forest Inventory of Spain. The whole MODIS NDVI time series (2000-2016) were used to characterize the seasonal behavior of the pine forest. The following phenological parameters were extracted for each cycle from the smoothed time series: the day of beginning, end, middle and the length in days of season also base value, maximum value, amplitude and integrated value. Multi-temporal metrics were calculated to synthesize the inter-annual variability of the phenological parameters.

An atypical behavior was detected for the years 2004 and 2011 and 2000, 2009 and 2015 for all Pinus species, matching wet and dry cycles, respectively. The inter and intra-species analysis of NDVI and LSP showed two different patterns: an important decreasing during the summer for those species such as *P. halepensis*, *P. pinea* y *P. pinaster*; and a lower NDVI variation among the year for *P. sylvestris* and *P. nigra* in certain areas. *P. sylvestris* had a phenological behavior different to *P. pinea*, *P. halepensis* and *P. pinaster*. *P. nigra* showed a heterogeneous intra-specific behaviour that might be associated to the existence of subspecies with different phenology.