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It's time for a crisper image of the Face of the Earth: Landsat and climate time series for massive land cover & climate change mapping at detailed resolution.

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Combining climate dynamics and land cover at a relative coarse resolution allows a very interesting approach to global studies, because in many cases these studies are based on a quite high temporal resolution, but they may be limited in large areas like the Mediterranean. However, the current availability of long time series of Landsat imagery and spatially detailed surface climate models allow thinking on global databases improving the results of mapping in areas with a complex history of landscape dynamics, characterized by fragmentation, or areas where relief creates intricate climate patterns that can be hardly monitored or modeled at coarse spatial resolutions.

DinaCliVe (supported by the Spanish Government and ERDF, and by the Catalan Government, under grants CGL2012-33927 and SGR2009-1511) is the name of the project that aims analyzing land cover and land use dynamics as well as vegetation stress, with a particular emphasis on droughts, and the role that climate variation may have had in such phenomena. To meet this objective is proposed to design a massive database from long time series of Landsat land cover products (grouped in quinquennia) and monthly climate records (in situ climate data) for the Iberian Peninsula (582,000 km2). The whole area encompasses 47 Landsat WRS2 scenes (Landsat 4 to 8 missions, from path 197 to 202 and from rows 30 to 34), and 52 Landsat WRS1 scenes (for the previous Landsat missions, 212 to 221 and 30 to 34). Therefore, a mean of 49.5 Landsat scenes, 8 quinquennia per scene and a about 6 dates per quinquennium , from 1975 to present, produces around 2376 sets resulting in 30 m x 30 m spatial resolution maps. Each set is composed by highly coherent geometric and radiometric multispectral and multitemporal (to account for phenology) imagery as well as vegetation and wetness indexes, and several derived topographic information (about 10 Tbyte of data). Furthermore, on the basis on a previous work: the Digital Climatic Atlas of the Iberian Peninsula, spatio-temporal surface climate data has been generated with a monthly resolution (from January 1950 to December 2010) through a multiple regression model and residuals spatial interpolation using geographic variables (altitude, latitude and continentality) and solar radiation (only in the case of temperatures). This database includes precipitation, mean minimum and mean maximum air temperature and mean air temperature, improving the previous one by using the ASTER GDEM at 30 m spatial resolution, by deepening to a monthly resolution and by increasing the number of meteorological stations used, representing a total amount of 0.7 Tbyte of data. An initial validation shows accuracies higher than 85 % for land cover maps and an RMS of 1.2 ºC, 1.6 ºC and 22 mm for mean and extreme temperatures, and for precipitation, respectively.

This amount of new detailed data for the Iberian Peninsula framework will be used to study the spatial direction, velocity and acceleration of the tendencies related to climate change, land cover and tree line dynamics. A global analysis using all these datasets will try to discriminate the climatic signal when interpreted together with anthropogenic driving forces. Ultimately, getting ready for massive database computation and analysis will improve predictions for global models that will require of the growing high-resolution information available.