Synoptic circulation patterns associated with large fires in Cantabria (Northern Spain)

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Cantabria (Northern Spain) is not only one of the Spanish regions affected by more wildfires, but also they owe some singularities: most of them happen at the end of the winter and the beginning of the spring, not in summer, as it is usual in Mediterranean regions, and they are connected with strong downslope winds events. The purpose of this contribution is to analyze the characteristics of the meteorological situations associated with large wildfires in Cantabria, since the forecasting of those events is a challenge task for the local and regional authorities, fire-fighters, environmental planners etc.

To obtain a characterisation of the atmospheric conditions conductive to those events, several surface, low- and mid-tropospheric meteorological variables were extracted from the NCEP/NCAR reanalysis database, for a selected window (25W-15E and 25N-55N). Besides, the atmospheric information was completed using upper rawinsonde data from Santander-Centro and Madrid-Barajas stations (Instituto Nacional de Meteorología, España) and hourly surface data from automated meteorological stations (CIMA; Centro de Investigaciones Medioambientales, Consejería de Medio Ambiente, Gobierno de Cantabria). Composite and anomaly fields were elaborated and tested using a two tailed t-test, to objectively highlight areas where climatic anomalies are significantly different from the climatology. The wildfire database consists of daily values of number of fires and area burnt by fire occurred in Cantabria within the 2000-2005 study period, provided by the Servicio de Montes, Consejería de Ganadería, Gobierno de Cantabria. Because a small proportion of fires accounts for a large proportion of the total burned area, we selected days with a minimum number of active fires or surface burnt above the 90th percentile of the complete database.

This analysis has shown that large wildfires in Cantabria are related with an atmospheric circulation pattern dominated by a strong ridge located over the Iberian Peninsula or the Western Mediterranean Basin, and a through over the Atlantic Ocean. A strong westerly to southwesterly flow is enhanced by the steep pressure gradient, causing an anomalous advection of warm and dry air masses. Analysis of rawinsonde data and backward trayectories shows that the origin of this advection can be located southward the Iberian Peninsula, moving through central Iberia. Because their thermodynamic characteristics, those air masses do suffer a warming during its descend along the northern slopes of the mountains, due to adiabatic compression, but not because

the release of condensation latent heat.

A Fire Weather Index (FWI), a numerical rating used to estimate risk of fire, which takes into account the effects of fuel moisture and surface weather parameters on fire behaviour, and used by the INM to alert of fire risk in Spain, was calculated in several meteorological stations of Cantabria, ranging from the coastline to the inner mountains. Results show that the situations of high risk are much more common in the interior, although many of them do not result on actual fires, due to the dependence of fire regimen on cultural practices.