

Potential solar radiation and land cover contributions to digital climate surface modeling

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Overview: We have designed a series of ad-hoc experiments to study the role of factors that a priori have a strong weight in developing digital models of temperature and precipitation, such as solar radiation and land cover. Empirical test beds have been designed to improve climate (mean air temperature and total precipitation) digital models using statistical general techniques (multiple regression) with residual correction (interpolated with inverse weighting distance).

Aim: Understand what roles these two factors (solar radiation and land cover) play to incorporate them into the process of generating mapping of temperature and rainfall.

Study area: The Iberian Peninsula and supported in this, Catalonia and the Catalan Pyrenees.

Data: The dependent variables used in all experiments relate to data from meteorological stations precipitation (PL), mean temperature (MT), average temperature minimum (MN) and maximum average temperature (MX). These data were obtained monthly from the AEMET (Agencia Estatal de Meteorología). Data series of stations covers the period between 1950 to 2010.

Methodology: The idea is to design ad hoc, based on a sample of more equitable space statistician, to detect the role of radiation. Based on the influence of solar radiation on the temperature of the air from a quantitative point of view, the difficulty in answering this lies in the fact that there are lots of weather stations located in areas where solar radiation is similar. This suggests that the role of the radiation variable remains "off" when, instead, we intuitively think that would strongly influence the temperature.

We have developed a multiple regression analysis between these meteorological variables as the dependent ones (Temperature and rainfall), and some geographical variables: altitude (ALT), latitude (LAT), continentality (CON) and solar radiation (RAD) as the independent ones.

In case of the experiment with land covers, we have used the NDVI index as a proxy of land covers and added this variable in to the independents to improve the models.

Results: The role of solar radiation does not improve models only under certain conditions and areas, especially in the Pyrennes. The vegetation index NDVI and therefore the land cover on which the station is located, helps improve rainfall and temperature patterns, obtaining various degrees of improvement in terms of modeled variables and months.