For Details, Contact:

J.L. Sánchez

Lab. Física de la Atmósfera
Universidad de León
Campus Universitario
24071 Leon
Spain
dfqjsg@unileon.es

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Application of a statistical model to the prediction of thunderstorms

J.L. Sánchez, E. García. J.L. Marcos, Lab. Física de la Atmósfera. Universidad de León.

It is very important for a great variety of economic activities to have access to reliable models that are able to predict summer thunderstorms. In most cases there is a need for a model of short-term prediction establishing very clearly the dichotomy: thunderstorm risk yes/no.

For the building up of such a statistical model several meteorological data are necessary so that the weather conditions may be characterized correctly. Thus, a local sounding is usually employed, since it provides the vertical distribution of several variables. The data provided by meteorological stations are also very useful. The establishment of a statistical model requires an initial amount of certain data determining the values of the variables in the two possible situations: storm or no storm.

A ground network for meteorological observation has been used in León (Spain) since 1991. Its spatial distribution is of one observer every 15 km^2 approximately. This network allows the classification of the meteorological situations into two groups: storm day and no-storm day. Thus, the corresponding meteorological databases are easily established.

For this model 15 different meteorological variables were used. 11 were obtained from the data provided by the sounding and the rest of them from a meteorological station on the ground.

The model selected is the one known as logistic regression, which provides the answer - storm risk yes/no - taking into account the meteorological variables chosen. The sample consists of 229 days, 78 of which were storm days. A test sample of 152 days was employed to build up the model. Once the model equations were obtained, they were applied to the test sample.

The paper presents the results and the importance of each variable in the model, depending on whether

more

different variables were taken into account or not. Thus, with the 15 variables selected, FAR = 0.205 (false alarm ratio) and TSS = 0.644 (true skill score) were found. The minimum temperature during the night before, which is called TMIN, is the variable that plays the most important role in this model.