Master thesis Statistics in cooperation with the department of Physics (Anja Raedler), LMU

Supervision: Prof Helmut Küchenhoff and Andreas Bender, Department of Statistics

Title

"Analysis and evaluation of an additive logistic regression with respect to temporal and spatial dependency of its predictor variables"

Aim:

An additive logistic regression has been applied to physical parameters derived from reanalysis data and lightning observations in order to better model the probability for thunderstorm occurrence.

The physical parameters have been assumed to be independent, both temporally and spatially. This assumption does not hold in reality for atmospheric data.

It should now be analyzed how a consideration of temporal and spatial dependency of the predictor variables changes the quality of the predictand.

Background:

The relations between lightning occurrence over Europe from the European Cooperation for Lightning Detection (EUCLID)[i] network and parameters derived from the ERA-Interim[ii] global atmospheric reanalysis, produced at the European Centre for Medium-Range Weather Forecasts (ECMWF) were studied to increase the understanding of the conditions under which thunderstorms form.

The objective was to identify relevant factors beyond instability and convective inhibition, in order to better model thunderstorms using numerical weather prediction or climate model data.

ERA-Interim is a state-of-the-art reanalysis dataset representing the atmosphere every six hours, available on a 0.75°x0.75° horizontal grid. Over the entire 6 year period from 2008 to 2013, 9977984 data points result in total in the study area.

A statistical model was developed for the occurrence of electrified convection across Central Europe, based on ERA-Interim reanalysis data and EUCLID lightning detection data.

The model was developed by fitting an additive logistic regression to multiple selected physical parameters, whose individual relation to lightning occurrence was studied *a priori*.

Requirements:

- Skills for big data sets in R

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[i] http://www.euclid.org/ ;
http://www.schweizerbart.de/papers/metz/detail/26/86504/Identification_of_favorable_environments_for_thunderstorms_in_reanalysis_data.
[ii] D. P. Dee et al (2011), The ERA-Interim reanalysis: configuration and performance of the data assimilation system, Q.J.R. Meteorol. Soc., Vol. 137: 553-597, DOI: 10.1002/qj.828