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Concerning Thunderstorm Potential prediction

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(Poster)
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The physical-stochastic approach has been applied to improve ideas referred to in a very early, work: "The prediction of air mass thunderstorms and hails" by Lityńska , Parfiniewicz & Piwkowski, 1976.
With the accuracy to statistic method - the method used is almost identical with Collins&Tissot (CT), 2007 (http://lighthouse.tamucc.edu/dnrpub/nn-channel-3.wmv). Here the decomposed and generalised Kalman Filter (KF)
- i.e. self learning statistic structure (generalised to automatic renewal of the new multi-regression set of parameters), there - self learning Artificial Neural Net. The genesis of these two works is quite independent, however the ROC curves idea has been adopted from the CT to reverse continues (quantitative) probabilistic input signal onto qualitative [0,1] output. The actual proposition recapitulate the earlier authors doing searches on Tornado prediction, (Parfiniewicz et all, 2011), which clearly indicates that current NWP models are not be able to predict strong convection events in frame of pure hydro- dynamical approach.
The algorithm is learning - "good forecasting" - basing on meteorological stations (observations by SYNOP WW key)
and lightning activity detected by the SAFIR/PERUN network system restored every 1h. The "universal" forecasting
signal is generated by COSMO-7km model and the local stochastic response is then taken with one-hour-step on each
grid network via interpolation from neighboring stations statistic characteristic (called "modified climate").
To forecast thunderstorm (convectivity) the 21 predictors (the physical parameters calculated from COSMO model)
has been chosen. They might be gathered into 5 categories that describe the state of atmosphere via: humidity (the several indexes), available convective (instability) energy (the several indexes, including CAPE derivatives), stratification of atmosphere (including the height of the isotherm 0 C and -20 C), the synoptic background (vorticity, pressure tendency, vertical velocity). These 21 potential parameters guarantee that maximum part of thunderstorm dispersion was described for each of the 57 synoptic stations. From these 21 potentially available indexes every 1h a set of 5 indexes is automatically modified (what means some generalisation to KF).
Parallel to predictability of the thunderstorm the Strength of Convection in the 0-7 scale (from its absence to thunderstorm with hail) is being taken for calculation basing on the WW SYNOP key. The predictions in maps formats and diagrams are tested on IMGW aviation portal. Currently calculated POD and FAR indicators are relatively high (0.6-08, 0.2-0.4) depending on the station, the correlation (1point/1h) is about 0.5 but for time/space surroundings it is much higher.

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