

# Probabilistic 0-12 h forecasts of (severe) thunderstorms in the Netherlands

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In this project the technique of Model Output Statistics (MOS)<sup>1</sup> has been used to derive logistic regression<sup>1</sup> equations for the (conditional) probability of (severe) thunderstorms in the warm half-year (from mid-April to mid-October) in the Netherlands. For 12 regions of about 90×80 km<sup>2</sup> each and for projections out to 12 hours in advance (with 6-hour periods), we have developed these equations using four different potential predictor sources. They consist of combined (postprocessed) output from the HIRLAM and ECMWF models, as well as an ensemble of 18 members of advected radar and lightning data. The predictands are derived from reprocessed SAFIR<sup>2</sup> lightning data, being either the probability of a thunderstorm ( $\geq 2$  discharges) or the conditional probability of a *severe* thunderstorm ( $\geq 50$  discharges/ 5 min. and possibly  $\geq 100$  discharges/ 5 min. and  $\geq 200$  discharges/ 5 min.) under the condition that  $\geq 2$  discharges will be detected. The dataset used for the development consists of  $\frac{2}{3}$  part of the July 2002 to July 2005 data (warm half-years only) and the independent verification set consists of the remaining  $\frac{1}{3}$  part.

Figure 1a shows an example of a probabilistic forecast of severe thunderstorms and Figure 1b shows the observed maximum 5-min. lightning intensity.

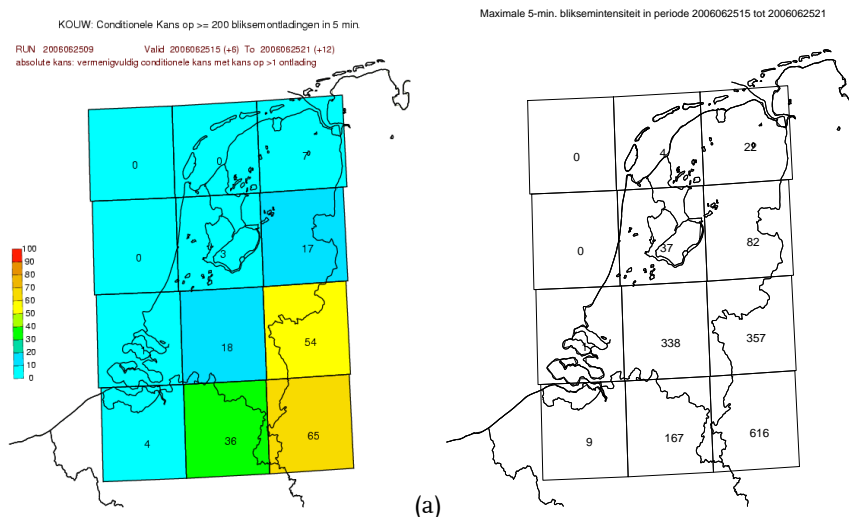


Figure 1. (a) +6 to +12 h (conditional) probability forecast (%) of maximum 5-min. lightning intensity  $\geq 200$  discharges/ 5 min. for 15-21 UTC on June 25 2006. This forecast is based on the 09 UTC run of the MOS system. (b) Maximum 5-min. lightning intensity, as detected by the SAFIR network, during the same period.

We can conclude from the objective verification results for the independent dataset (not shown) that the overall skill of the MOS (severe) thunderstorm forecast system is good. Therefore, the system was made quasi-operational at KNMI in April 2006. The thunderstorm forecast system shows the best skill for the afternoon (12 and 15 UTC) and evening (18 and 21 UTC). The *severe* thunderstorm forecast system shows the best skill for these central verification times as well.

Finally, future developments in our MOS system may be even more extreme criteria for severe thunderstorms together with the inclusion of advected Meteosat Second Generation (MSG) data as a potential predictor source.

## References

- 1) Wilks, D.S., 1995, *Statistical methods in the atmospheric sciences: an introduction*, Academic Press, San Diego/London, 467 pp.
- 2) Wessels, H.R.A., 1998, *Evaluation of a radio interferometry lightning positioning system*. KNMI Scientific Report WR 98-04, De Bilt, The Netherlands.