

Forecasted satellite images for a severe weather event in the Netherlands

Y. Hinssen, G. van der Grijn, and I. Smeding-Zuurendonk
MeteoGroup, Wageningen, Netherlands (hinssen@meteogroup.com)

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Tracking of Radar Echoes by Correlation (TREC) is a method that is used to determine forecast radar images. It is based on displacement vectors computed using a correlation analysis of two subsequent radar scans. TREC has been further developed within the MeteoGroup and is used successfully in near-real time precipitation forecasting. This system has been dubbed MTREC. Due to its generic nature, MTREC can be used to detect movement in all sorts of images. In the current study it is used to compute displacement vectors for clouds from the correlation between two subsequent high resolution visible satellite images. These displacement vectors are then used for advecting individual satellite pixels to determine forecast satellite images. To distinguish clouds from the background land and sea, clear sky reference images are constructed and only pixels with a pixel value substantially above the reference value are displaced. Forecast satellite images could help the forecaster in improving the short term forecast for clouds, including cloud systems containing thunderstorms.

As an example, MTREC is applied to the situation of 14 July 2010, the day when KNMI (the Royal Netherlands Meteorological Institute) released a weather alarm for heavy precipitation, thunderstorms and wind gusts for eastern parts of the Netherlands. Caravans were blown through the air and a few high voltage pylons were blown down. Forecasted satellite images could be used to make a quantitative prediction of the timing of the passage of certain cloud systems.

A 3 hour satellite forecast is performed at 15 minute intervals for the period when the cloud system travelled over the Netherlands on 14 July 2010. Comparison with observed satellite images shows reasonable correspondence up to 3 hours ahead. The position of the cloud band over the Netherlands is captured quite well by the forecasted images. The area with clear sky and small scale clouds behind the cloud band is, however, only partly captured by the forecasted satellite images.

To conclude, forecasted satellite images based on the MTREC method can be useful to obtain a prediction of the timing of large cloud systems and associated severe weather phenomena up to 3 hours ahead. The predictive skill of the forecasted images will, however, depend on the situation. Obviously, there is no generation or disappearance of clouds in MTREC. However, clouds can be deformed due to convergence or divergence of the displacement vectors. It should further be noted that while gap filling is needed to deal with divergence of clouds, this will also lead to some smoothing and loss of detail in the forecasted images, especially for large forecast times.