Reliability of windstorm predictions in the ECMWF ensemble prediction system

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1) Introduction

- The focus of the RAIN project is on the impact of extreme weather events on critical infrastructure in Europe
- Interviews with managers of critical infrastructure have shown that reliable forecasts of windstorms (location, timing and intensity) is important for preparations prior to the event
- Ensemble predictions enable the estimation of forecast uncertainties and the prediction of occurrence probabilities of certain windstorm events
- Identification- and tracking algorithms enable an event-based prediction and evaluation of windstorm forecasts

The aim of this work is to estimate and evaluate the spatial uncertainty of windstorm forecasts in ECMWF ensemble predictions

2) Data

Forecast data:

- Forecasts of the ensemble prediction system (EPS) of the European Centre for Medium-Range Weather Forecasts (ECMWF)
- 50 ensemble members
- Available time period: 2006 2010 (Oct.-Mar.)
- Forecasts initialized twice per day at 00 and 12 UTC
- Analysed forecast length of 10 days

Windstorm tracks:

- Osinski et al. (2016) identified windstorm track in the ECMWF forecast data by using the approach of Leckebusch et al. (2008)
- Coherent regions of exceedances of the local 98th percentile of 10m wind speeds are tracked in time by a nearestneighbour approach





5) Results



- The average size of the 50% probability area (A_{05}) is increasing with increasing lead time
- At three days lead time $A_{0.5} = 400,000$ km², which is roughly the size of Germany (357,000 km²)

Frequencies of storm clusters





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- <u>Ideally:</u> In 50 out of 100 50% probability areas (A_{05}) and observed storm should occur within the area
- If this is true also for other forecast probabilities is shown in a reliability diagram
- Here: The forecast probabilities match well with the observed storm frequencies (ERA-interim) up to three days of lead time
- At longer lead times the EPS overestimates the observed storm frequencies





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