

The representation of convective wind gusts in coarse numerical models

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The objective of the EWENT project is to assess the impacts and consequences of extreme weather events on EU transport system *VD*, Offenbach, 15 September 2011



Wind gust threat

- start with ERA-Interim reanalysis
- use climate models to extrapolate to the future

ERA-Interim (1989-2009) Average annual number of days with gusts > 17 m/s





Wind gust threat - RCM projections

- model-mean result
- decrease over much of northern Atlantic
 Ocean and
 Mediterranean Sea.
- increase over Baltic Sea
- small changes over European continent

Multi-model mean of changes in annual wind gust days from 1989-2009 to 2041-2070 > 17 m/s based on 6 regional climate models (ENSEMBLES Project)





Convective component

- problem summer evident
- reason probably convective gusts that are not resolved
- evolution of convective component important for climate projections



ERA-Interim maximum daily gusts 1990-2009 compared with daily maxima from ECAD



Convective component

- how bad is it in other places?
- In Finland, ERA does a better job.



ERA-Interim maximum daily gusts 1990-2009 compared with daily maxima from FMI



Convective component

- peak of poorly represented gusts in summer evident
- two peaks
- sensitivity of environment to gusts varies throughout the year



ERA-Interim maximum daily gusts 1990-2009 compared with daily maxima from ECAD dataset (DWD)

Geographic comparison

percentage of 20 m/s wind gusts that was associated with > 500 J/kg CAPE

size of large bubble/ denotes frequency of winds > 20 m/s

red dot size denotes frequency of winds > 20 m/s[/] with CAPE > 500 J/kg



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Environment of the gusts

blue & red crosses: CAPE> 500 j/kg

gusts occur

- within strong low-level flow
- with deep, moist convection
- often a combination of both





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Conclusions

- ERA-Interim does not represent convectively-enhanced wind gusts well; it was not designed to do so
- The fraction of strong gusts (20 m/s or 25 m/s) related to convection is about 4% in the coastal Netherlands and in Finland, and about 20% across southern Germany and Spain.
- In some areas (S Germany), two distinct annual maxima of wind gusts can be found (convective and non-convective)
- In regions with many deciduous trees, the convective maximum has a higher impact than these percentages suggest
- It is **not O.K.** to ignore take climate model gusts at face value when modelling the present and future risk of wind gusts.





Thank you!