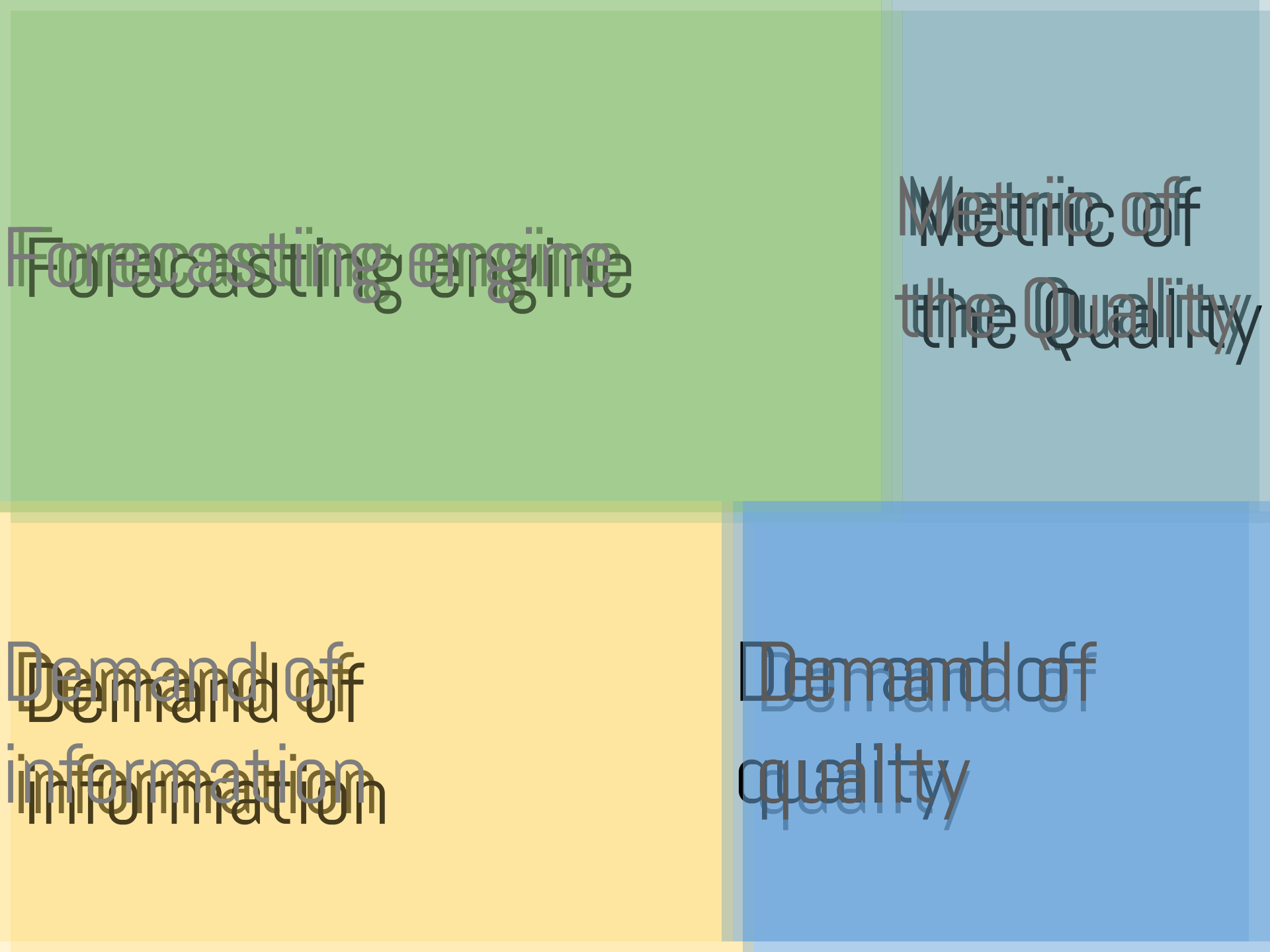
Forecasting engine

Forecasting engine

Metric of the Quality

Demand of information

Demand of quality


Forecasting engine
Metric of the Quality
Demand of information
Demand of quality

perception

/pəˈsɛpʃ(ə)n/

noun

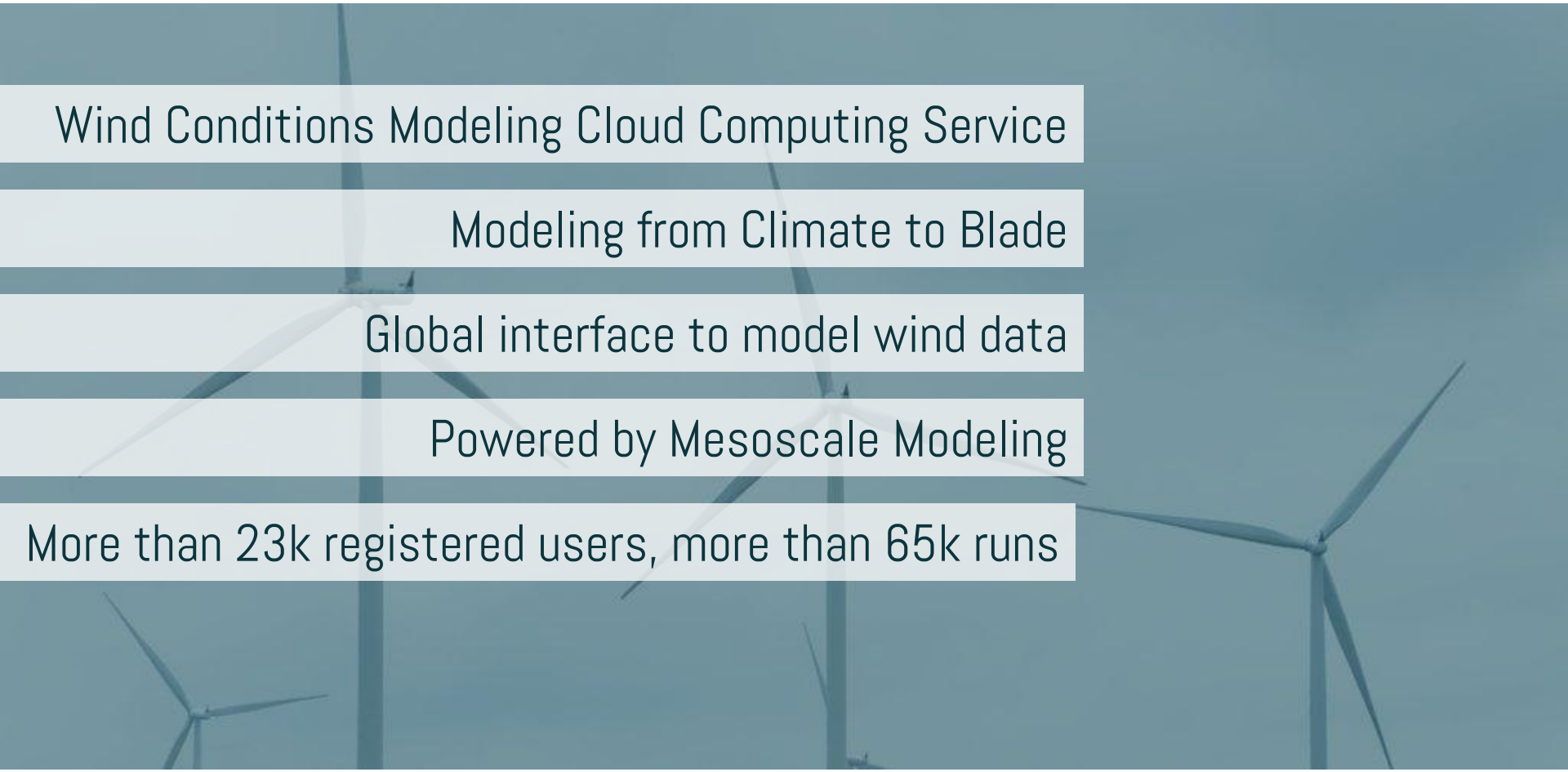
1. the ability to see, hear, or become aware of something through the senses.
   "the normal limits to human perception"

2. **the way in which something is regarded, understood, or interpreted.**
   "Hollywood's perception of the tastes of the American public"

Perceptions on *doing forecasting* for the wind industry

Comments to
gil.lizcano@vortex.es

VORTEX



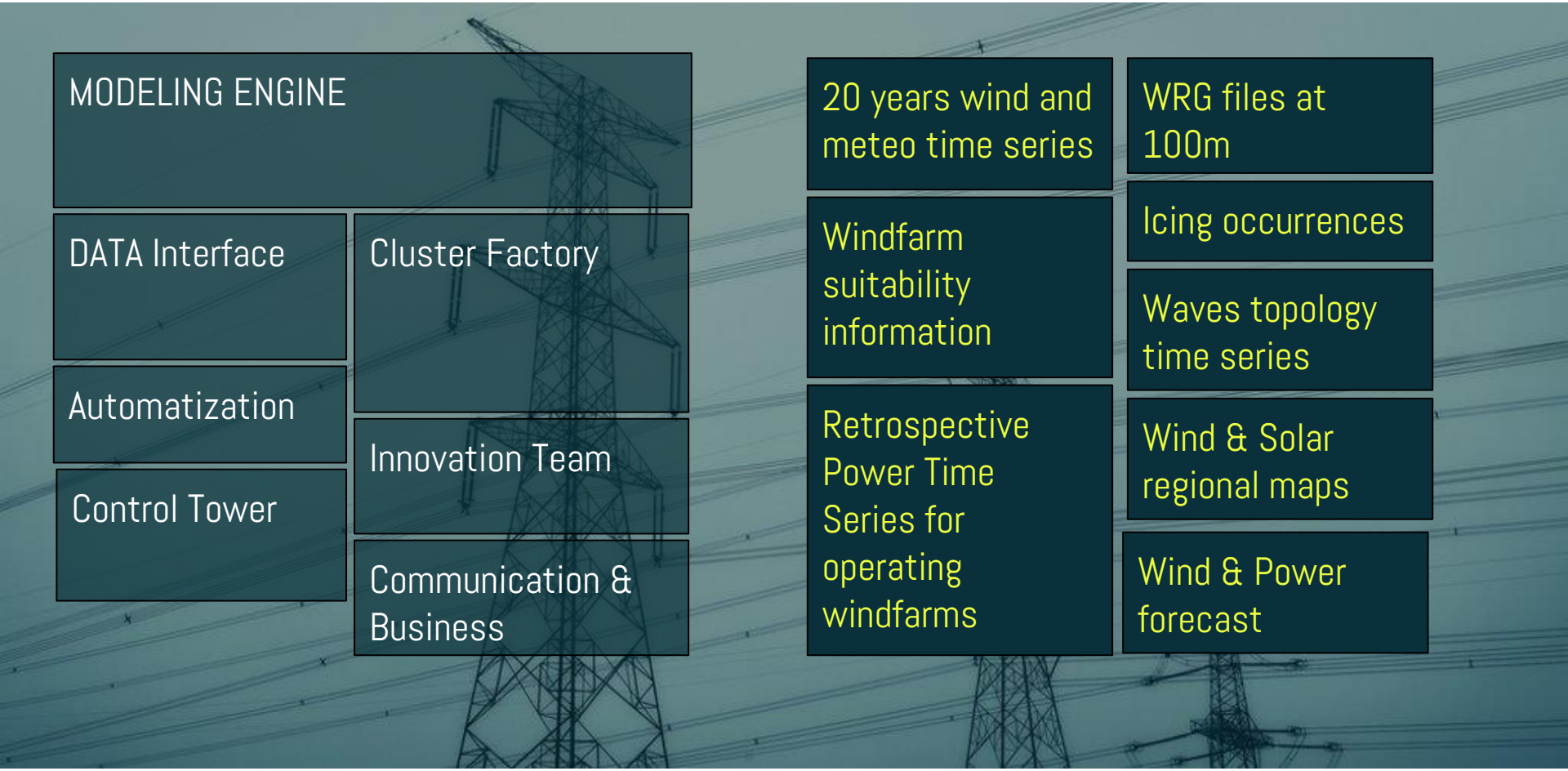
Wind Conditions Modeling Cloud Computing Service

Modeling from Climate to Blade

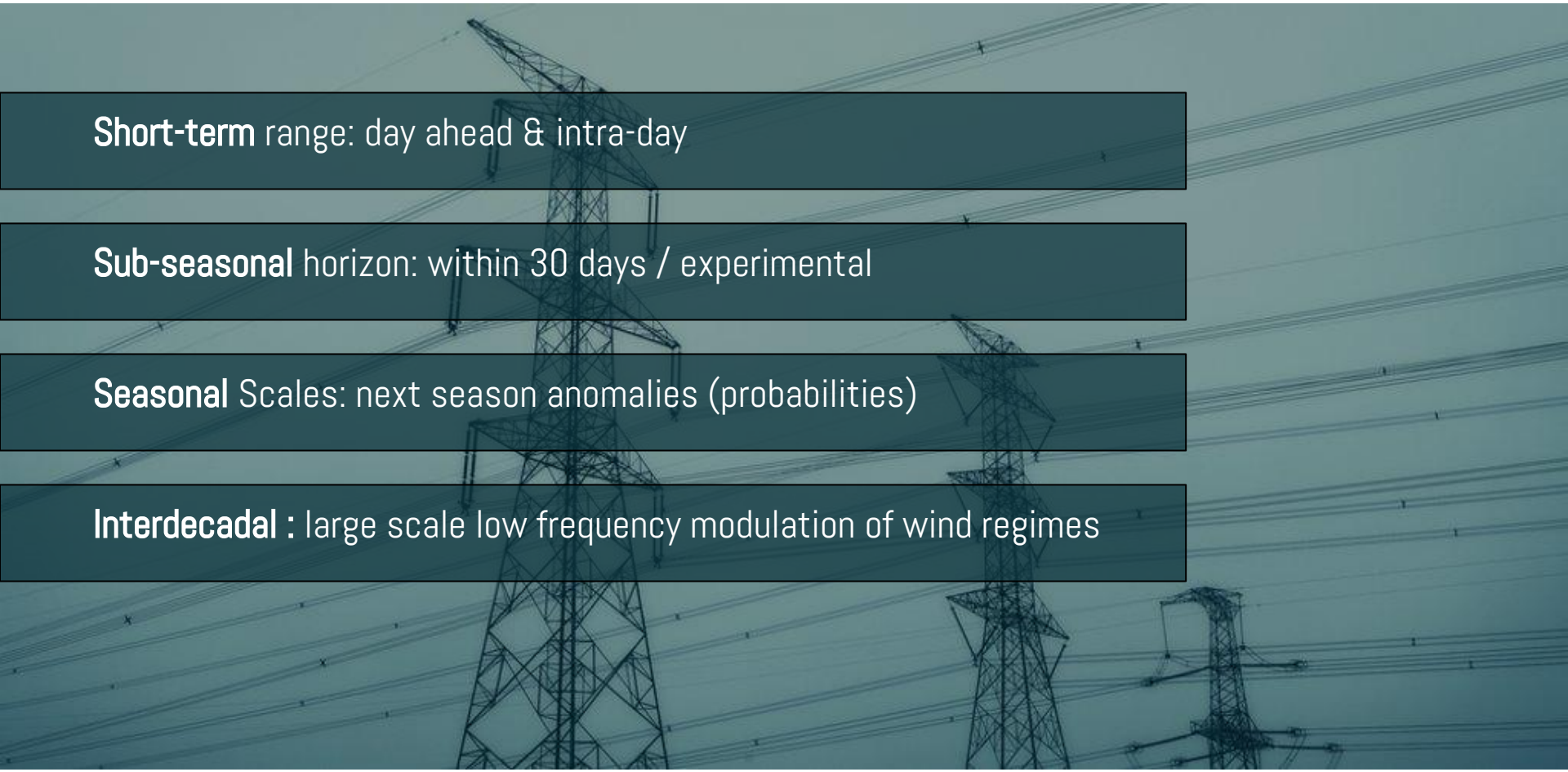
Global interface to model wind data

Powered by Mesoscale Modeling

More than 23k registered users, more than 65k runs


MODELING ENGINE
DATA Interface
Cluster Factory
Automatization
Innovation Team
Control Tower
Communication & Business
20 years wind and meteo time series
WRG files at 100m
Windfarm suitability information
Icing occurrences
Waves topology time series
Retrospective Power Time Series for operating windfarms
Wind & Solar regional maps
Wind & Power forecast

VORTEX Wind & Power Forecasting streams



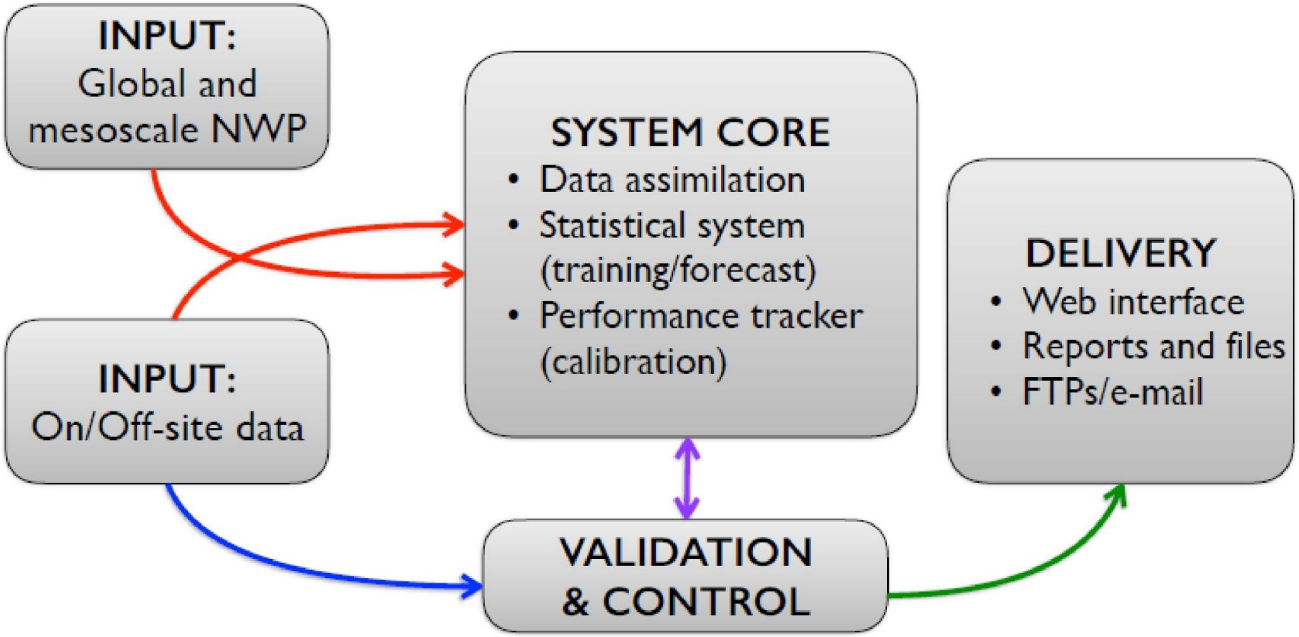
Short-term range: day ahead & intra-day

Sub-seasonal horizon: within 30 days / experimental

Seasonal Scales: next season anomalies (probabilities)

Interdecadal : large scale low frequency modulation of wind regimes

Short-term range: day ahead & intra-day



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Short-term (honestly)

Competitive Market

Value going down

worthless MAE/euros effort

Strong supervision

Validation Standards

Users data standards

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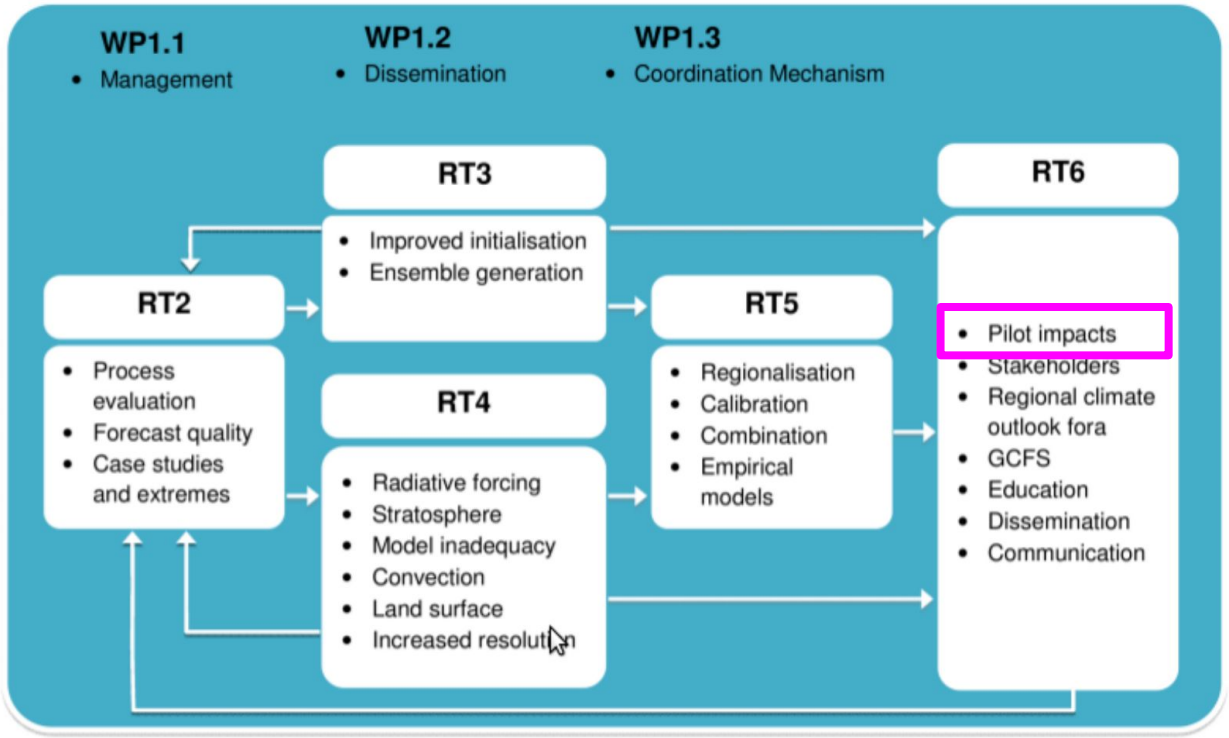
Seasonal Scales: next season anomalies (probabilities)

- DEV: post-processing methods for wind industry
- INTELLIGENCE: Reliability of Seasonal Wind Predictions
- LOBBY: Communicate perceptive and unperceptive advances in seasonal forecast
- KNOWLEDGE: Should we put more effort in seasonal scales predictions ?

SPECS
Seasonal-to-decadal climate Prediction for the improvement of European Climate Services

SEVENTH FRAMEWORK PROGRAMME

SPECS will deliver a new generation of climate prediction systems for seasonal-to-decadal time scales, to provide actionable climate information for a wide range of users



VORTEX

Two reasons seasonal forecast is possible*

- **Answering different questions**:
  seasonal predictions provide estimates of seasonal-mean statistics of weather, typically up to three months ahead of the season in question

- **Slow Motion = More Memory**
  The physical basis for such estimates arises from the effect of predictable seasonal- timescale signals arising from the ocean, and to a lesser extent the land surface, on the atmosphere

* You might have a look to SPECS factsheets (http://specs-fp7.eu/Factsheets)

Model Uncertainty

Predictability

Seasonal products

Perception
(first & end-users)

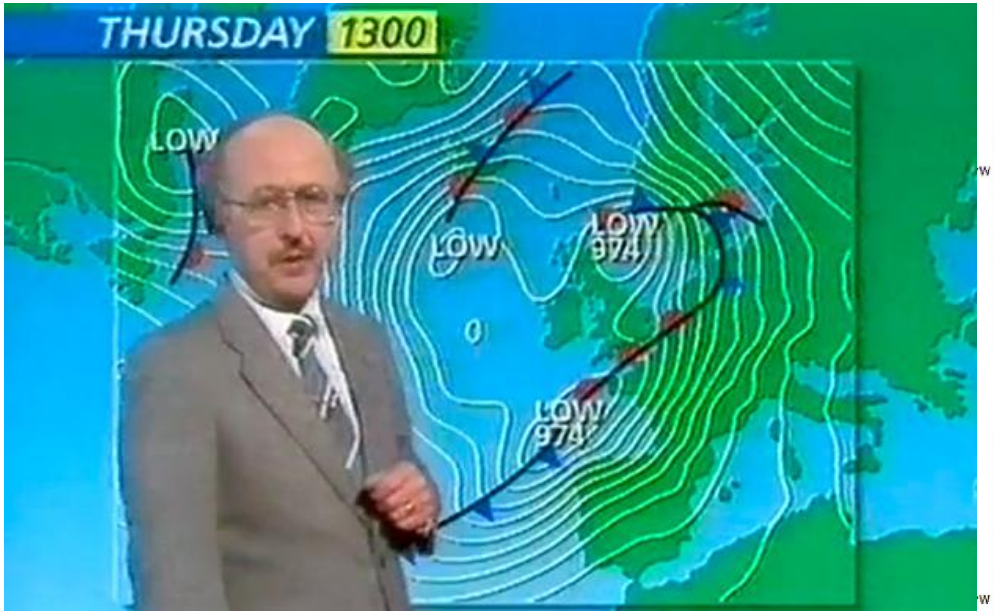
Postprocessing for
Wind Industry

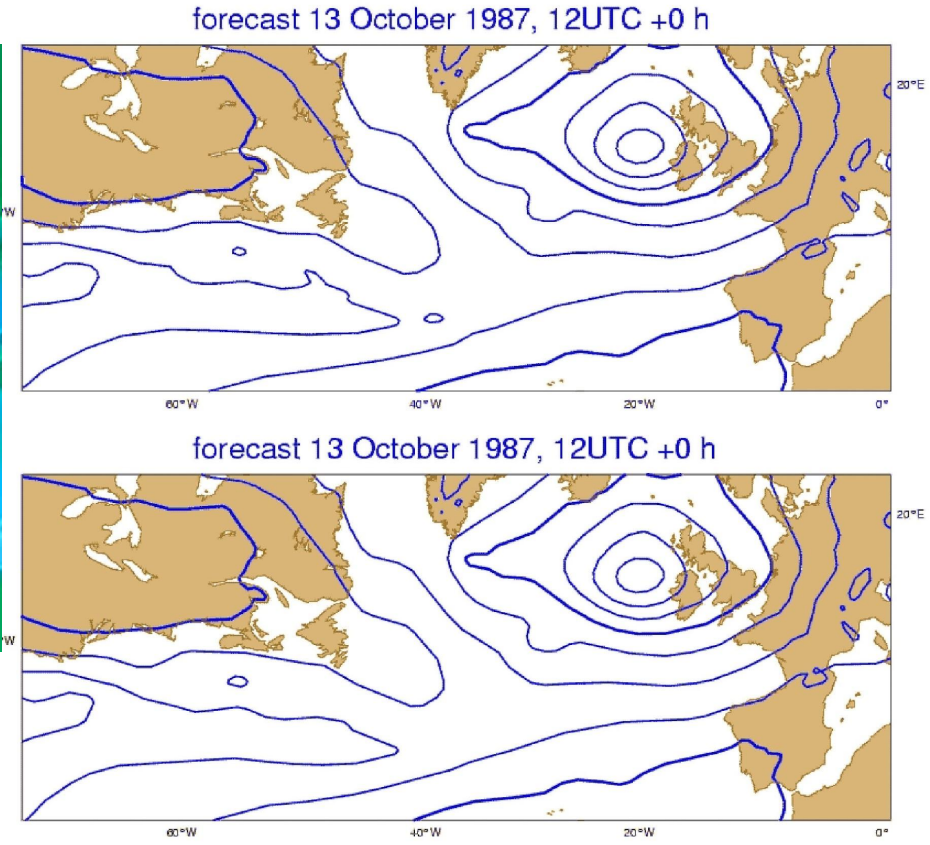
VORTEX

Homeworks

- Work on initialisation: initial conditions for all components (including better ocean), better ensemble generation, etc. Link to observational and reanalysis efforts.
- Model improvement: leverage knowledge and resources from modelling at other time scales (improve sea ice, treatment of volcanic and anthropogenic aerosols, vegetation and land, etc); drift reduction; more efficient codes and adequate computing resources.
- Calibration and combination: empirical prediction (better use of current benchmarks), local knowledge.
- Forecast quality assessment: scores closer to the user, reliability as a main target, process-based verification.
- More sensitivity to the users' needs: going beyond downscaling, better documentation (e.g. use the IPCC language), demonstration of value and outreach.

appendix (1/2) forecast errors & uncertainty

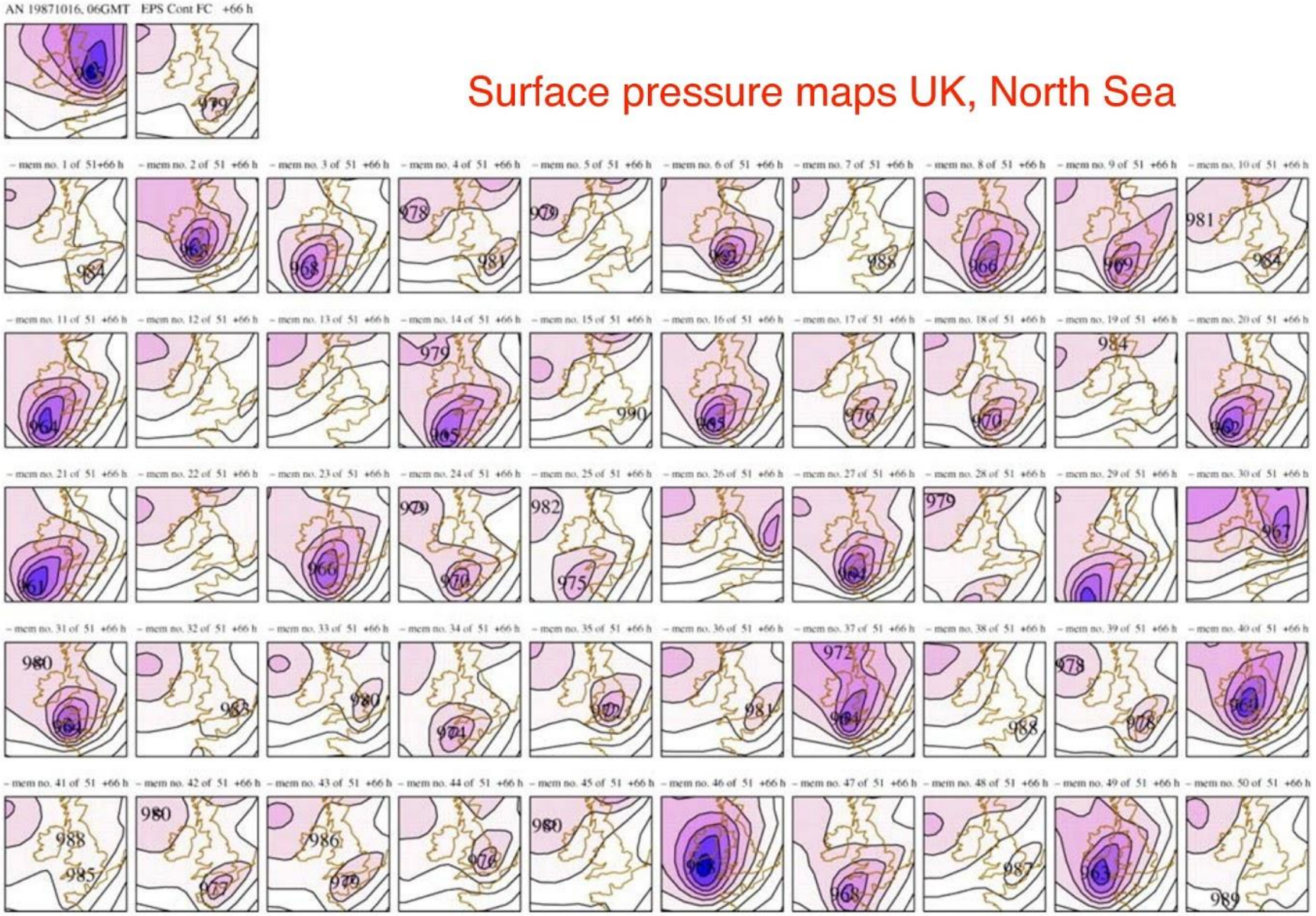




Source: Slingo & Palmer 2011

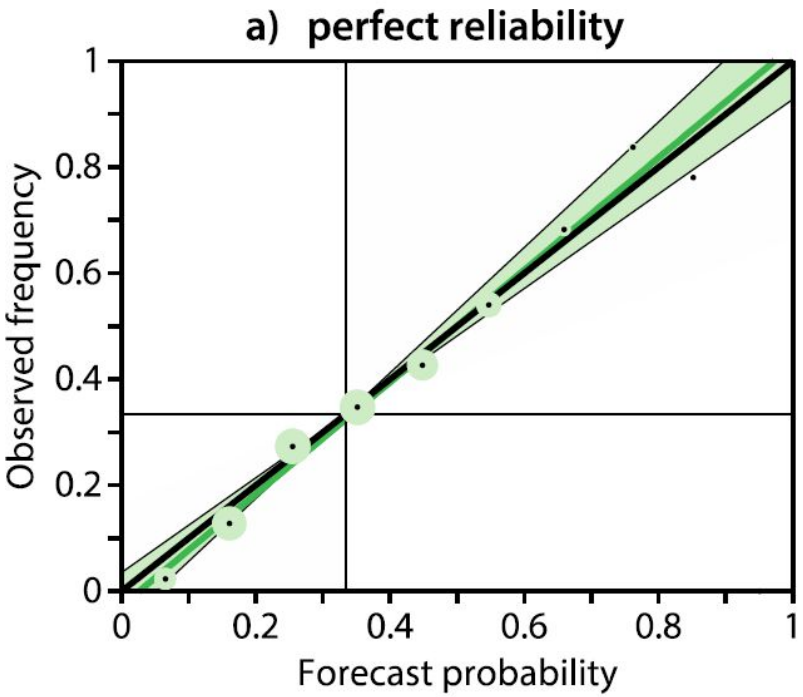
VORTEX

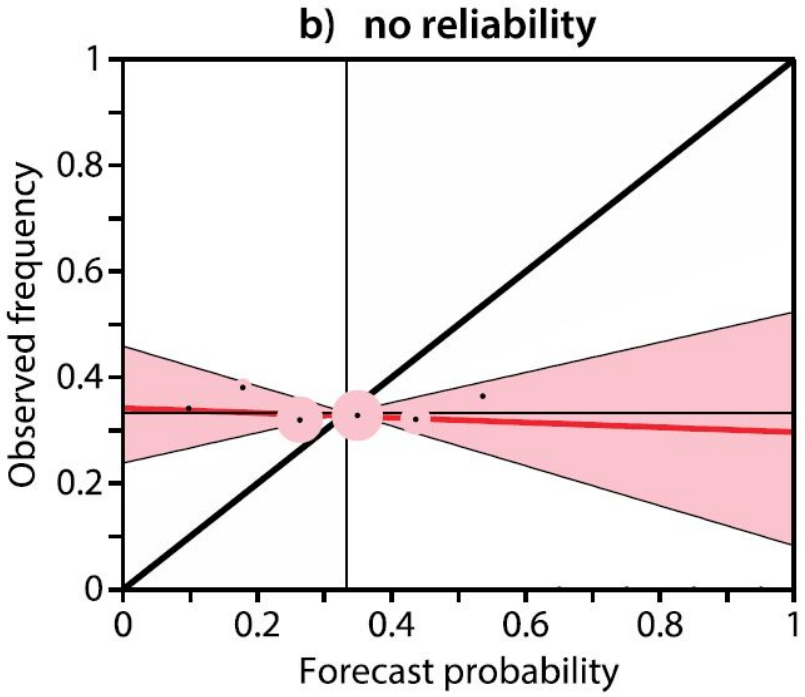
appendix (1/2) forecast errors & uncertainty



Slingo J , and Palmer T Phil. Trans. R. Soc. A 2011;369:4751-4767

How reliable





* You might have a look to SPECS factsheets (http://specs-fp7.eu/Factsheets)

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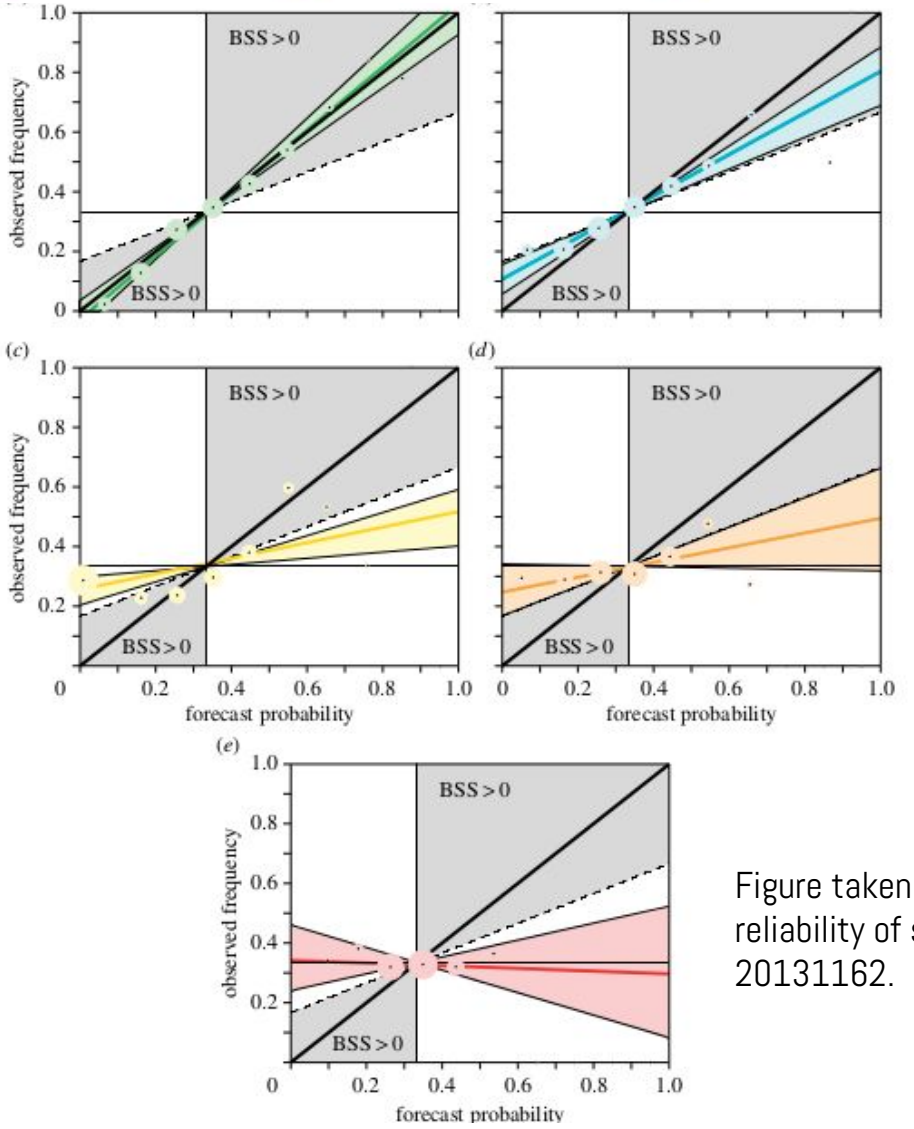
5 perfect 4 still useful 3 marginally useful 2 not useful 1 dangerous



- Forecast Event: higher and lower terciles
- 1981-2010

- Observed frequencies vs forecast probabilities
- Bootstrapped Weighted linear regression (~ #events for each bin)

- **Is near 1:1 relation?**
- **Does improve climatology (⅓)?** (grey shaded area)

Figure taken from Weisheimer, A. and T.N. Palmer (2014), On the reliability of seasonal climate forecasts. J.R.Soc. Interface, 11, 20131162.

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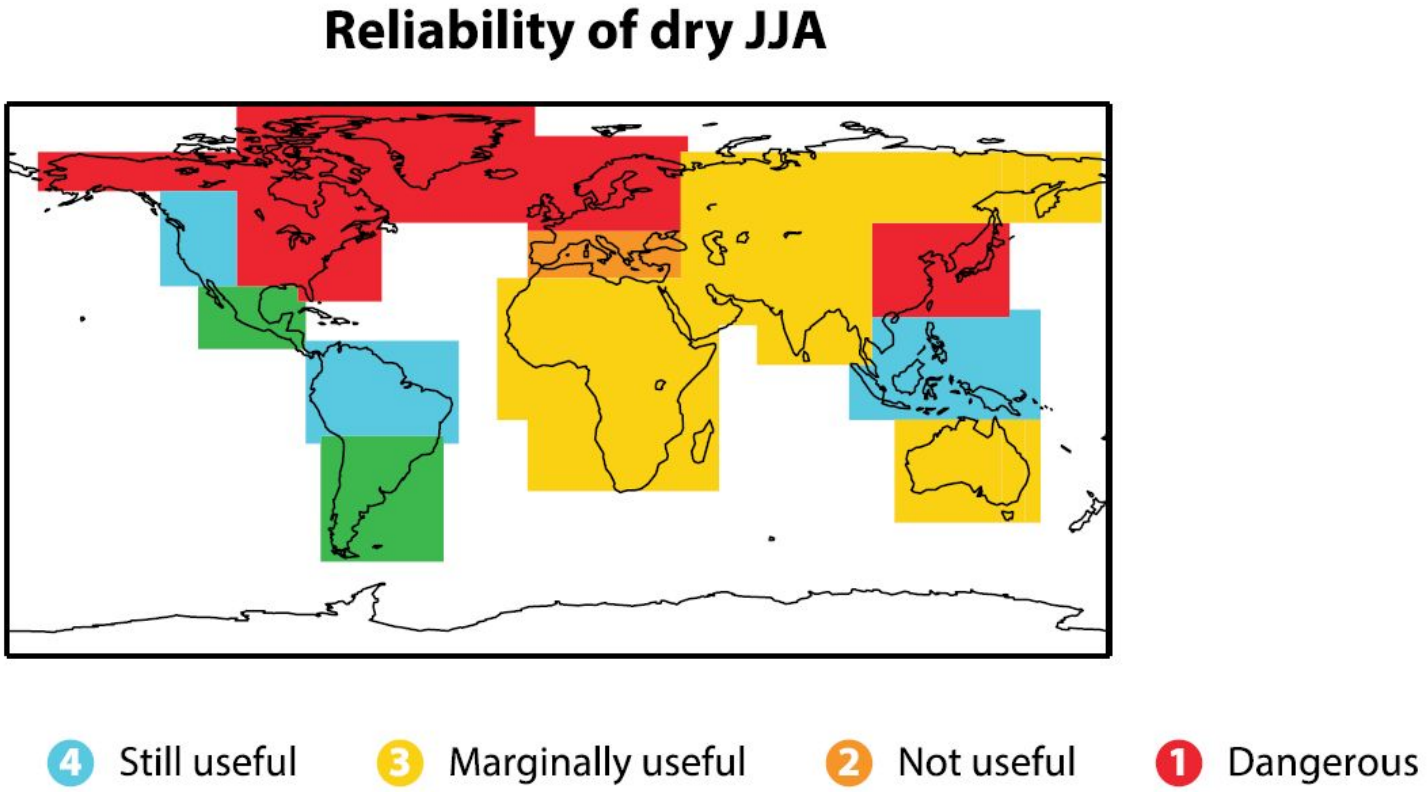
Seasonal Forecast Specifications

- Ensemble Forecast (butterflies and truncation)
- Global Circulations Model
  - ECMWF System-4 (51 members)
  - NMME (8 models from NCEP, CCCma, GFDL, NCAR, NASA)

- Ensemble Dressing
- Downscaling & Empirical Enhancement
- Bias Correction
  - using latest Reanalysis as proxy for observations
- Post-processing // Communication

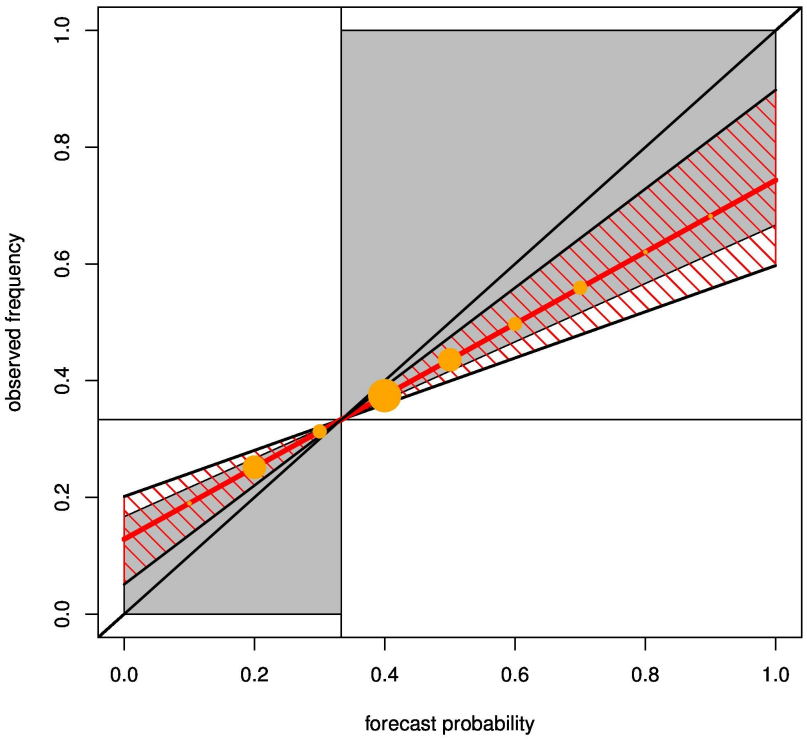
➔ ***Beat the climatology (Renalysis/Forecast hindcast)***



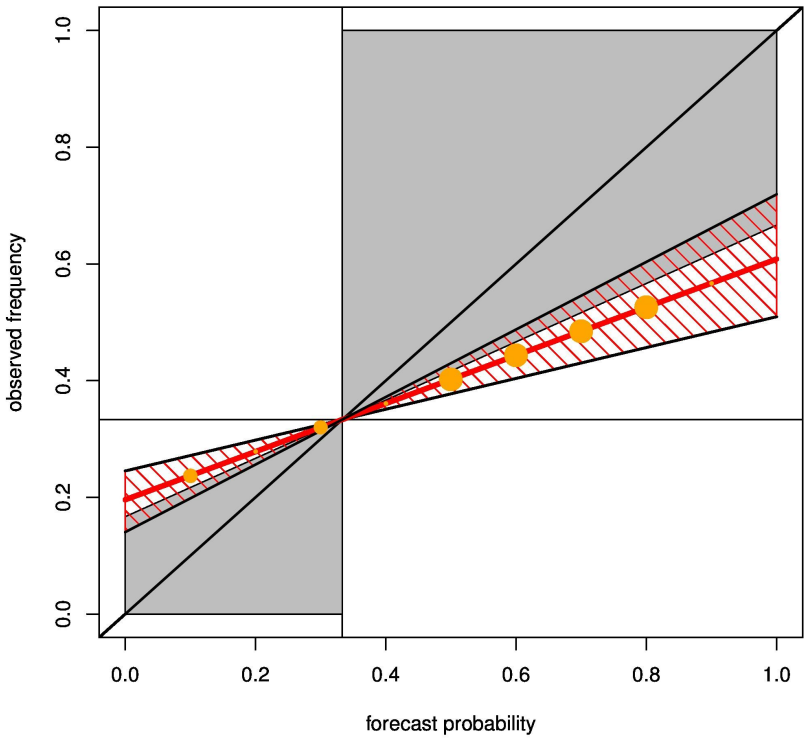
Reliability of the ECMWF seasonal forecasts of dry JJA

Figure taken from Weisheimer, A. and T.N. Palmer (2014), On the reliability of seasonal climate forecasts. J.R.Soc. Interface, 11, 20131162.

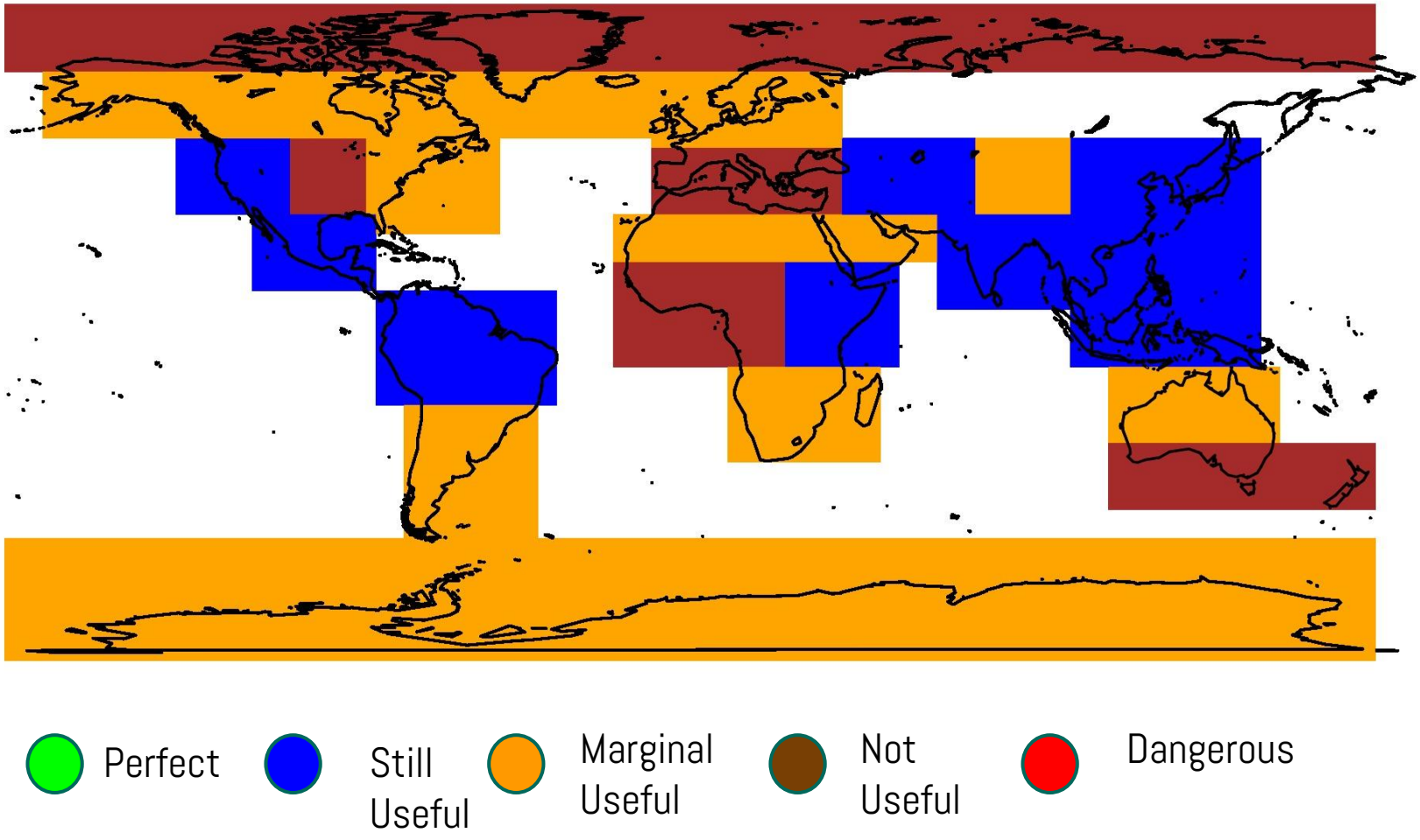
- Improve climatology



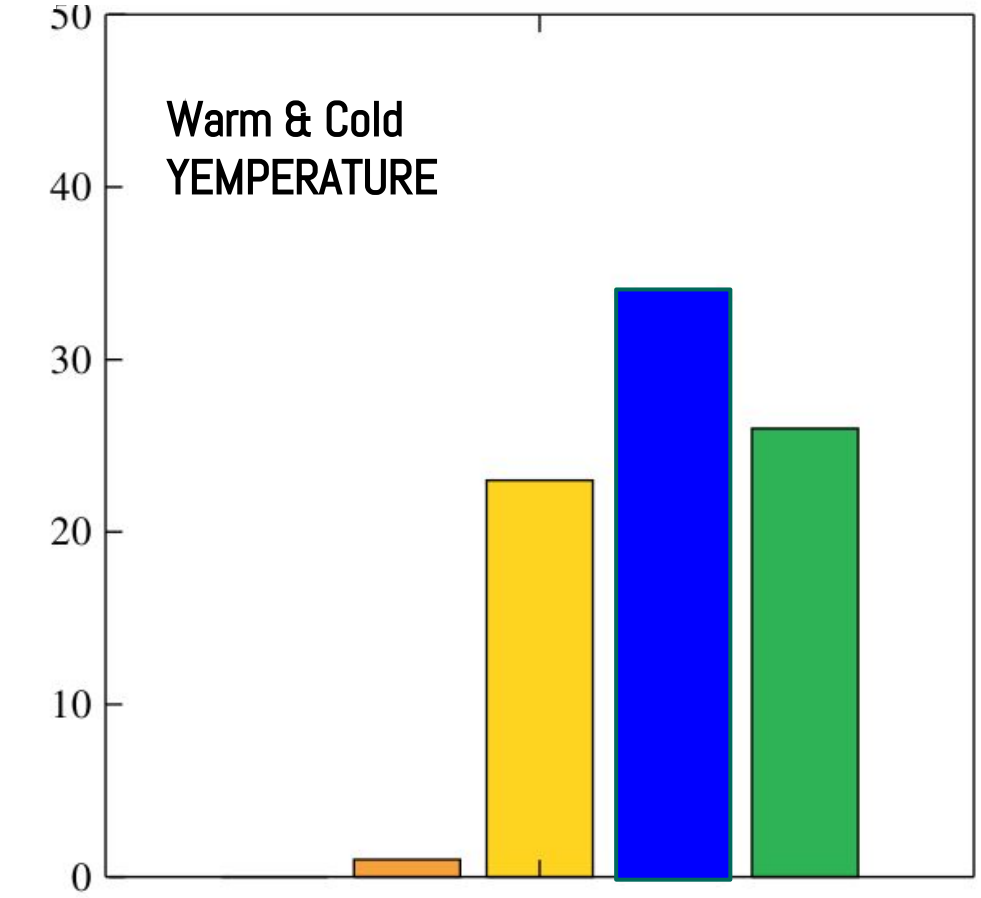
- Not too far from climatology perfomance

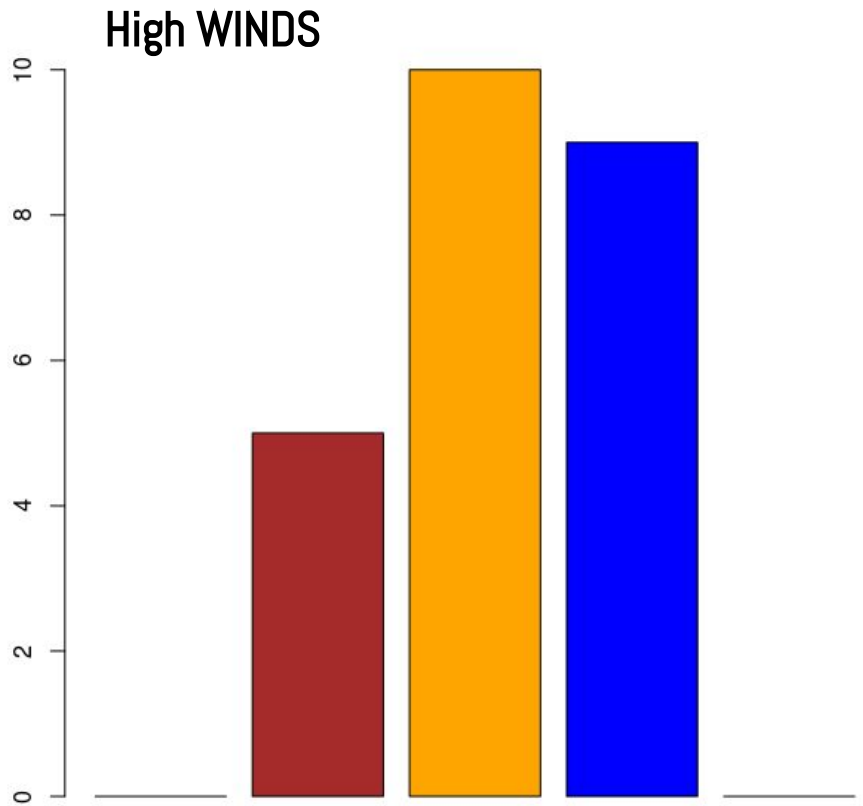


Examples reliability diagrams for the ECMWF **November** seasonal forecasts (S4) for a **Windy DJF (mean speed > 3rd tercile)**



Reliability of the ECMWF seasonal forecasts of High Winds DJF





Perfect

Still Useful

Marginal Useful

Not Useful

Dangerous

Reliability of the ECMWF seasonal forecasts
of **High Winds** & **Temperature (warm & cold)** DJF

VORTEX

- Seasonal Forecast is not a “Perfect Reliable” system
- International efforts do exists to improve the technology
- Forecast reliability for wind is not worse than for temperatures
- More reliable for positive wind anomalies
- More analysis are needed (always)
- More refinements are required (?) [to discuss]