Copernicus European Regional ReAnalysis – CERRA

Climate Change

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The systems – an overview

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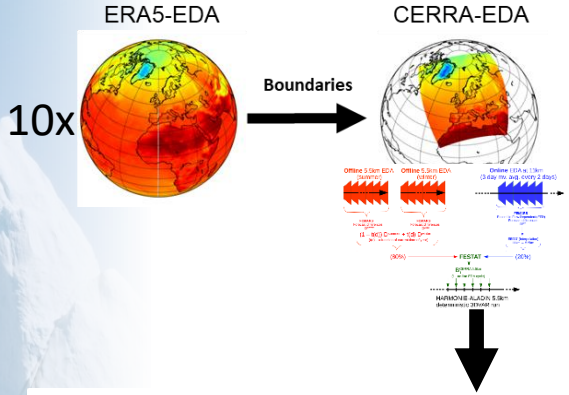
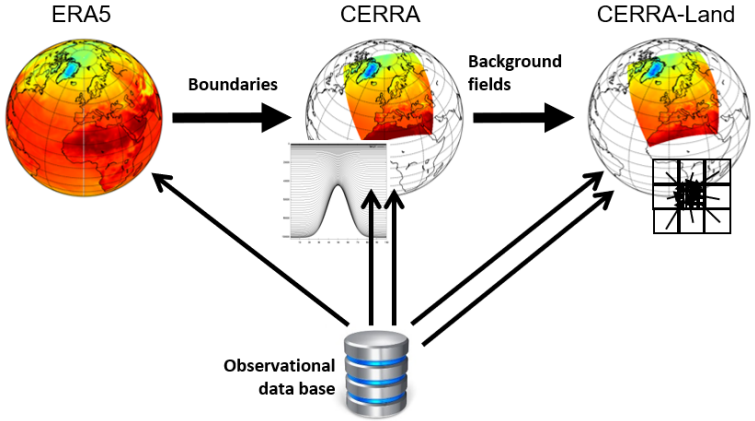
Global Reanalysis ➔ Regional Reanalysis



Global Reanalysis ➔ Regional Reanalysis ➔ Surface Reanalysis



- CERRA system
  - HARMONIE cycle 40h1.2, ALADIN physics (partly back phased from cy42)
  - 3D-VAR for upper air observations and OI at the surface
  - Estimation of background errors from CERRA-EDA
  - ERA5 as lateral boundary conditions
  - Assimilation of conventional observations, satellite radiances (MSU, AMSU-A+B, and IASI), GB-GNSS, RO-GNSS, AMV and scatterometer winds
  - 8 cycles per day, forecast lengths 6h and 30h
  - 5.5km horizontal resolution (1069x1069) and 106 vertical levels
- CERRA-EDA (same as CERRA beside)
  - 10 members
  - 11km horizontal resolution
  - 4 cycles per day with 6 hourly forecasts
- CERRA-Land
  - Daily precipitation analysis
  - Land surface model – SURFEX 8.1
  - 5.5km resolution

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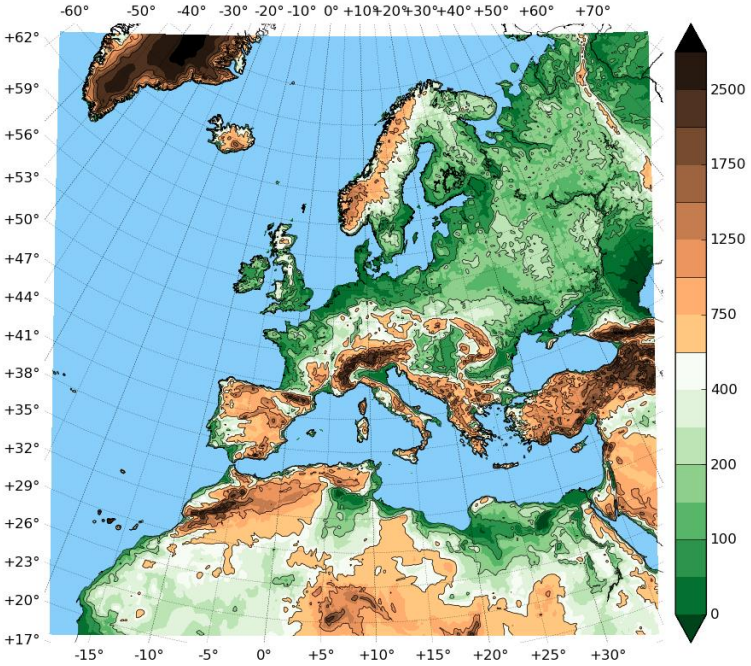
Available data

- Modell domain covers entire Europe
- Sept. 1984 – June 2021
- Paramters at the surface parameters (39), on pressure (11), height (10) and model (4) levels
- Same for CERRA-EDA
- Additional output for CERRA-Land

- Analyses 3-hourly, hourly forecast

- Height levels
  - 11 levels between 15 – 500 m
  - Parameters include wind speed and direction, TKE



Model domain illustrated with model topography and land-sea mask

CERRA is available in the CDS.

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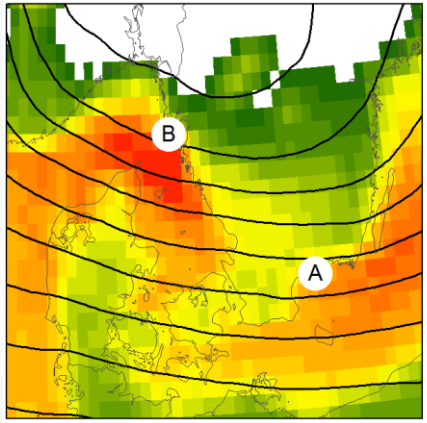
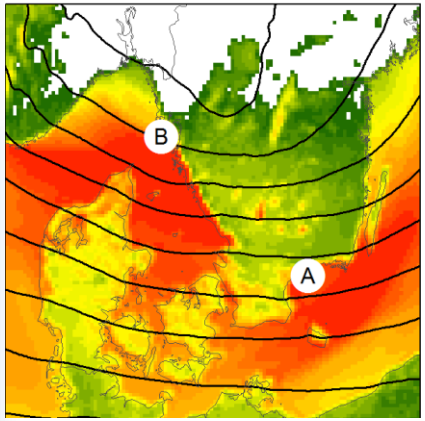
Demonstration: storm Gudrun, southern Sweden, January 2005

2005-01-08 18UTC

ERA5



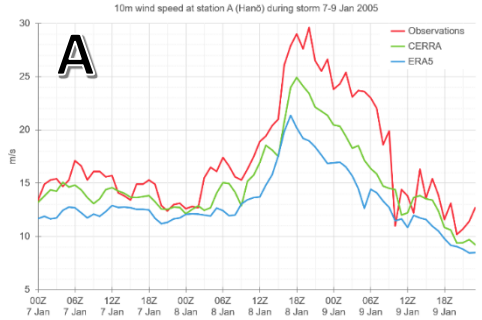
CERRA

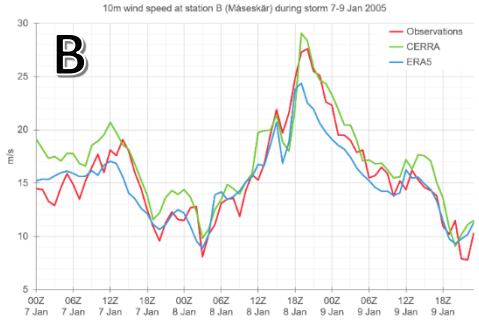


10 metre wind speed (m/s)

- 26 - 27
- 25 - 26
- 24 - 25
- 23 - 24
- 22 - 23
- 21 - 22
- 20 - 21
- 19 - 20
- 18 - 19
- 17 - 18
- 16 - 17
- 15 - 16
- 14 - 15
- 13 - 14
- 12 - 13
- 11 - 12
- 10 - 11
- 9 - 10
- 8 - 9

- Generally higher wind speeds in CERRA compared to ERA5
- More realistic features related to topography and land-sea mask
- For most Swedish stations we see a better fit to observations in CERRA





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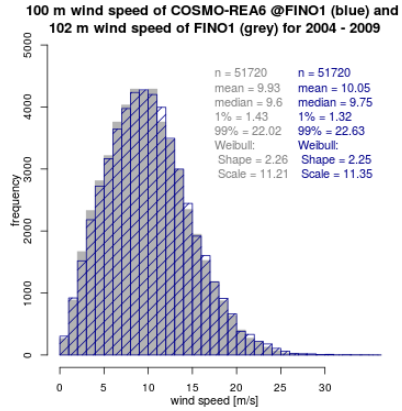
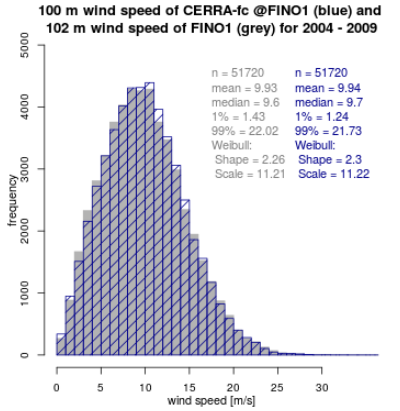
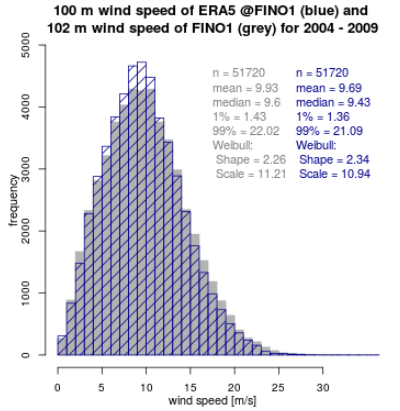
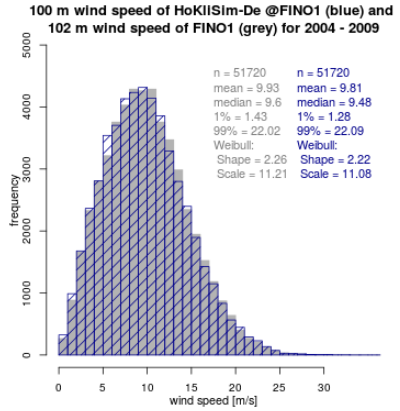
Spangehl et al. (2023), Figure 2
Frequency distribution of wind speed









Statistical parameters of pdf's of hourly wind speed [m/s] at 100 m at FINO1 for different products

Parameter	mean	median	1st percentile	99th percentile	shape	scale
FINO1	9.93	9.60	1.43	22.02	2.26	11.21
COSMO-REA6	10.05	9.75	1.32	22.93	2.25	11.35
CERRA-fc	9.94	9.70	1.24	21.73	2.3	11.22
ERA5	9.69	9.43	1.36	21.09	2.34	10.94
HoKliSim-De	9.81	9.48	1.28	22.09	2.22	11.08

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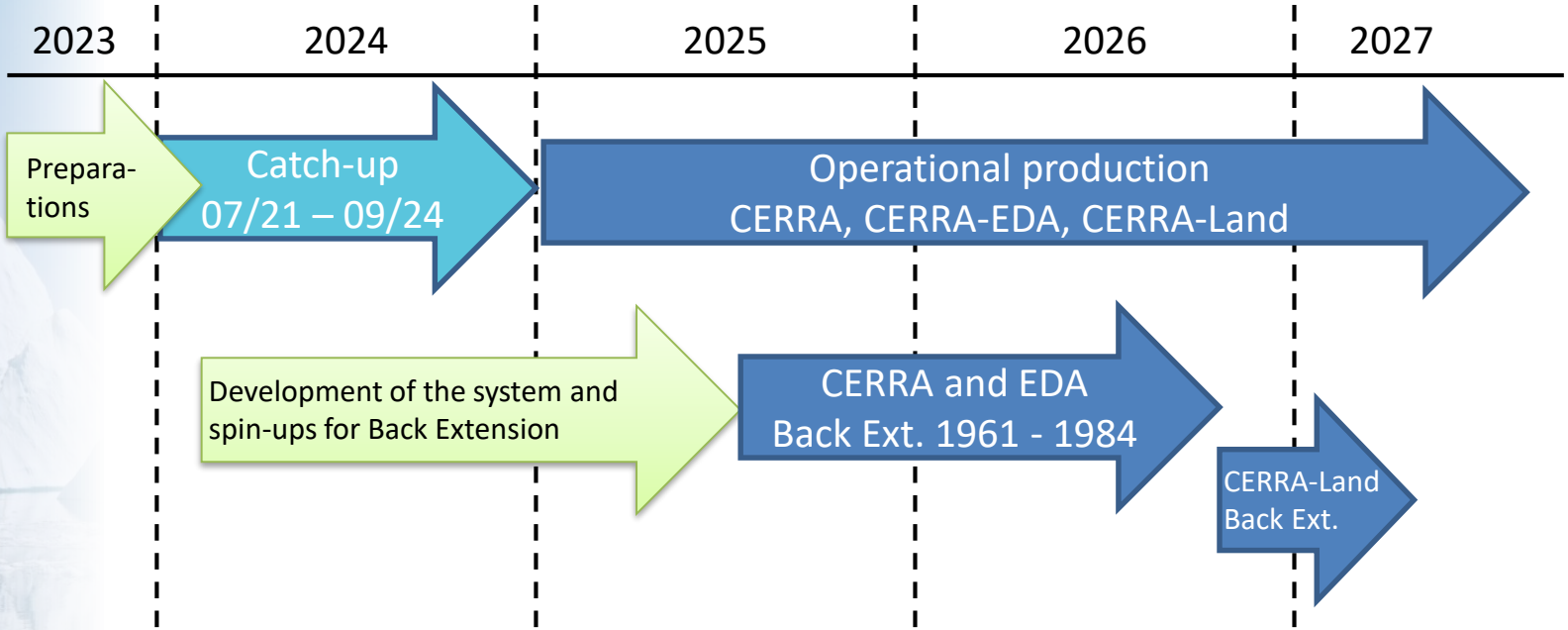
What's planned?



Preparations for the operational production include porting to ATOS as well as updating the observing system (Metop-C, Mode-S and ATMS from NOAA-20 and NPP).
Daily and monthly statistics will be prepared.

Development needed for the Back Extension include handling of new input data, which is currently prepared for ERA6, and retuning of the model systems.

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Thank you for listening!

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