

10-years reanalysis downscaling at a 3km grid in the North Sea

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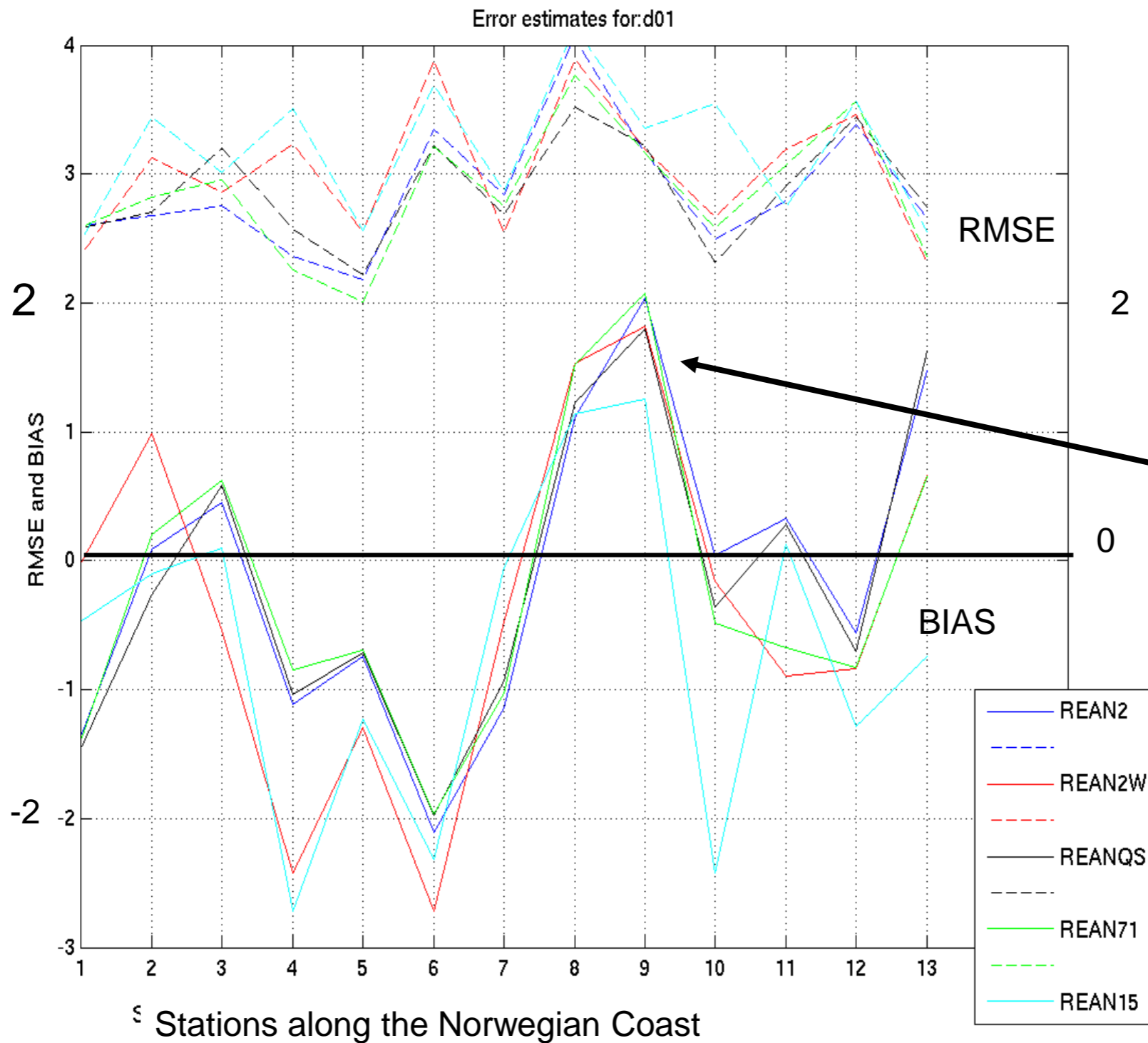
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Motivation:

Fill temporal and spatial gaps in data sparse areas.

High detail level across many different parameters (turbulence, wind shear etc.)

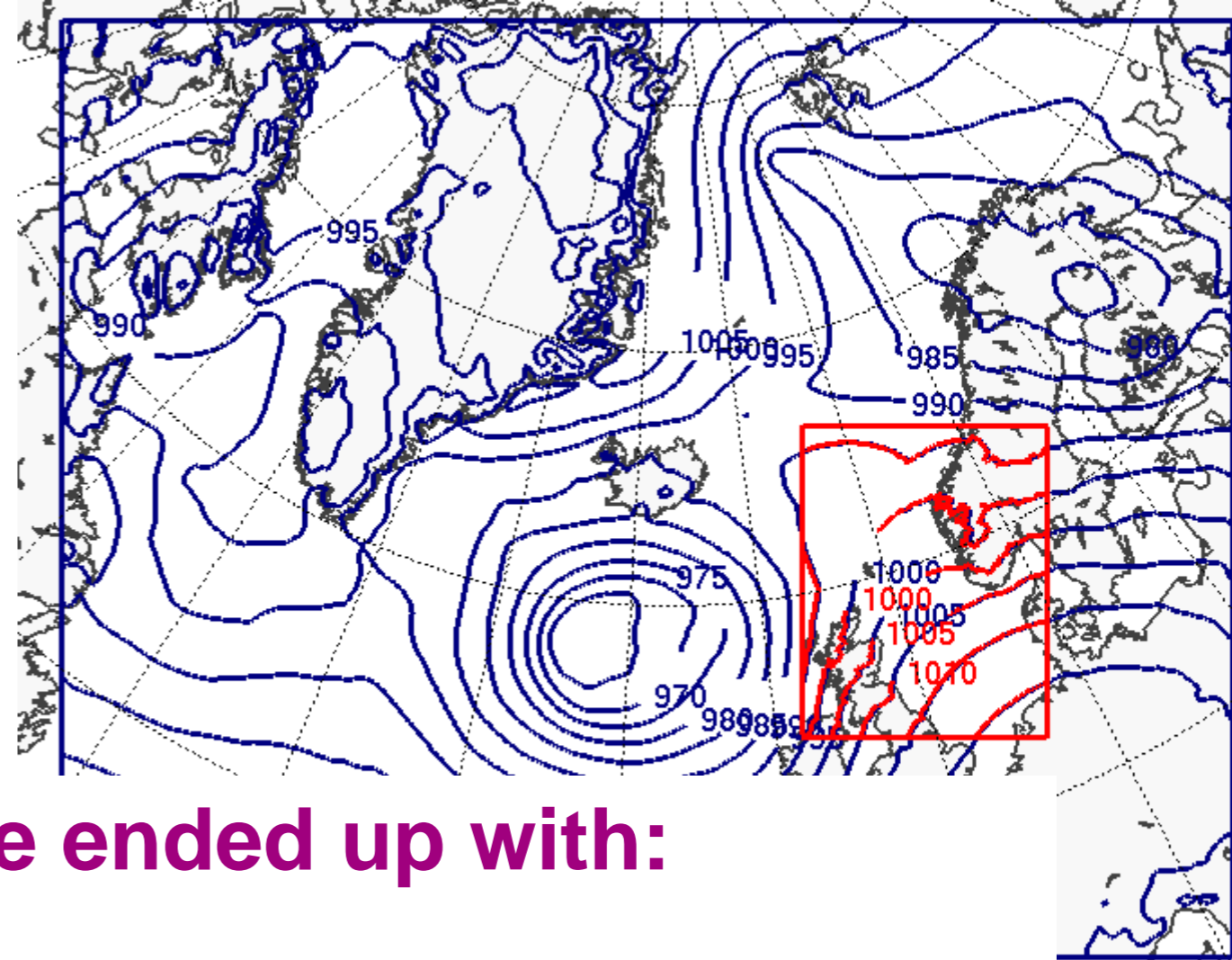
Strong local influence along the rugged coastline



Coastal effects

Test period for the model setup

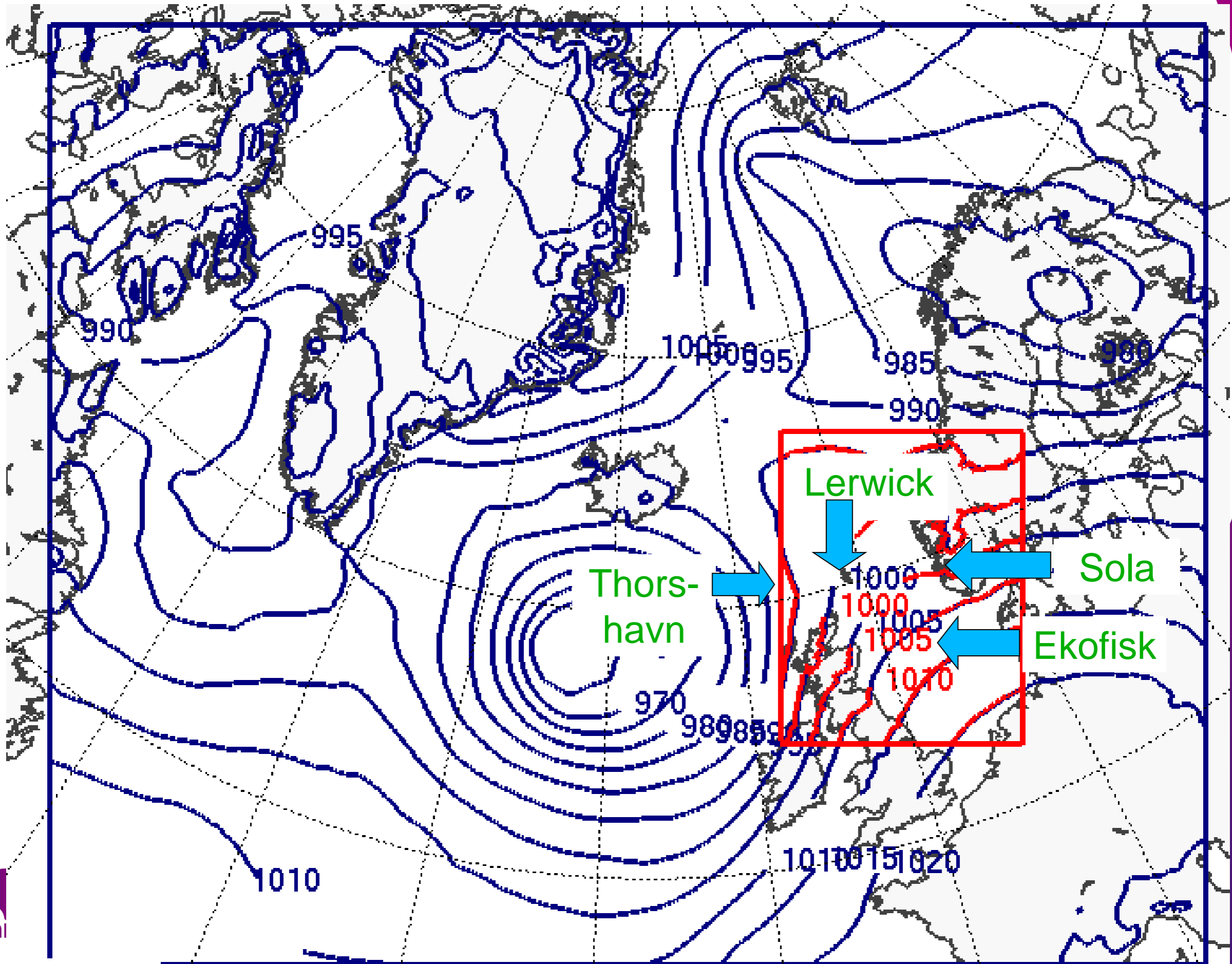
15Feb-20Mar 2008 – 5 weeks



From 5 weeks test cases, we ended up with:

- 9-3 km grid, 51 levels
- 2-way coupling between nests
- FDDA assimilation of satellite wind data (QSCAT)
- MYJ- pbl scheme
- Spectral nudging >1000 km
- EraInterim data as input

Radiosonde stations



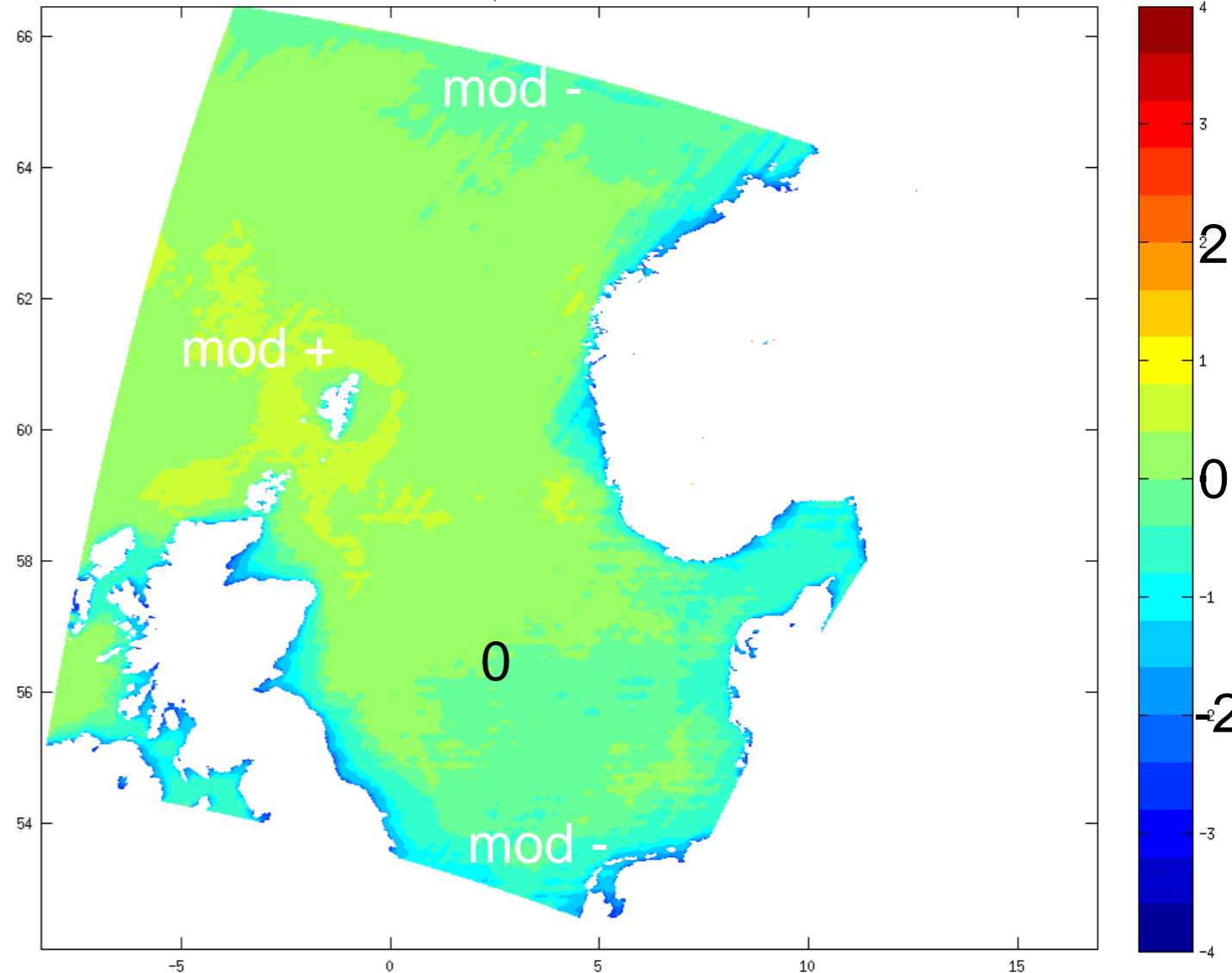
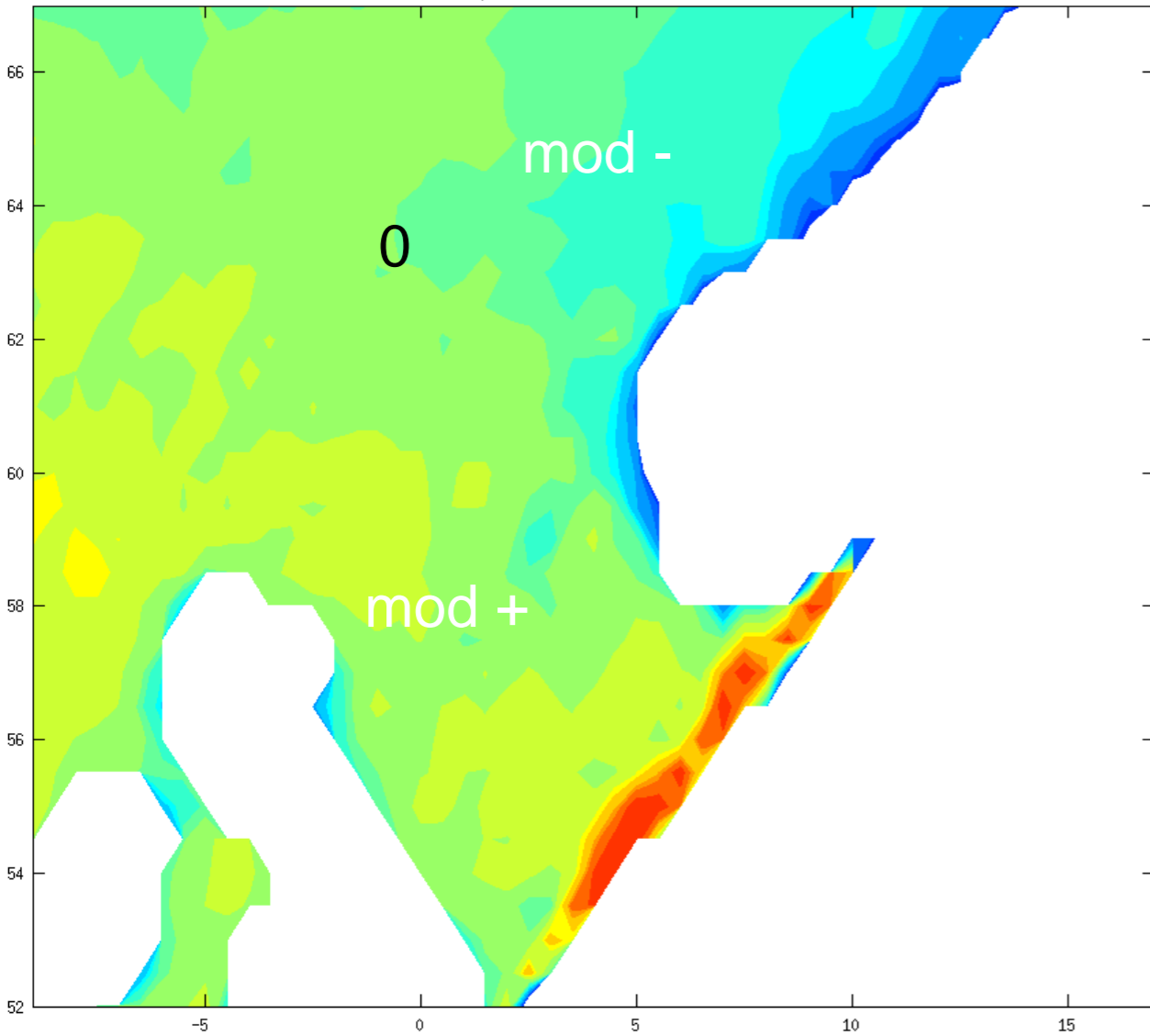
BIAS (mod-ASCAT) for 2008

ERAInterim

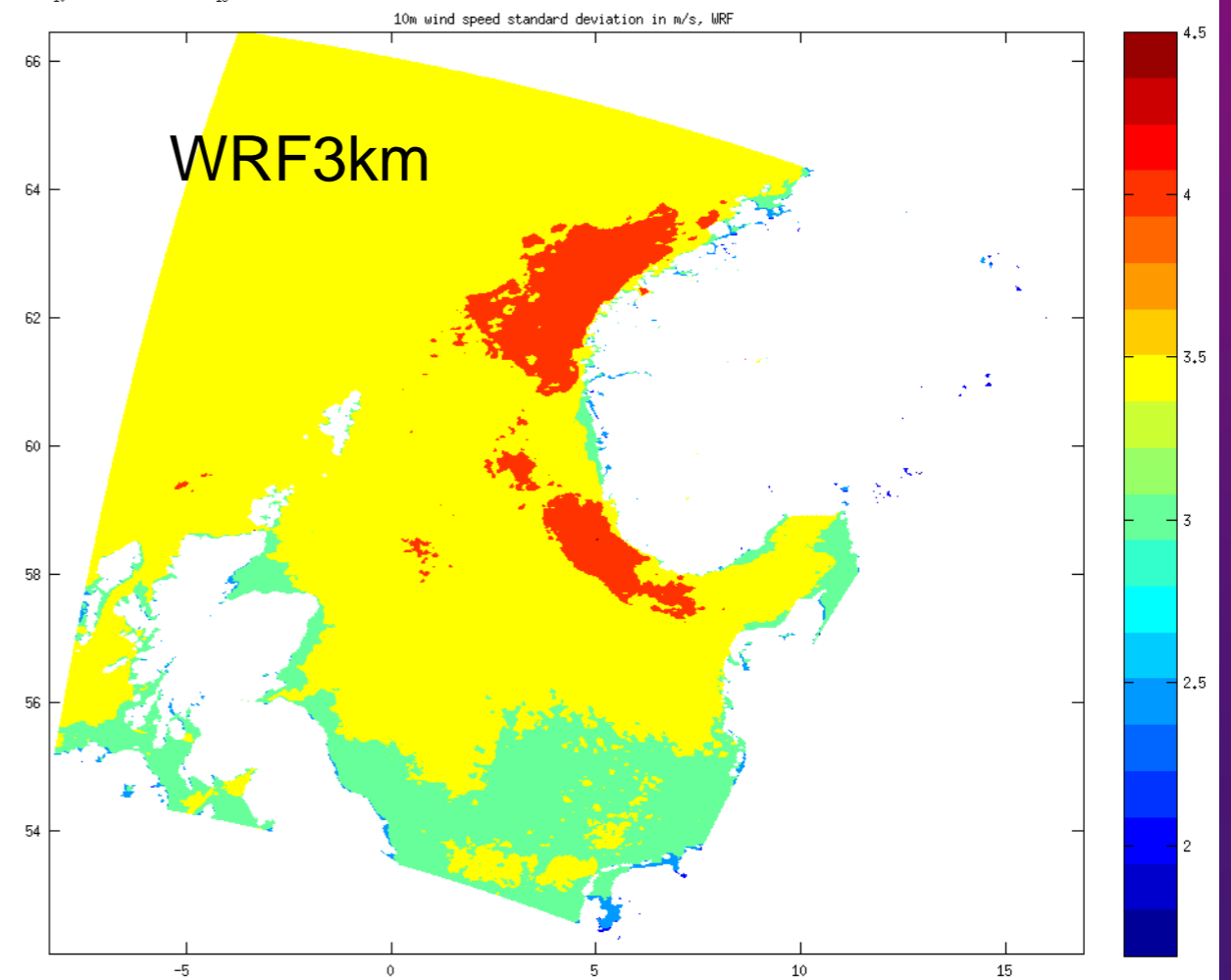
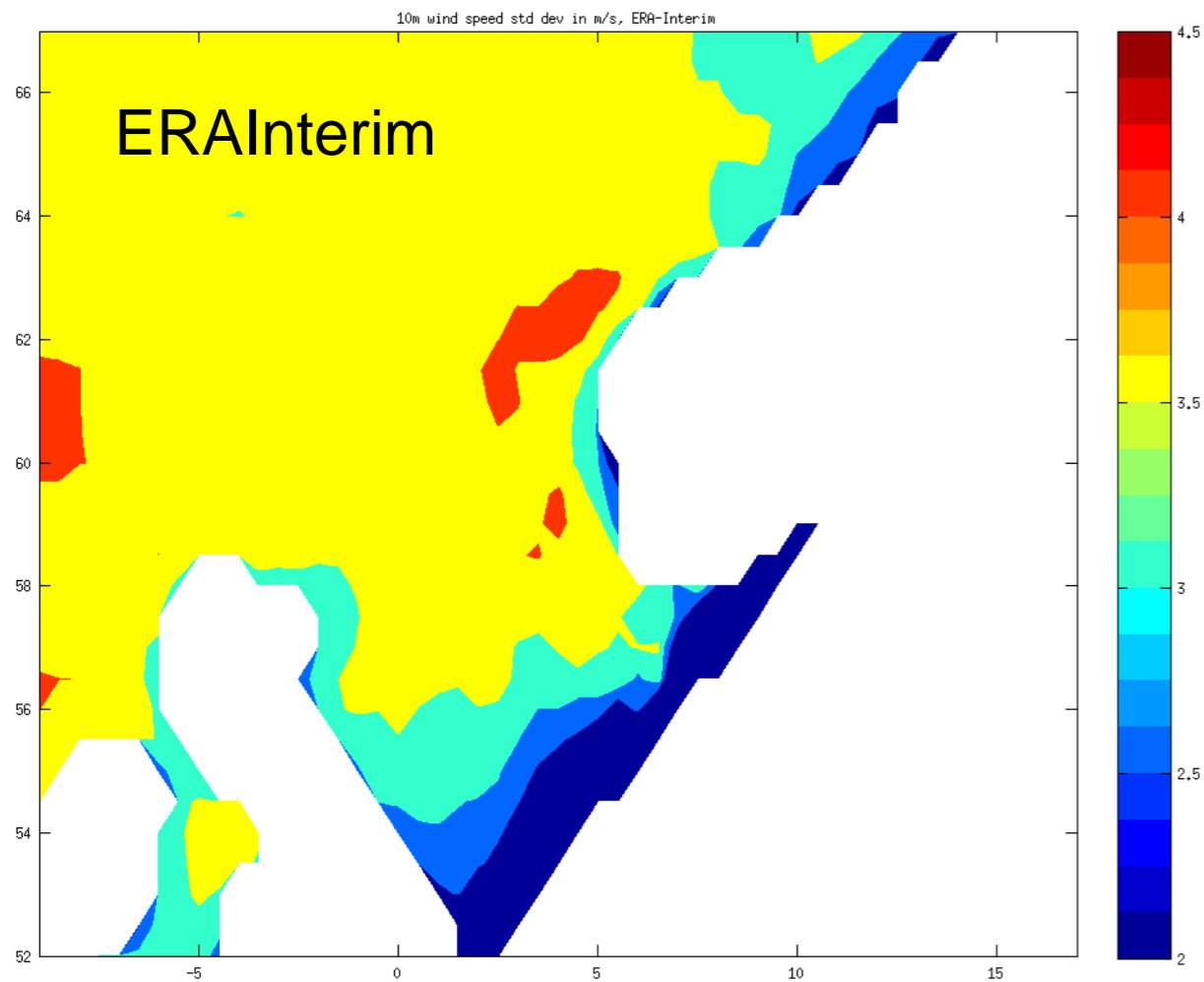
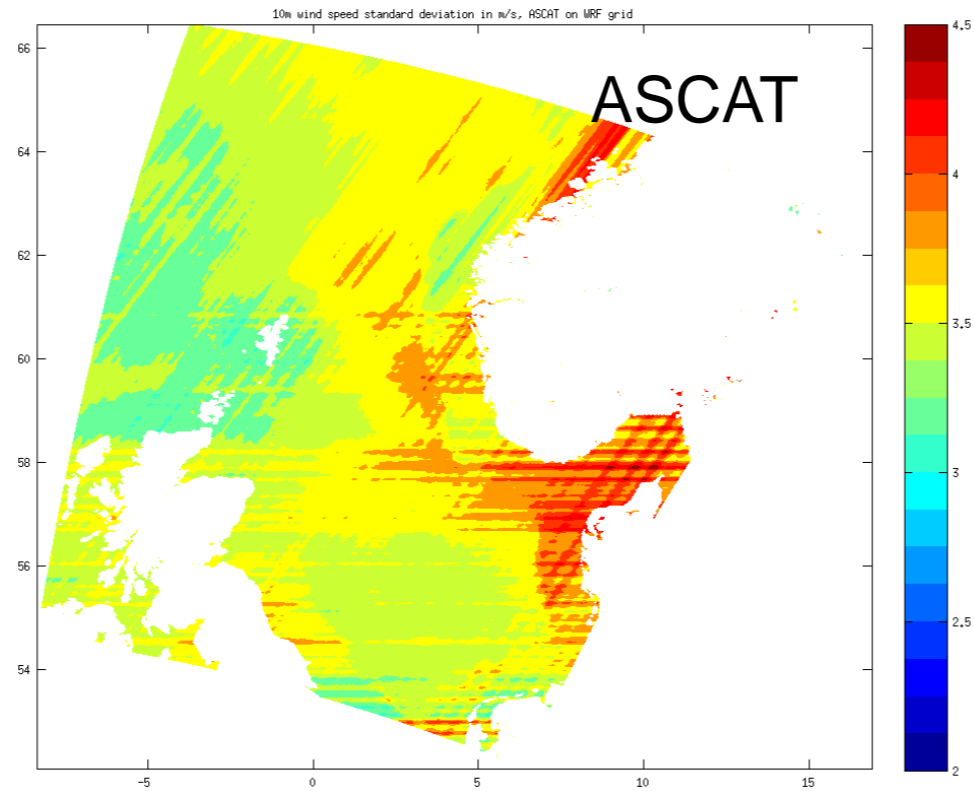
WRF3km

10m wind speed BIAS in m/s, ERA-Interim - ASCAT

10m wind speed BIAS in m/s, WRF - ASCAT



Standard deviation



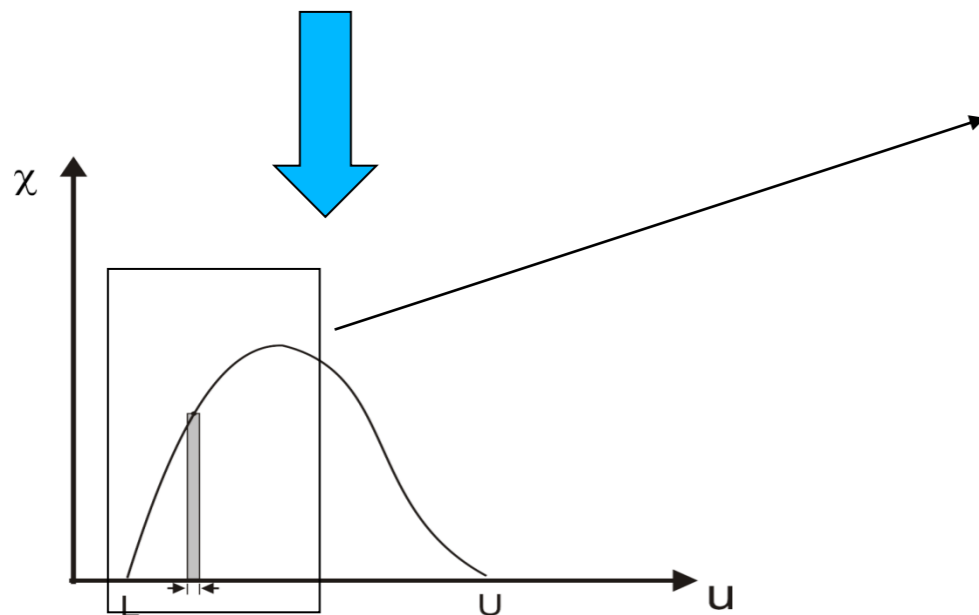
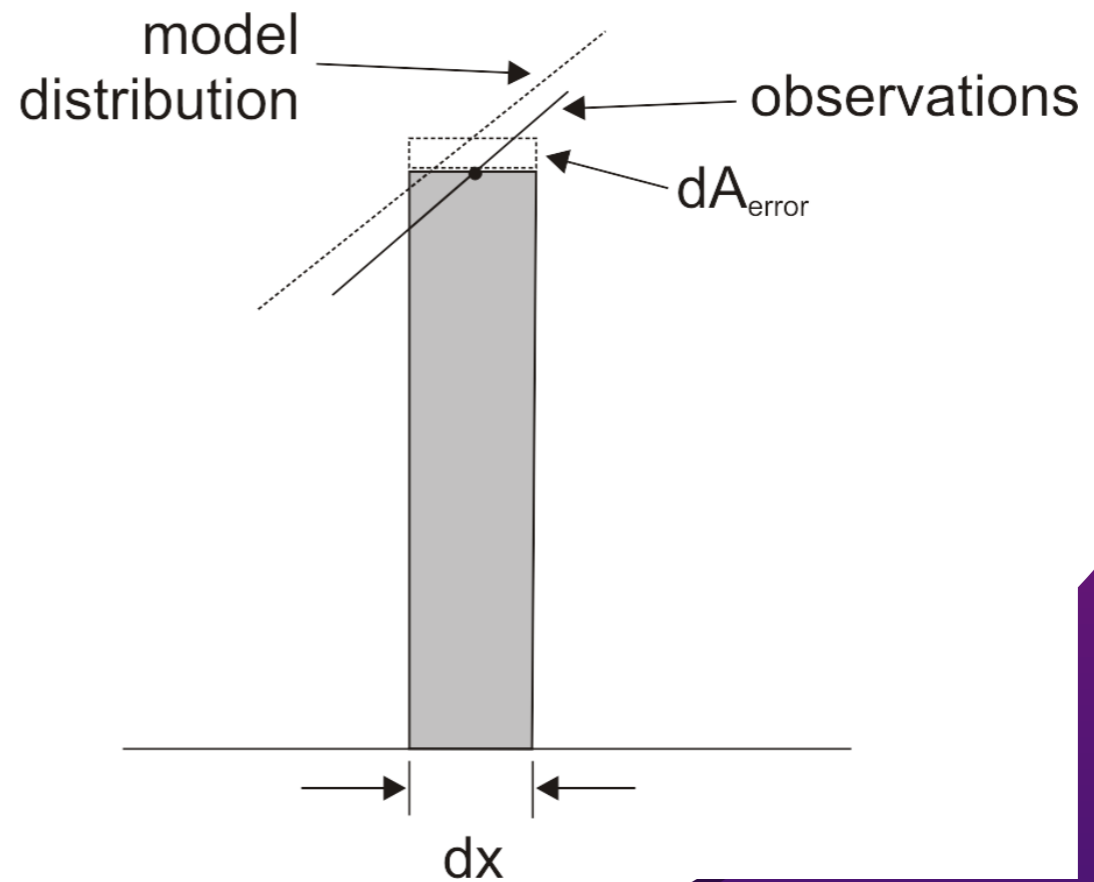
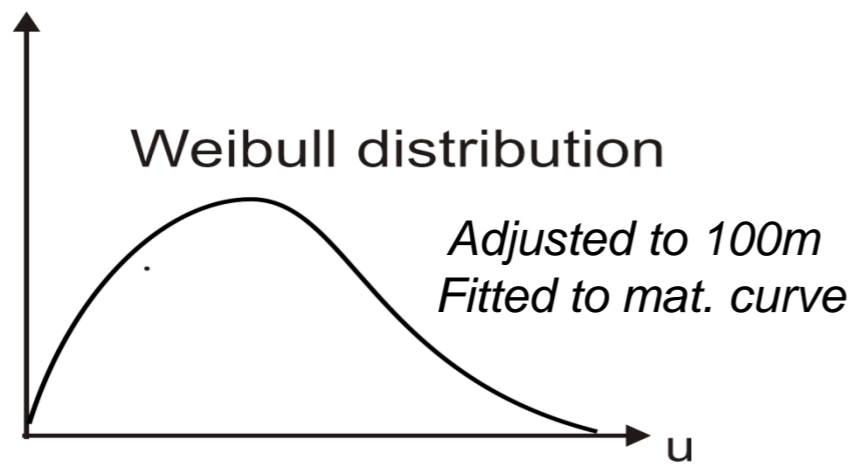
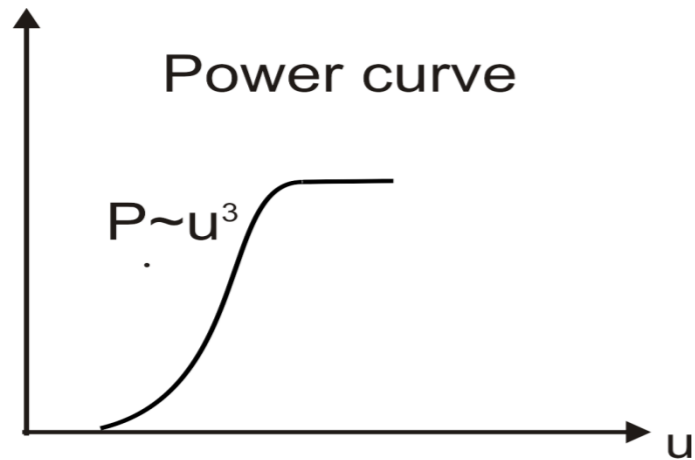
Comparison with radiosondes

for year 2008

Bias (mod-obs) / RMSE

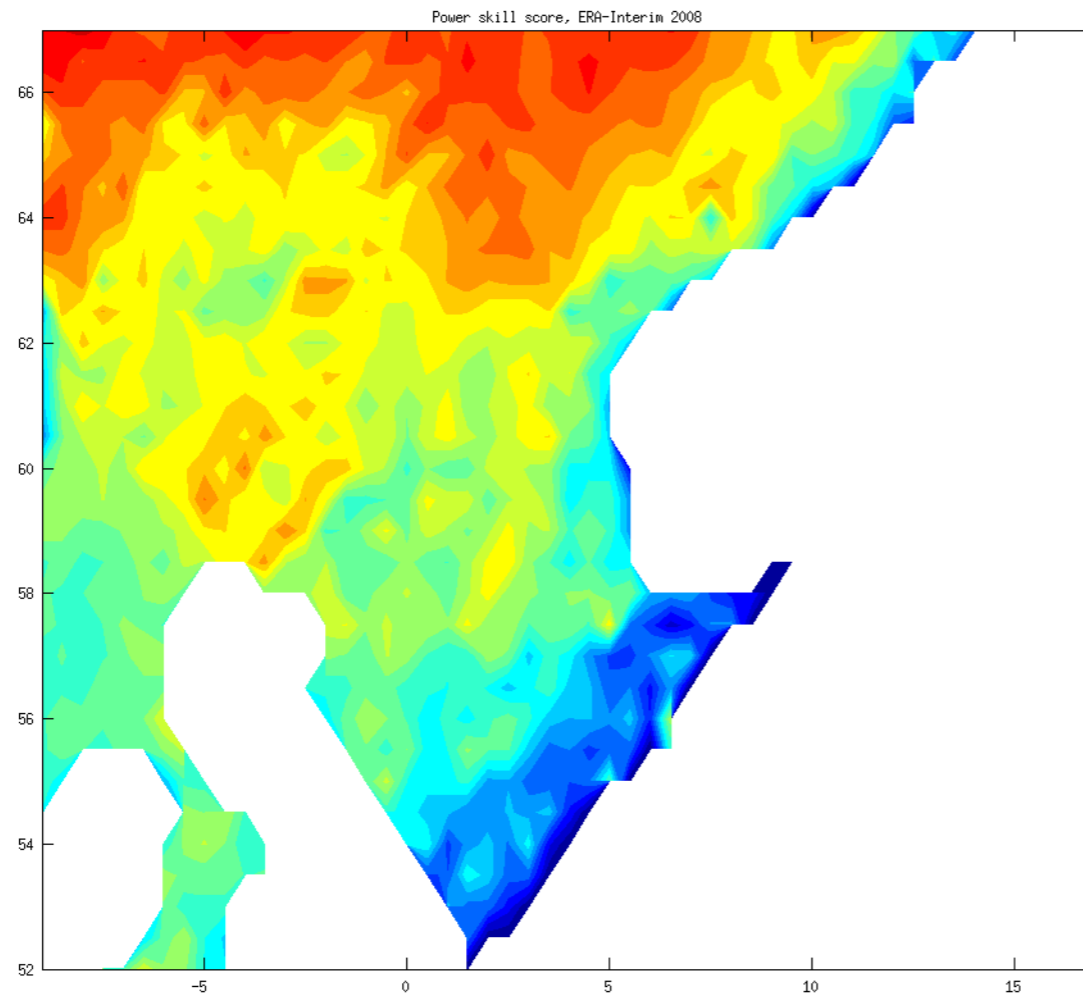
	Ekofisk <1km height		Lerwick <1km height		Thorshavn <1km height		Sola <1km height	
	RMSE	bias	RMSE	Bias	RMSE	bias	RMSE	bias
9km Outer grid	3.55 m/s	-0.51 m/s	3.84 m/s	-0.15 m/s	5.05 m/s	1.13 m/s	4.42 m/s	1.67 m/s
3km Inner grid	3.61 m/s	-0.46 m/s	3.86 m/s	-0.23 m/s			4.24 m/s	1.49 m/s
	Ekofisk @100m		Lerwick @100m		Thorshavn @100m		Sola @100m	
	RMSE	bias	RMSE	bias	RMSE	bias	RMSE	bias
9km Outer grid	3.16 m/s	-0.69 m/s	3.23 m/s	1.33 m/s	3.53 m/s	-0.30 m/s	4.53 m/s	4.00 m/s
3km Inner grid	3.14 m/s	-0.57 m/s	3.04 m/s	0.75 m/s			3.76 m/s	3.05 m/s

Wind power skillscore

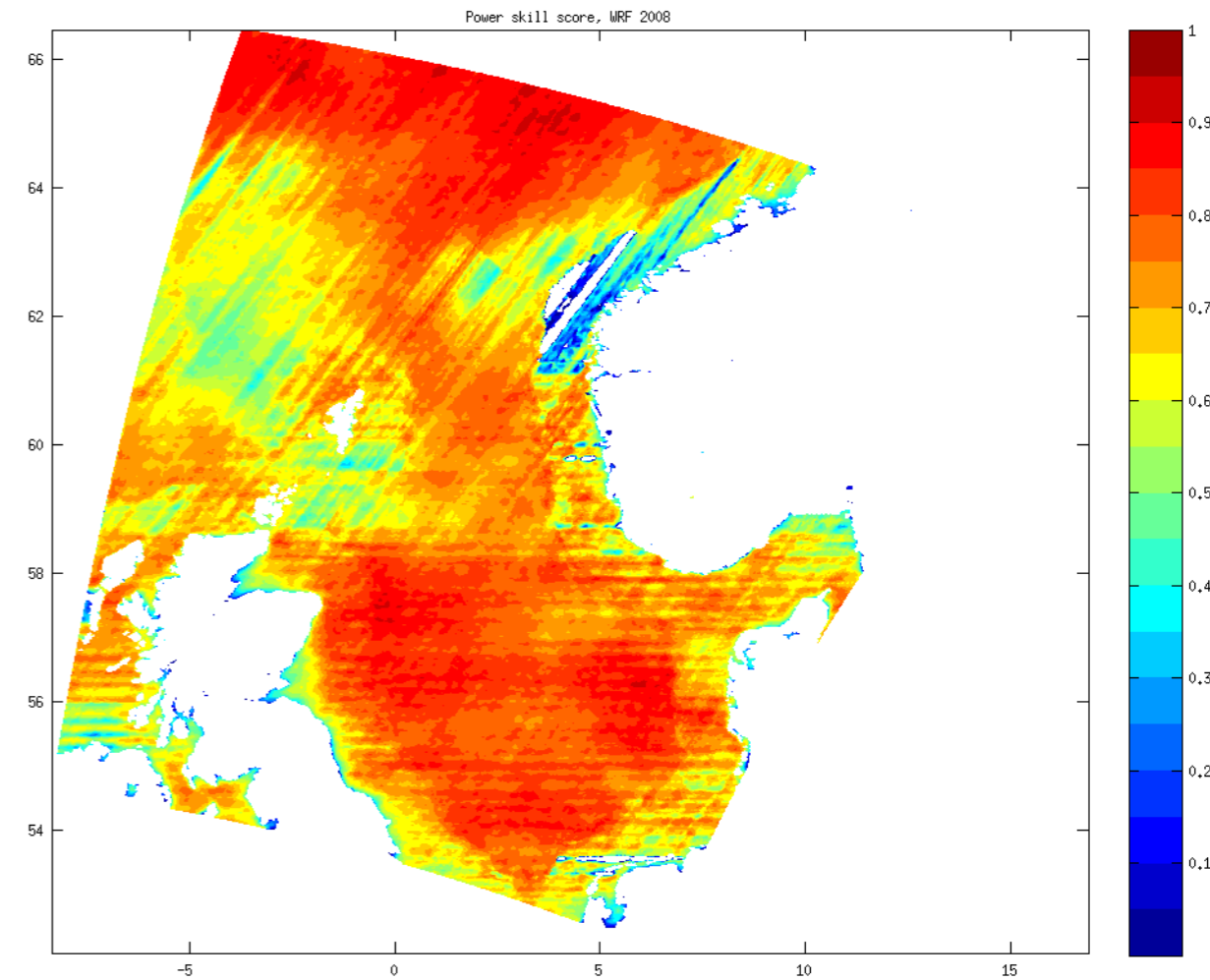


Wind power skillscore -2008

ERAInterim



WRF3km



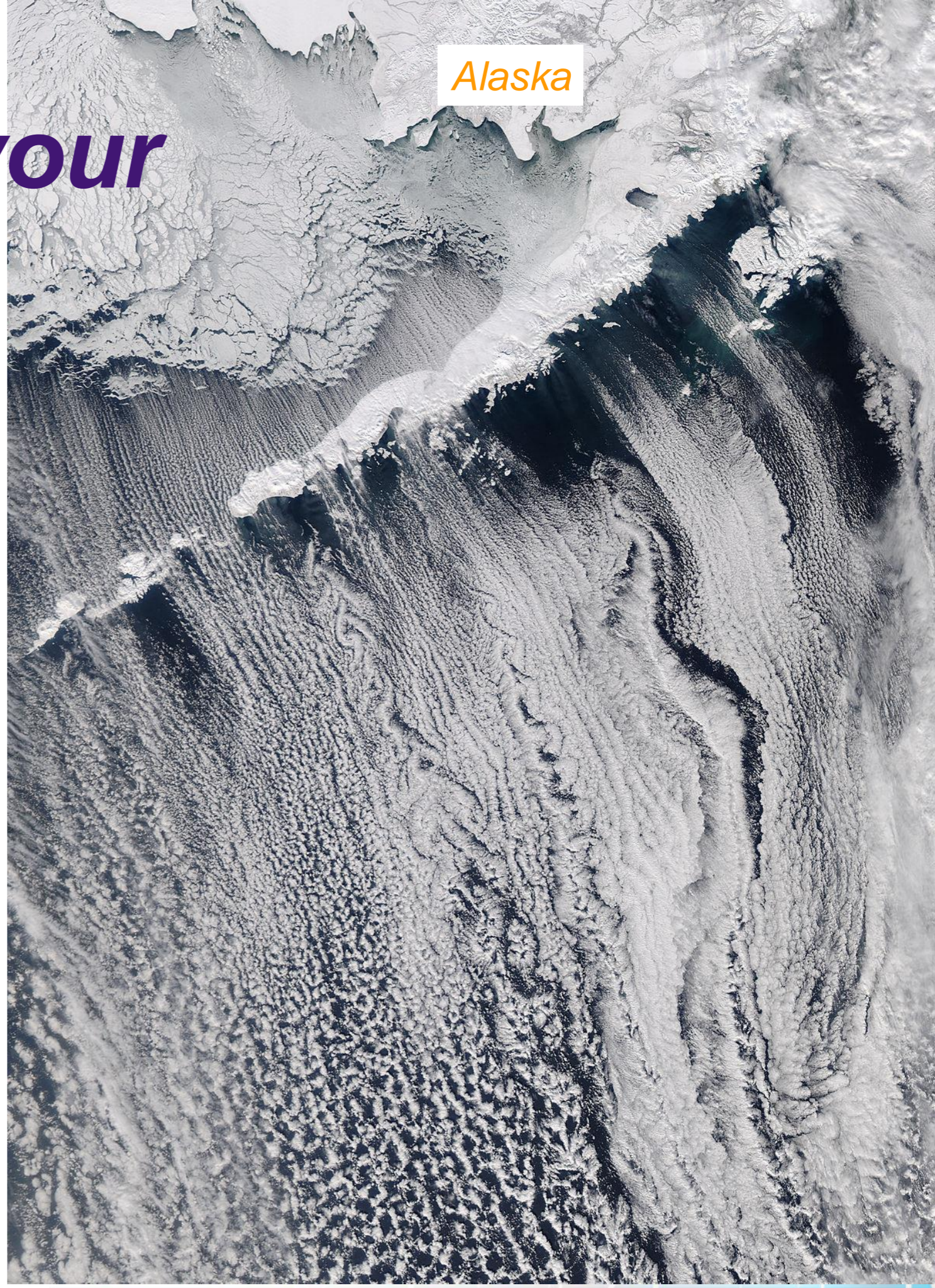
Conclusions

- A 3km-gridded downscaled reanalysis shows
 - small BIAS
 - very good distribution wrt. wind energy purposes
- Careful steps for evaluation is necessary
- More work is needed on wave and wave coupling before this can be implemented

***Thank you for your
attention!***

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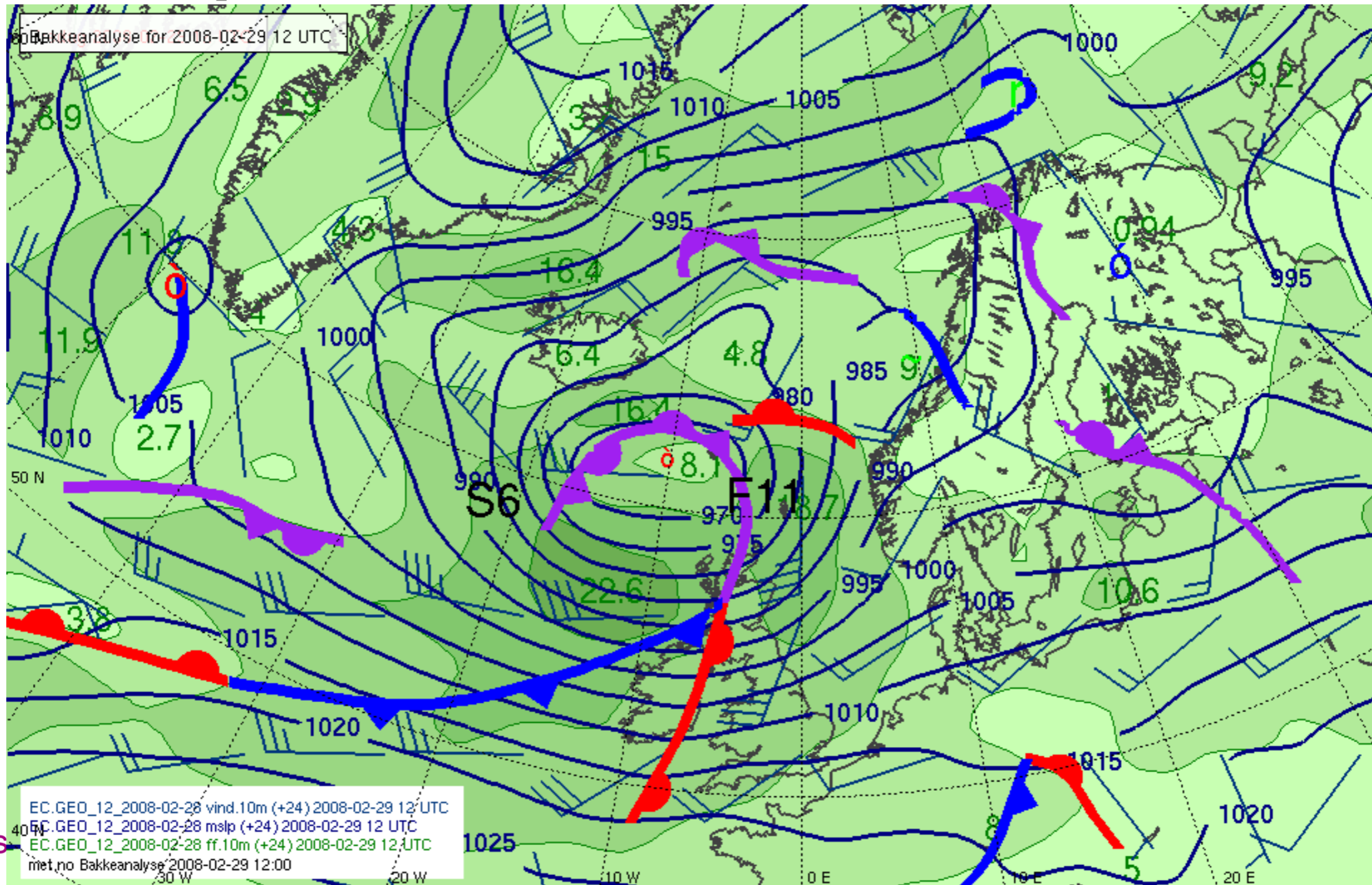
Alaska



The effect of surface waves

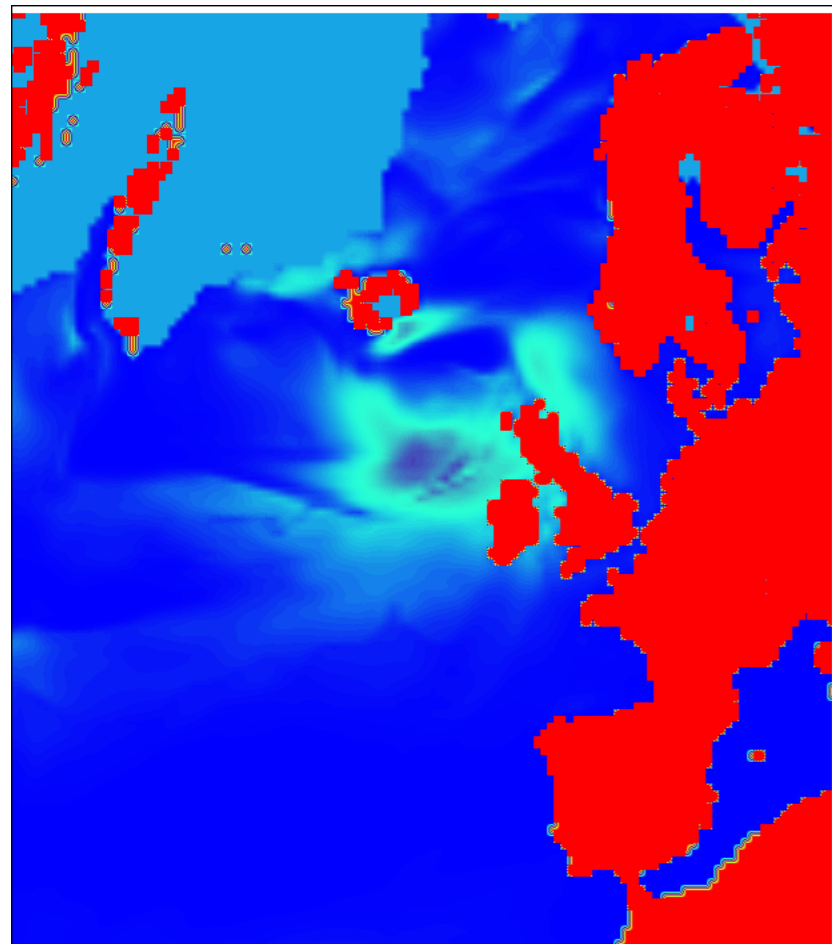
The work of Alastair Jenkins, Uni Research

Example 12UTC 29Feb 2008

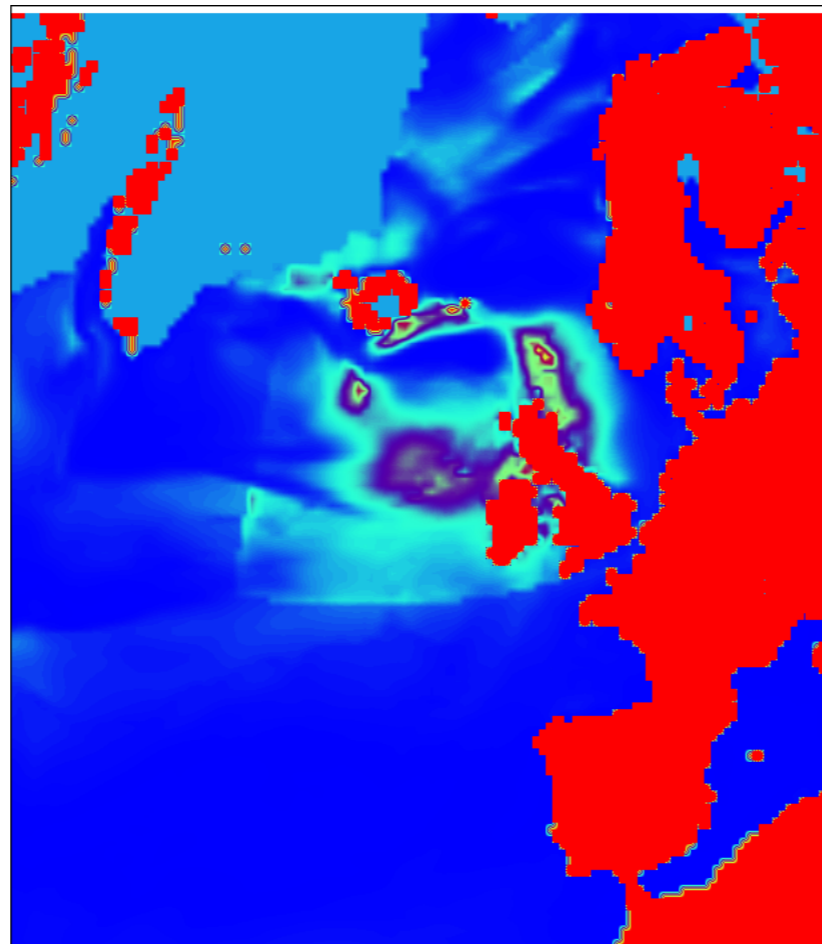


WRF roughness length (m) after 12 h

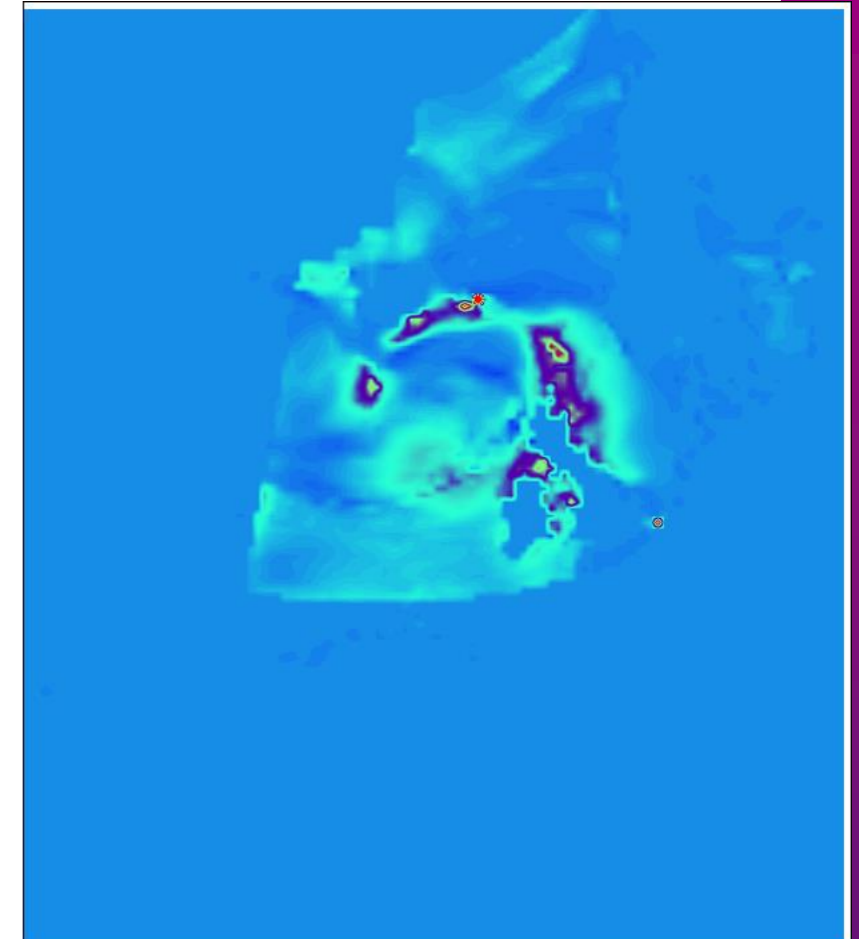
No coupling



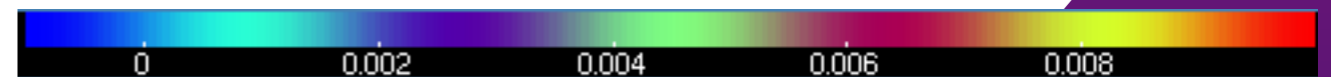
Two-way coupling



Difference



Colour scale for roughness length / m



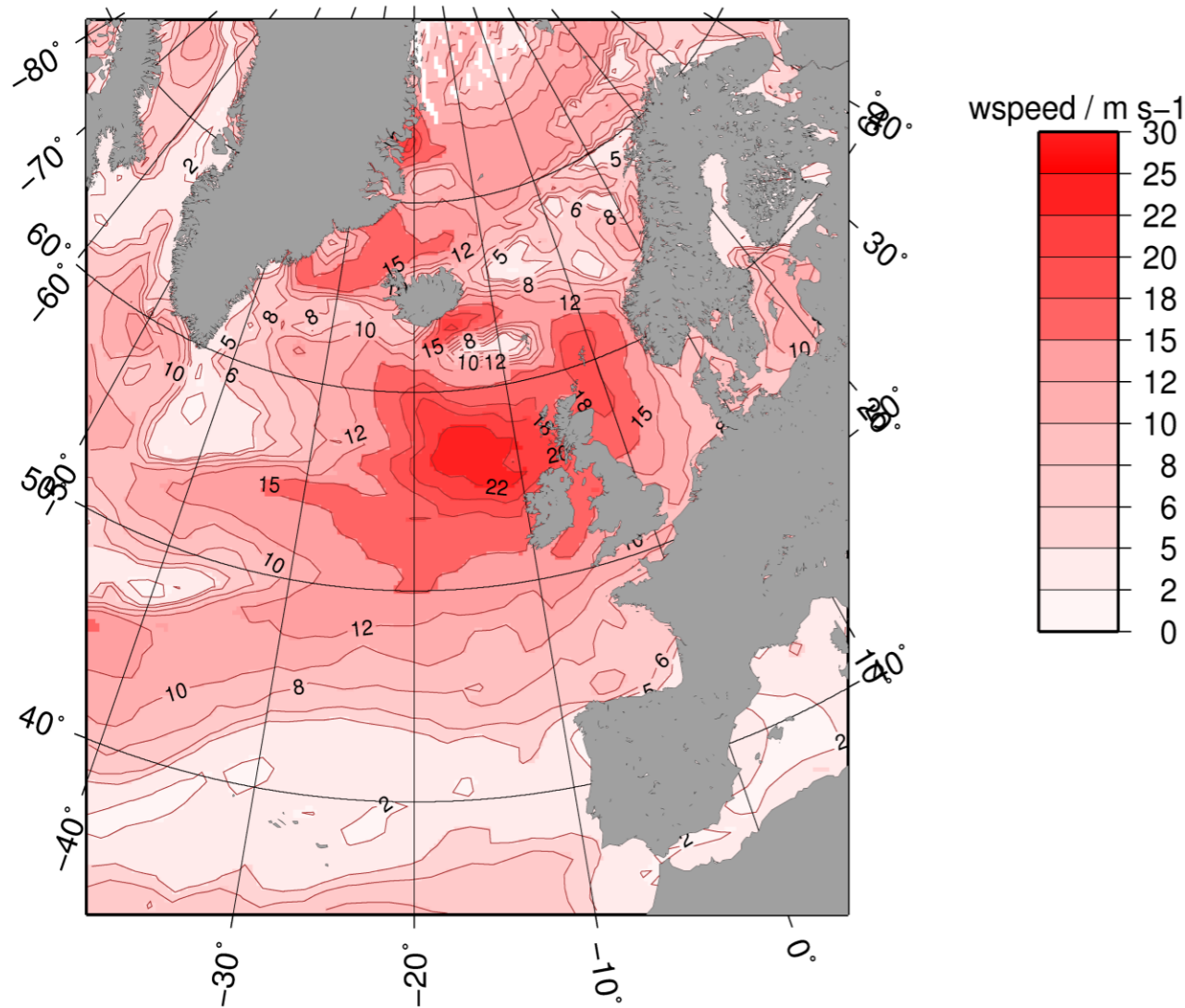
Colour scale for roughness length difference / m

Work by: Alastair Jenkins, Alok Gupta,
John Michalakes (NREL), Idar Barstad

The effect on U10 (wind speed) in WRF

2-way coupling :: Significant impact on the wind field!

10m wind speed, 2-way coupling



After 12 hrs simulation

Wind speed difference (2-way - 1-way) coupling

