Offshore wind from SAR satellite images

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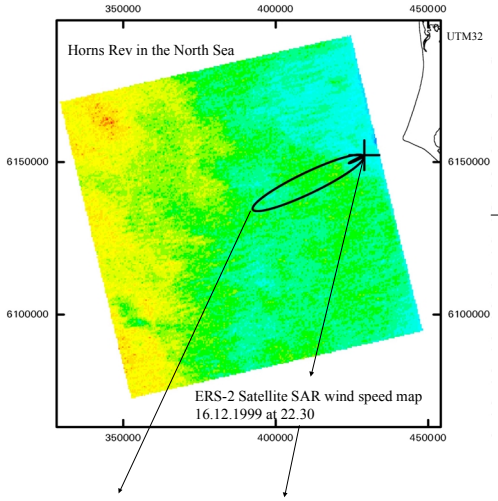
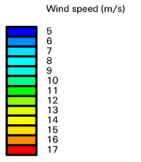
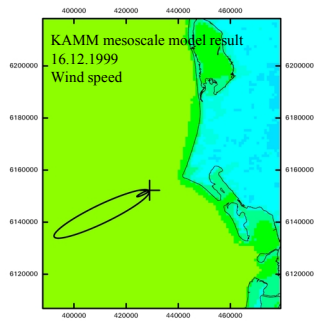
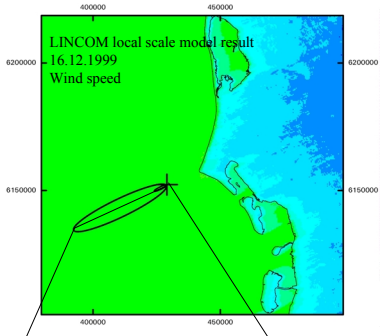




Position of meteorological mast 62 m tall (ELSAM).





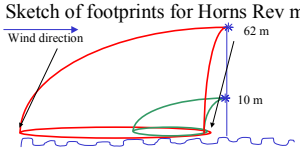
At Horns Rev in the North Sea the largest offshore wind farm in the world will be constructed in year 2002 around 14-20 km offshore (https://www.elsam.com).

Comparison of meteorological mast observations and SAR wind speed maps is performed through footprint analysis following Gash (1986).

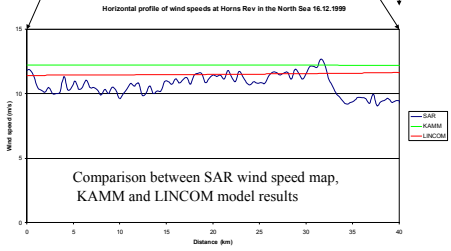
The higher up, the larger the footprint area.

For 16 cases mast observations and SAR wind speed at 10 m above sea level (corrected for tidal height) is graphed in the figure below.

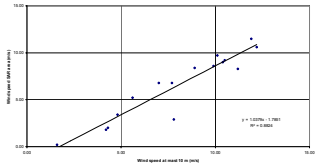
Sketch of footprints for Horns Rev mast



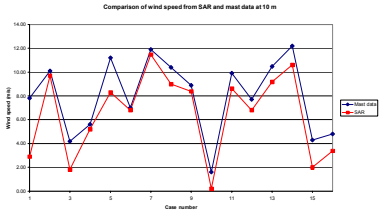
Mast



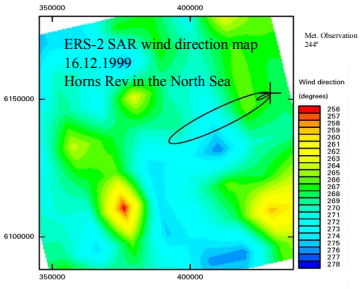
Comparison between SAR wind speed map, KAMM and LINCOM model results



Linear regresion between mast and SAR observations



Case #	Date yyyymmdd	Mast Dir. (degr.)	Mast U (m/s)	SAR U (m/s)
1	19990520	122.3	7.8	1.69
2	19990621	313.9	10.1	8.98
3	19990710	71.8	4.2	1.8
4	19990729	34.9	5.6	5.49
5	19990810	328.8	11.2	8.77
6	19990830	291.8	7	6.19
7	19991003	240.8	11.9	8.6
8	19991007	274.4	10.4	9.37
9	19991019	88.8	8.9	8.39
10	19991123	233.3	1.6	0.47
11	19991216	244.3	9.9	9.48
12	20000116	305.6	7.7	6.8
13	20000201	235.1	10.5	9.69
14	20000307	256.3	12.2	11.4
15	20000326	125.6	4.3	1.46
16	20000516	182.3	4.8	0.38



SAR satellite images

- Ocean wind speed maps can be retrieved from radar satellite images in C-band through C-band scatterometer model algorithms.
- SAR wind speed maps may improve offshore wind resource mapping.
- SAR images are available since 1992 around every third day from either ERS-1, ERS-2 and RADARSAT-1 and next year also from ENVISAT.
- In roughly 60% of all cases SAR images can also be used for mapping wind direction.

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