

“Silent” storm surge in Western Baltic Sea in 4 Jan. 2017 – preparation for CMEMS OSR3

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Structure of CMEMS Ocean State Report



- OSR 2015 – published
- OSR 2016 – accepted
- OSR 2017 – in preparation
- OSR 2017 structure
 - Ch1: Existing ocean monitoring index: daily maximum ice extend, major baltic inflow
 - Ch2: Newly developed ocean monitoring index: eutrophication
 - Ch3: Extreme statistics (99 percentile in 20 years)
 - Ch4: Extreme events

Facts



Station name	Maximum sea level (m)	Time reaching MSL	Time Interval of surge (hours)	Sea level change (m)
Tjen	1.17/1.19	2017.1.4 15:30/18:20	16.7	1.23
Drogden	1.52	2017.1.4 17:00	14	1.7
Gedser	1.69	2017.1.4 19:30	15	1.95
Warnemuende	1.46	2017.1.4 19:30	15.5	1.65
Bagenkop	1.77	2017.1.4 22:50	16	1.96
Kalkgrund	1.67	2017.1.4 23:45	16.3	2.05
Fredericia	1.22	2017.1.4 23:40	16	0.97
Slipshavn	1.14	2017.1.5 00:30	27.8	1.07

Highest water level reached at different time: stations in the west reach first, stations in the east reach later. The propagation phase speed is between 6-13m/s, slower than free surface gravity waves.

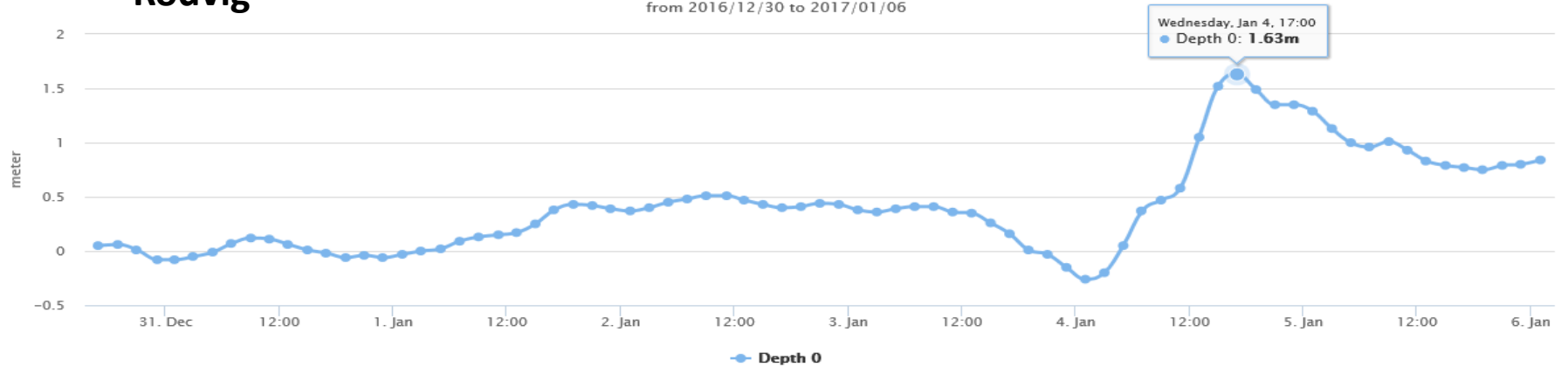
Sea level at Rodvig and Kalkgrund sations



Rodvig

observed sea level in TIME

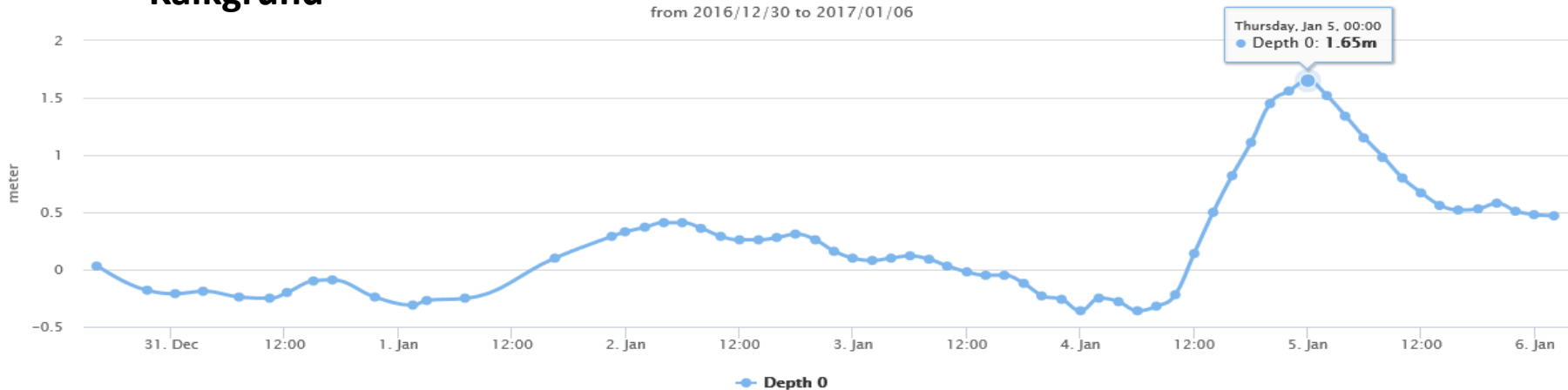
from 2016/12/30 to 2017/01/06



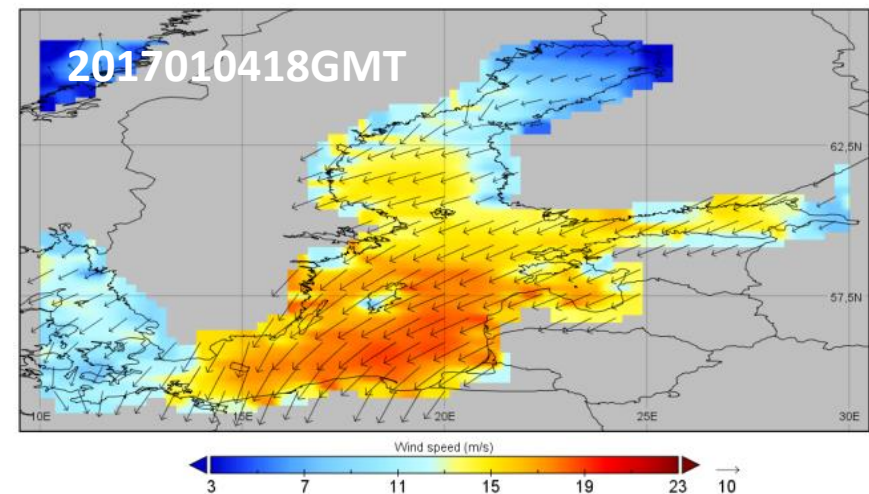
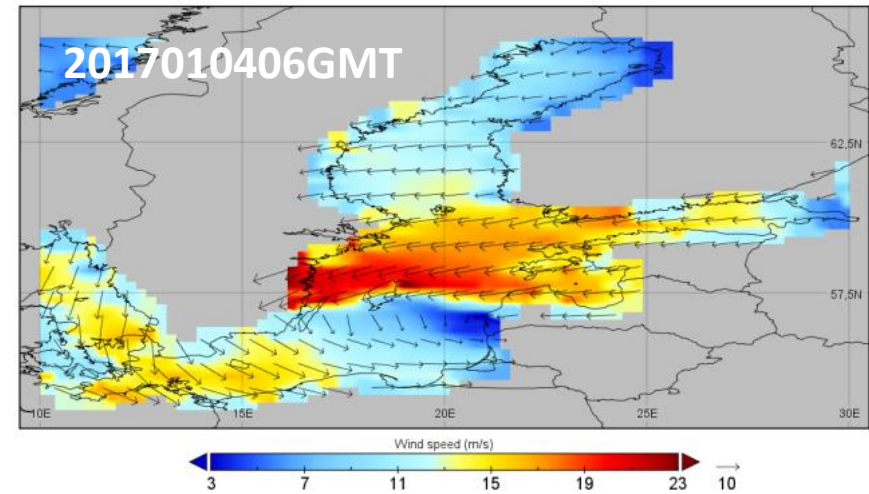
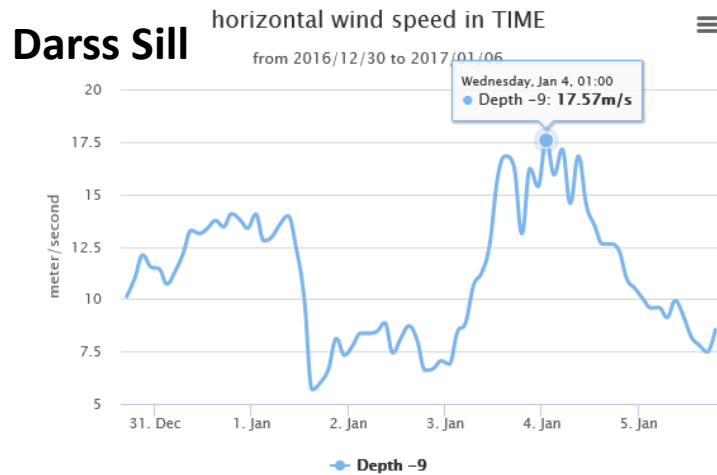
Kalkgrund

observed sea level in TIME

from 2016/12/30 to 2017/01/06

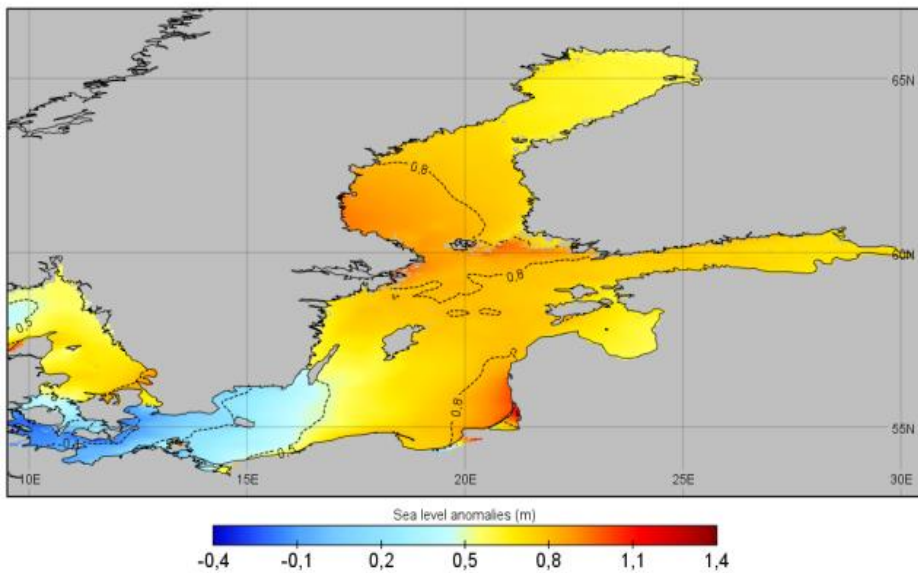


Sea surface wind conditions

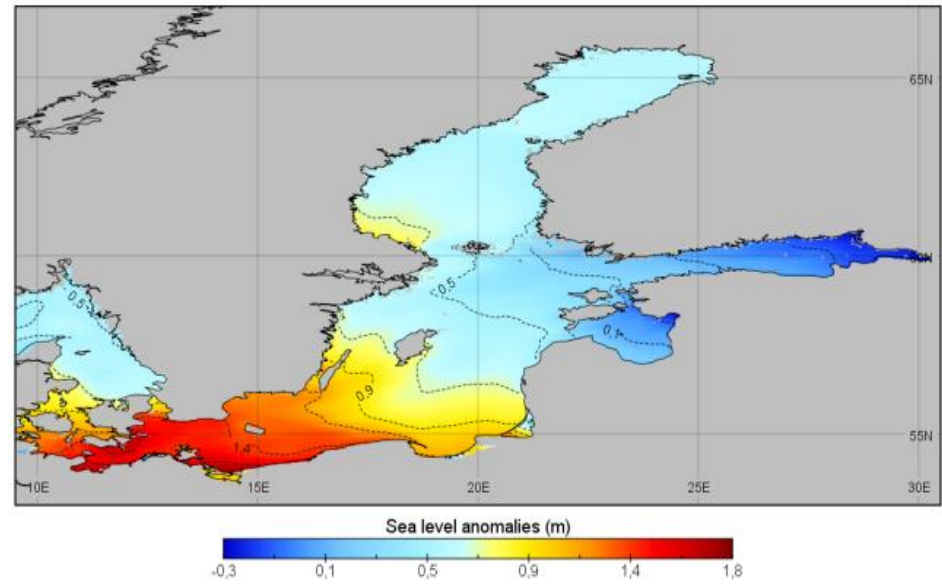


- 2-3 Jan., westerly winds prevails
- Strong northeasterly winds up to 23 m/s prevail in central/southern Baltic Sea in the 4th January.
- In the western Baltic Sea, high winds only occur in early time of the day but much weaker than in the central Baltic Sea.

Sea level before and during the storm surge event

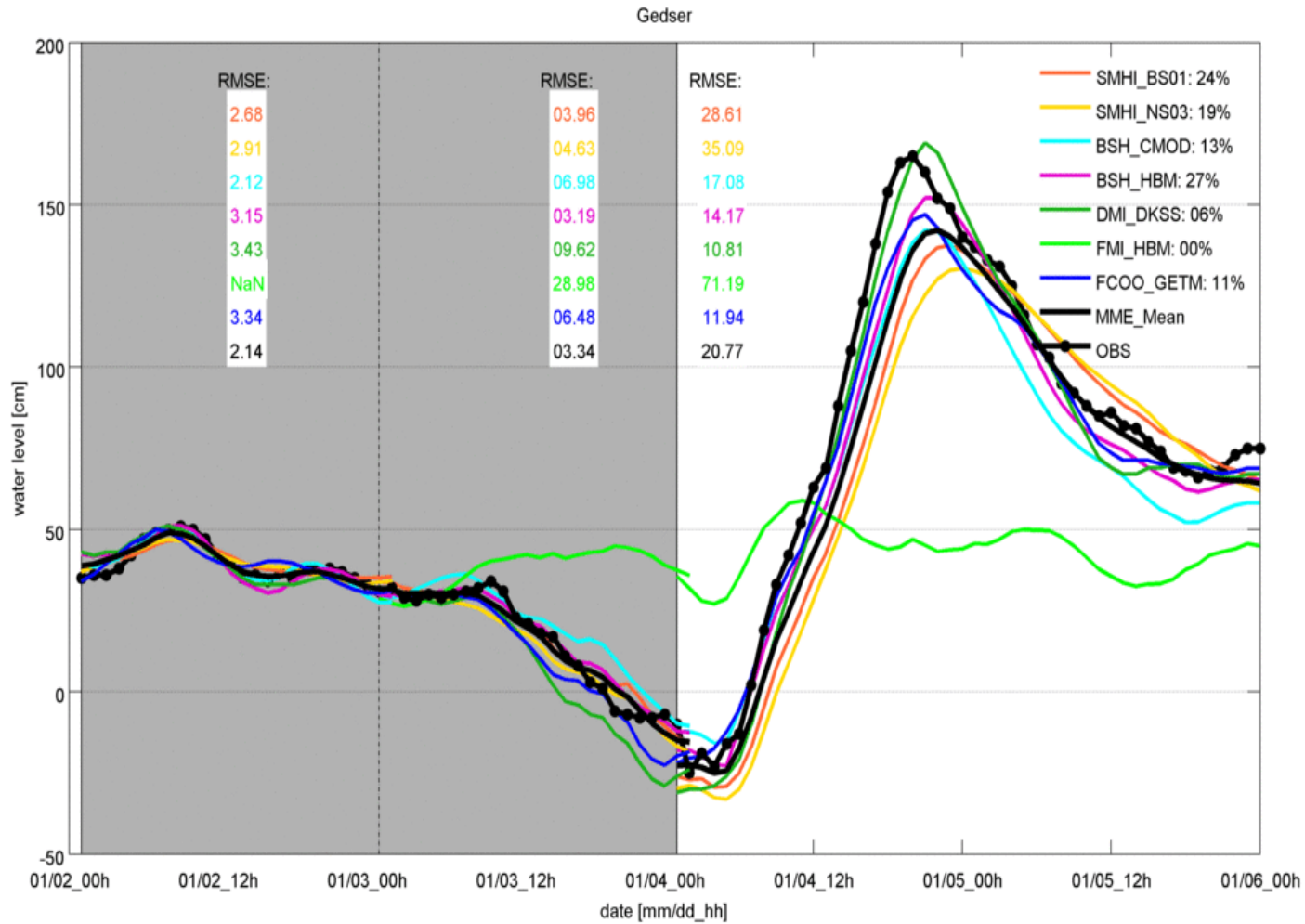


Sea level at 20170323GMT , the sea level is high in both Kattegat and central Baltic Sea but low in the western Baltic Sea.



Sea level change between 2017.1.3 23GMT and 2017.1.4 19GMT. Up to 1.9m water increase in the transition area during the 20h.

Forecasting skills



Implications of the event



- Important factors for model forecasting:
 - Initial large scale field (caused by winds)
 - Bottom drag
 - Bathymetry and grid
- Estimation of extremes with 50/100/1000y return period
 - 1993, Great Belt, 50year event
 - 2017, western Baltic, 50-100year event

Thank you for your attention!