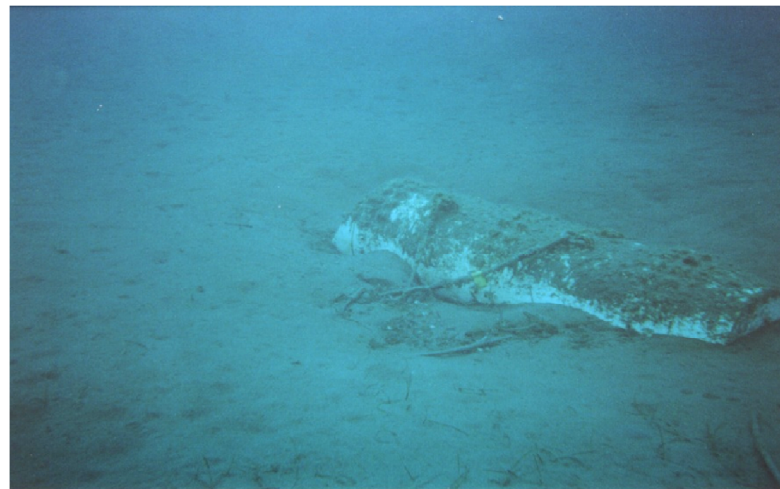


STORM INFLUENCE ON OBJECT BURIAL IN SHALLOW WATER

Sonia Papili, Thomas Wever



Belgian Navy - RCMG (Renard Centre of Marine Geology, Ghent University),
Marinebasis Zeebrugge, Graaf Jansdijk 1, 8380 Zeebrugge Belgium
Email: sonia.papili@mil.be

- Introduction
- Area of investigation
- Methods
- Results
- Discussion
- Space for questions

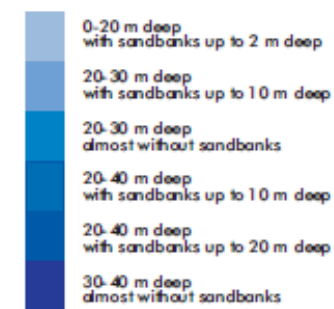




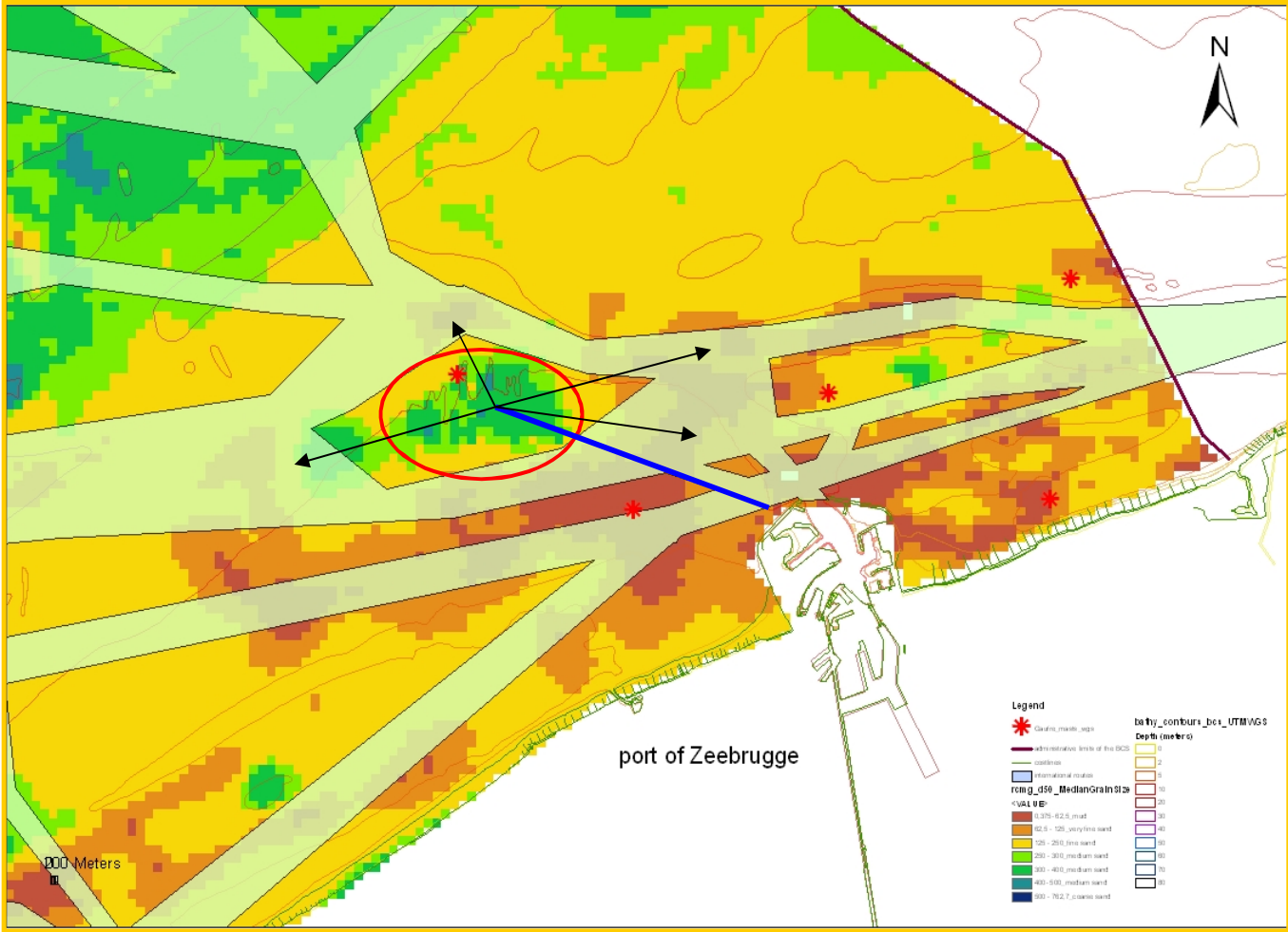
RELIEF

The Belgian part of the North Sea is characterised by a limited water depth and a small seabed gradient. The water depth ranges between 0 metres at the coast and a maximum of 40-45 metres in the north-western part. 10 to 20 kilometres from the coast the maximum depth amounts to 15 metres. Near the Hinder and Zeeland Banks the sea is 15 to 35 metres deep. In the very north of the BPNS the water is about 45 metres deep. Just to the West of the BPNS, in the French part, the gradient is much steeper: 20 kilometres off the coast of Dunkirk the sea is already 30 to 35 metres deep.

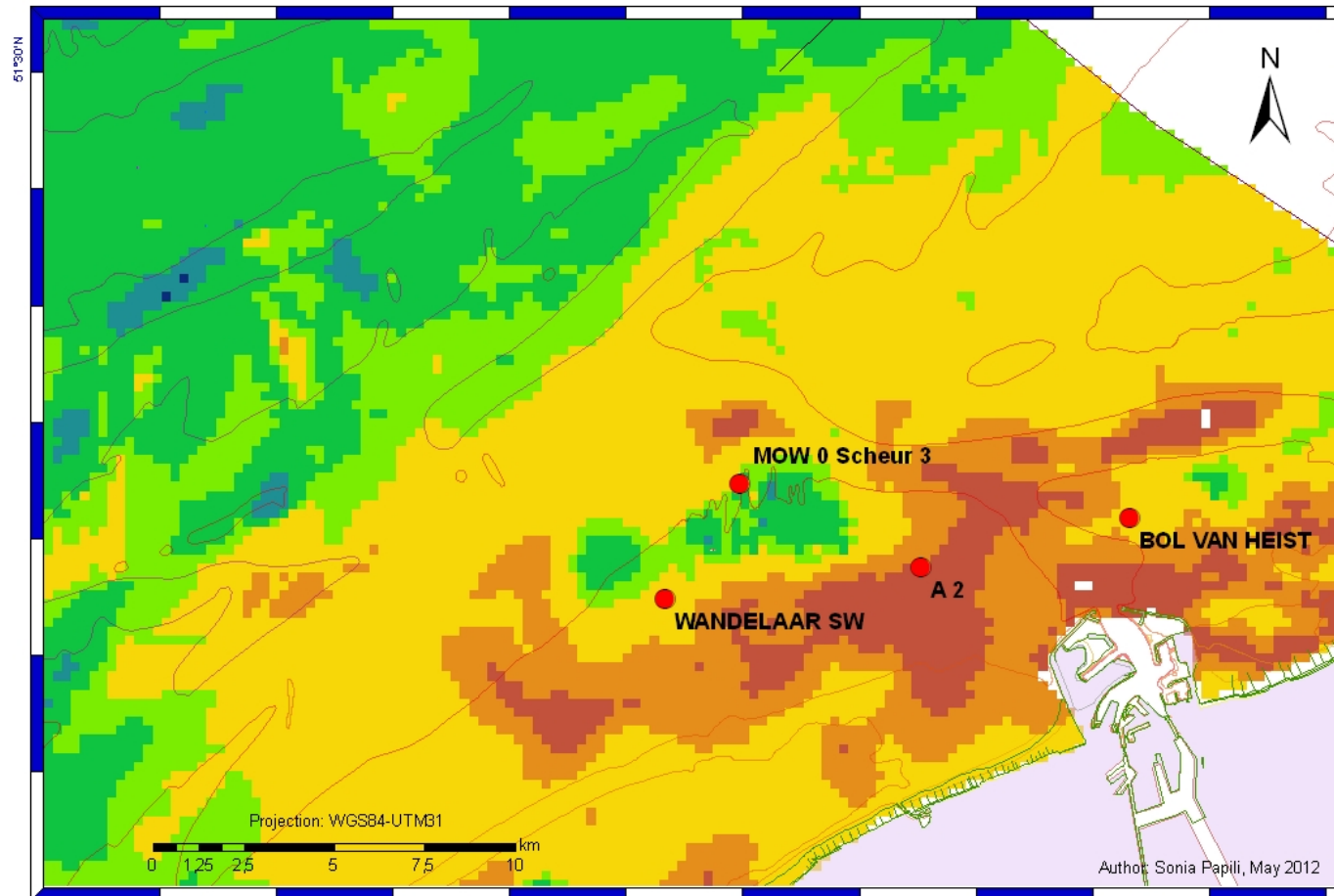
*Average water depth in the BPNS
(structure map)*



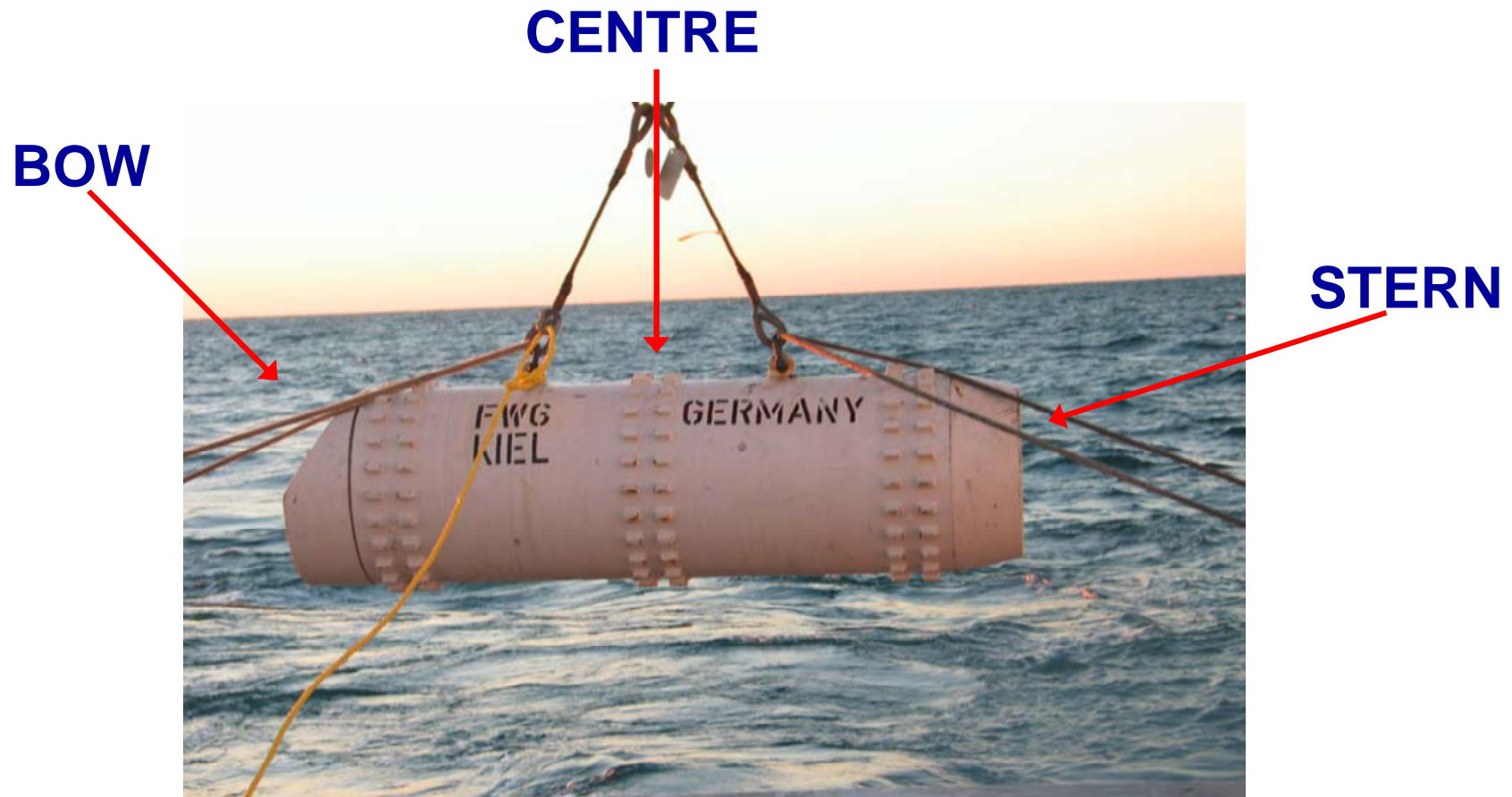
Wandelaar area



Wandelaar area



Burial Recording Mine



Provided by: FWG, Forschungsbereich für Wasserschall und Geophysik of WTD 71

Pitch-Roll

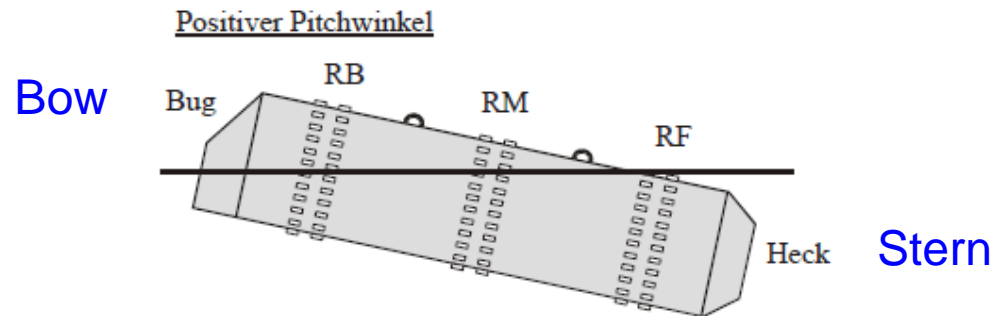


Figure 1: Side view of a BRM with positive pitch angle. The bow (Bug) is the tapered end of the mine, the stern (Heck) is symmetrical. The three rings are named RB, RM, and RF.

Figure 2 gives a cross section through the BRM and explains how the numbering is defined.

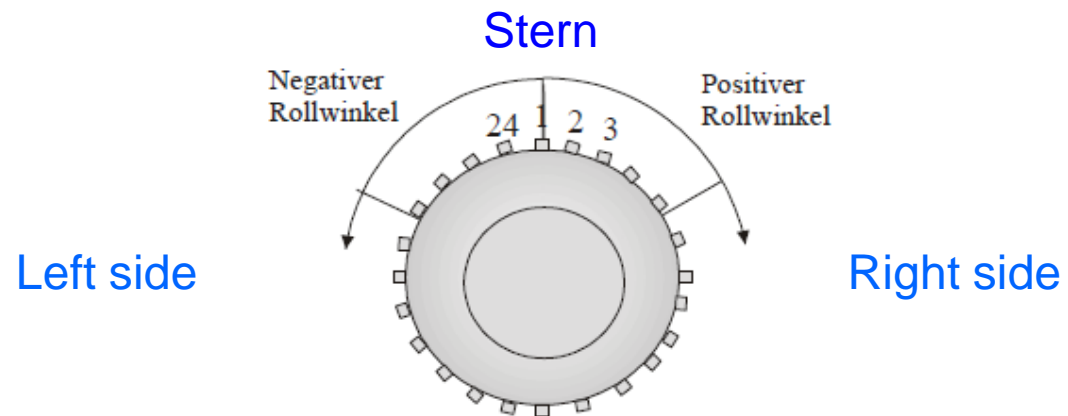


Figure 2: Cross section of a BRM and indication of positive and negative roll when looking from the stern (RF) of the mine to the bow. ("Rollwinkel": angle of roll).

At a distance of 45 minutes from the Drowned British mine (see page 10)

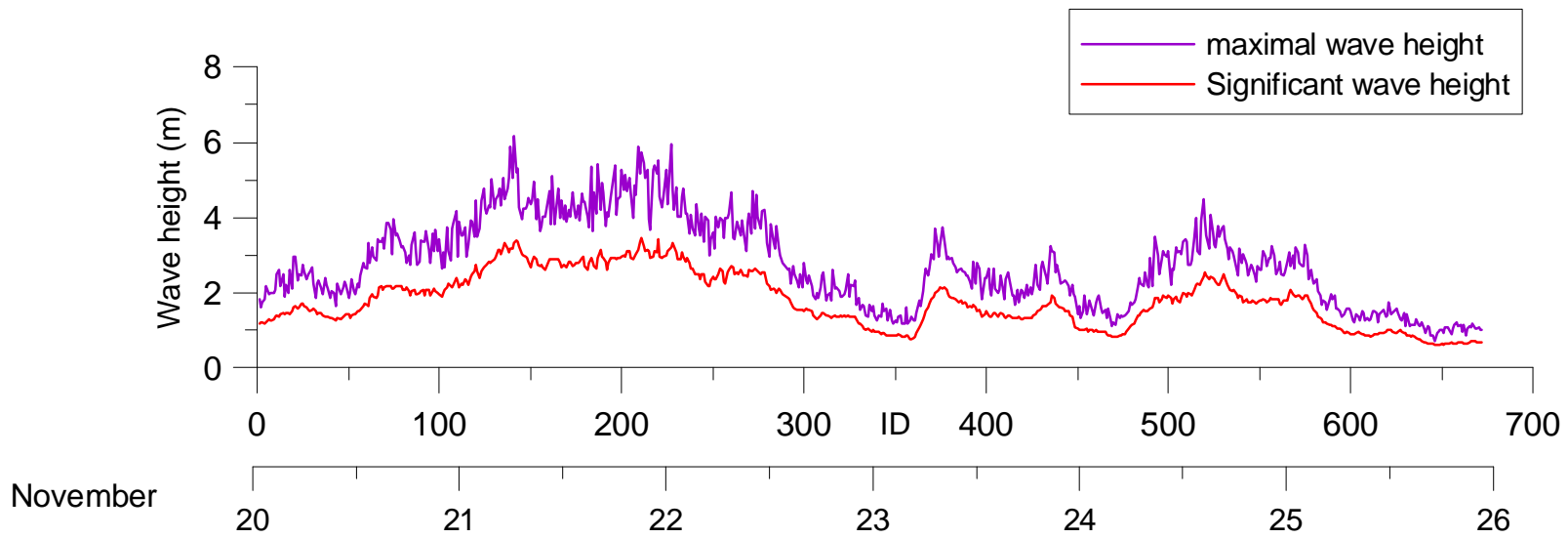
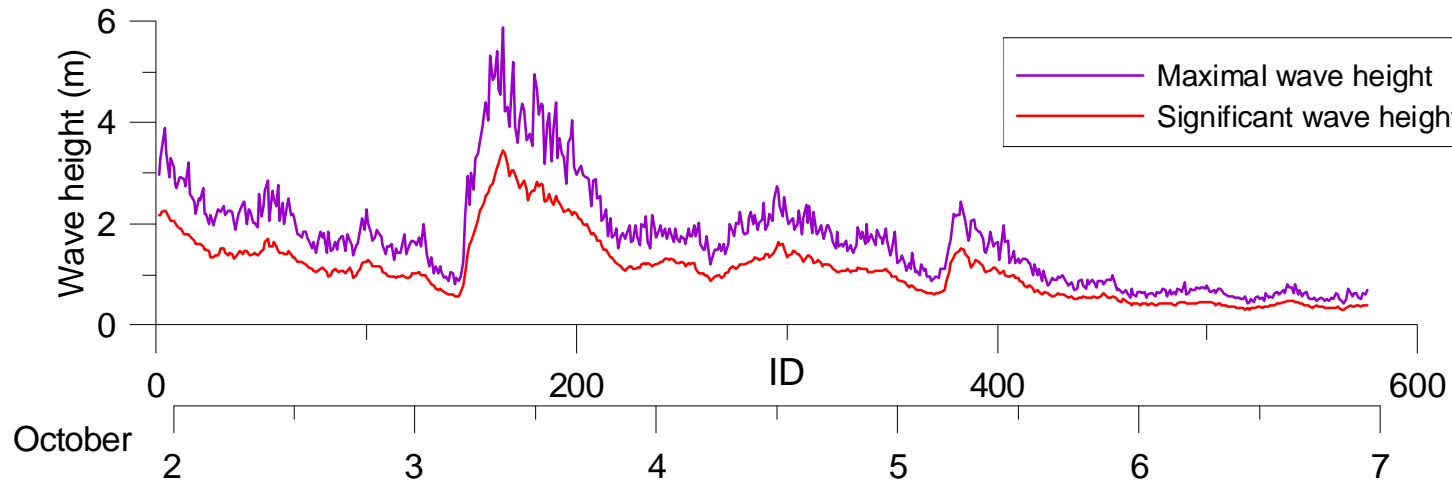


Sediment analysis

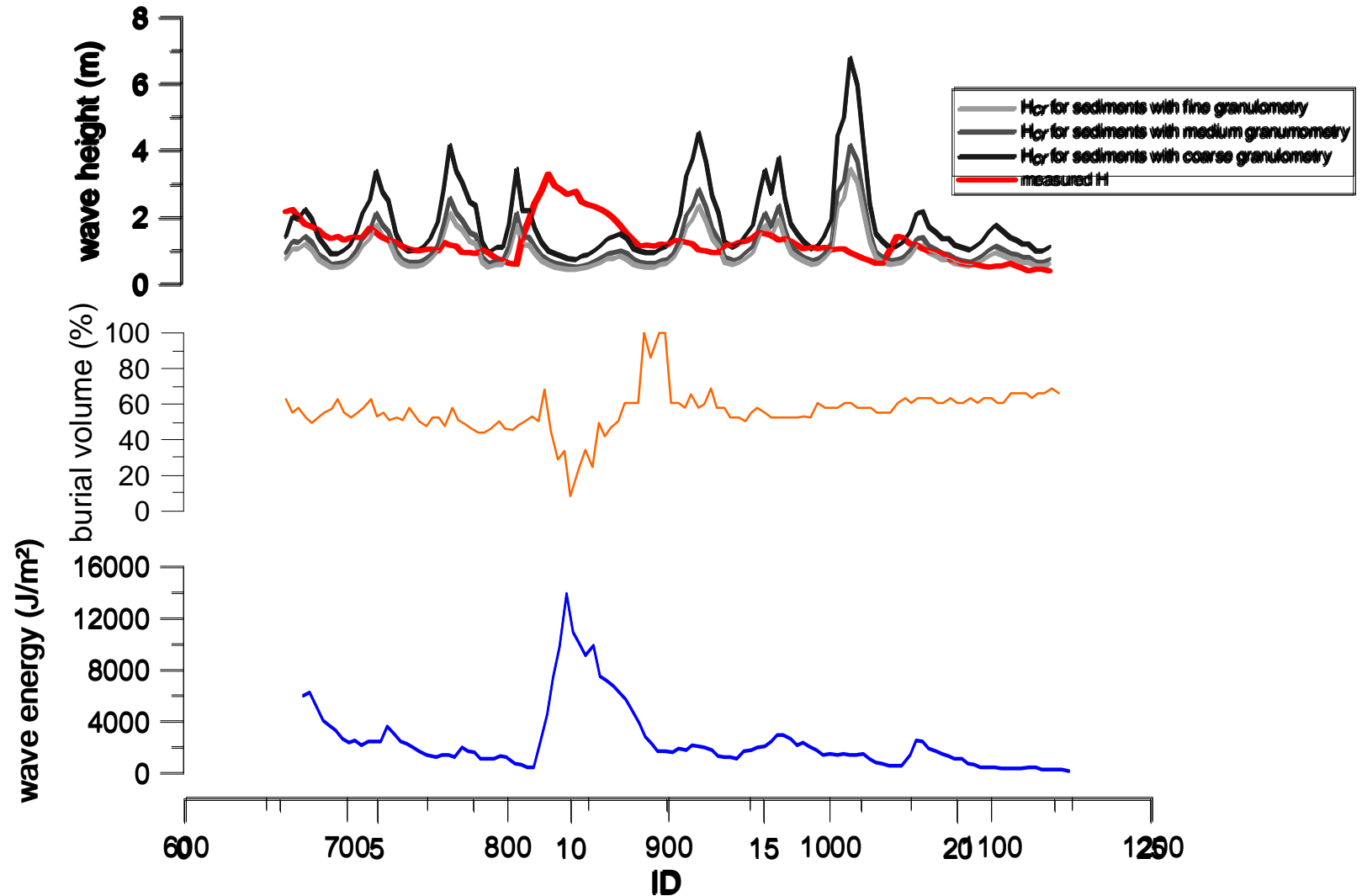
Sample Name	d (0.1)	d (0.5)	d (0.9)	kurtos	skewn	Mode
WandelaarBRM _LOC.1_1	258,99	446,86	755,58	0,23	0,71	450,57
WandelaarBRM _LOC.1_2	295,84	509,53	914,57	0,65	0,98	491,69
WandelaarBRM _LOC.1_3	271,90	474,10	833,67	0,27	0,85	469,37

RESULTS

Wave Height measured during storm periods



FIRST STORM OCTOBER 2008



October

2

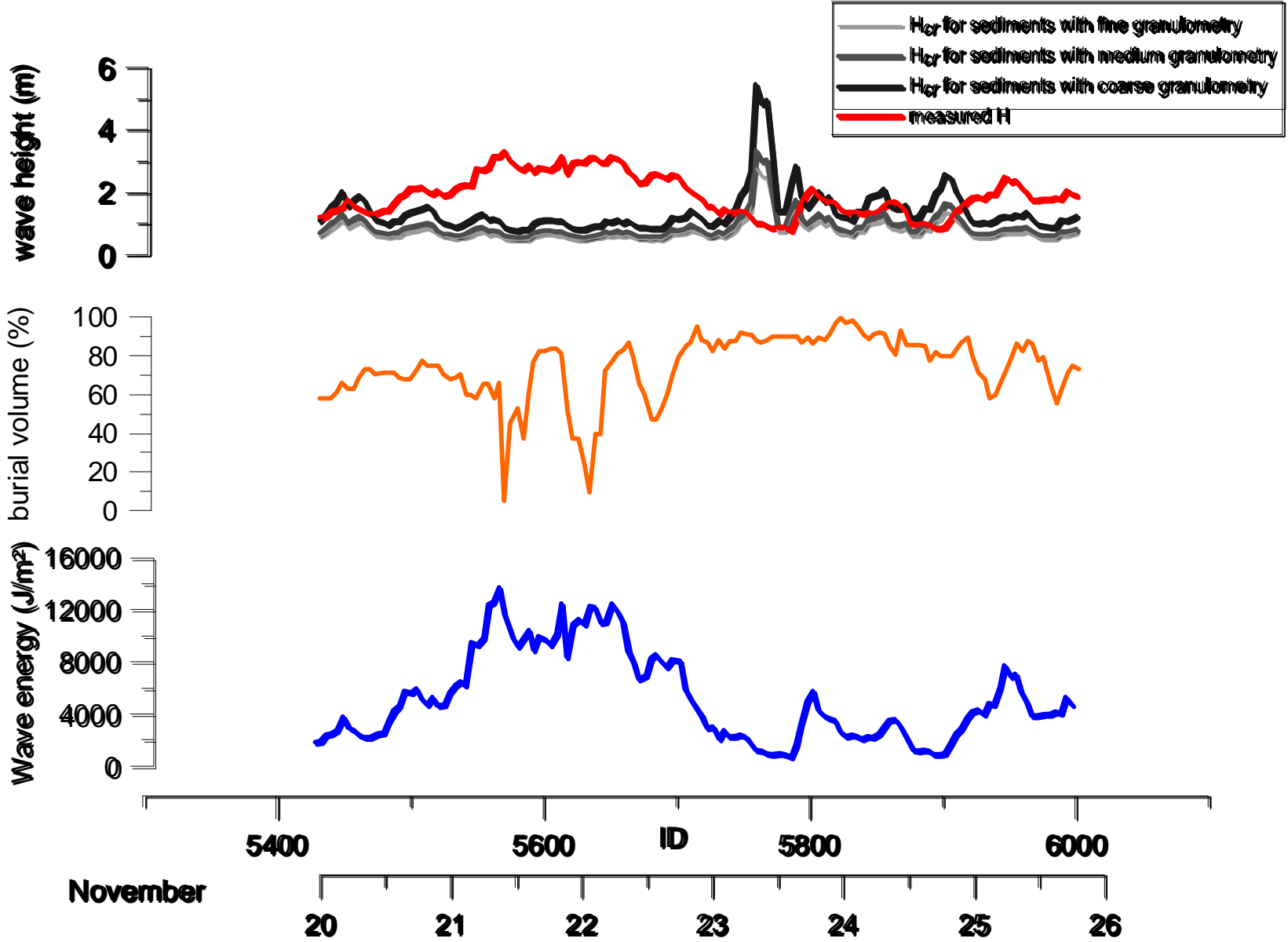
3

4

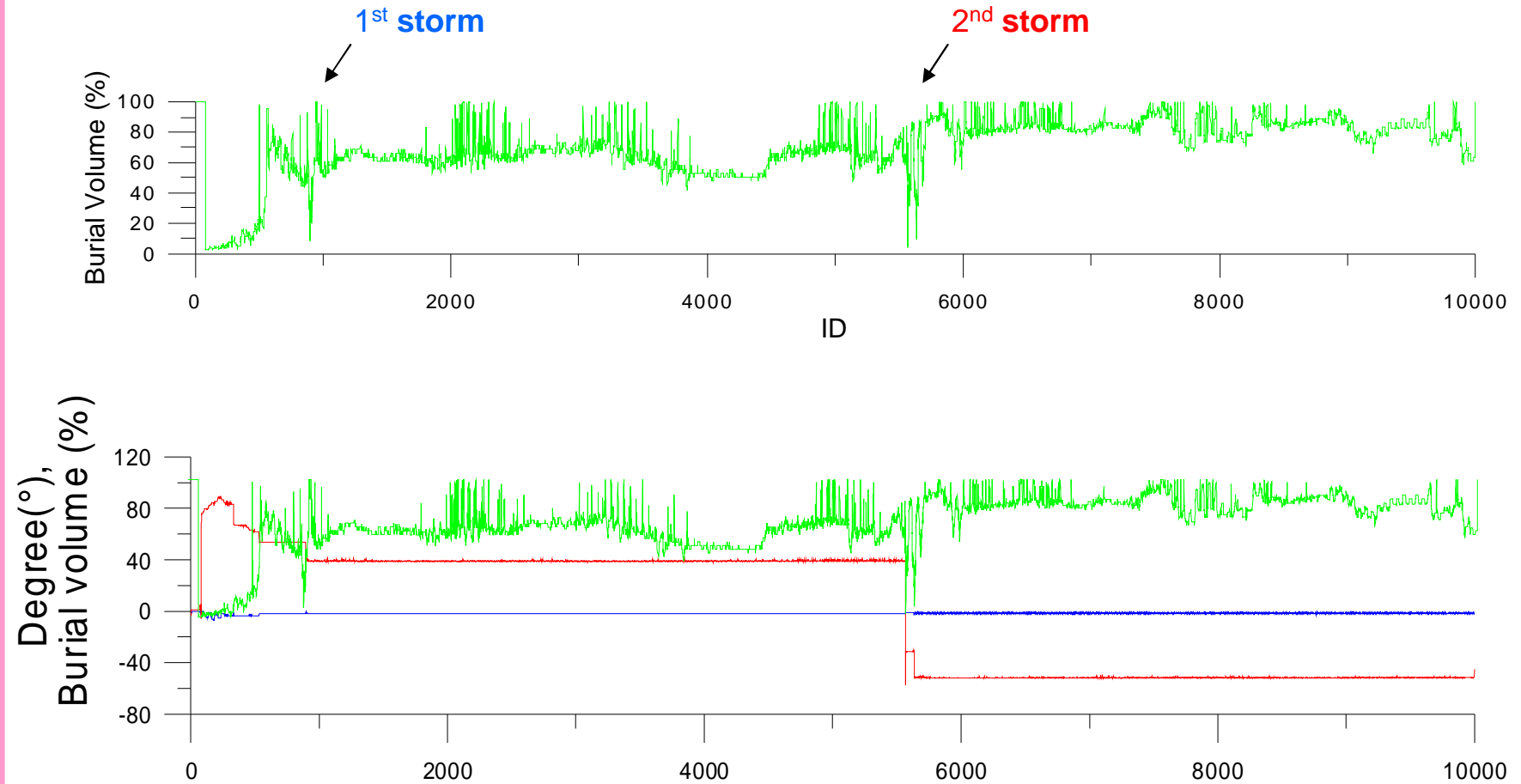
5

6

SECOND STORM NOVEMBER 2008



Relative burial volume correlate with roll and pitch events



Conclusion

Storm → Wave energy → Scour hole

Scour hole → Roll → Burial



IF you lose something in the
North Sea.....



Formula Komar-Miller

$$(1) U_{wcr} = [0,118g(s - 1)]^{2/3} d^{1/3} T^{1/3} \quad \text{for } d < 0,5 \text{ mm}$$

$$(2) U_{wcr} = [1,09g(s - 1)]^{4/7} d^{3/7} T^{1/7} \quad \text{for } d > 0,5 \text{ mm}$$

U_{wcr} = critical threshold orbital velocity

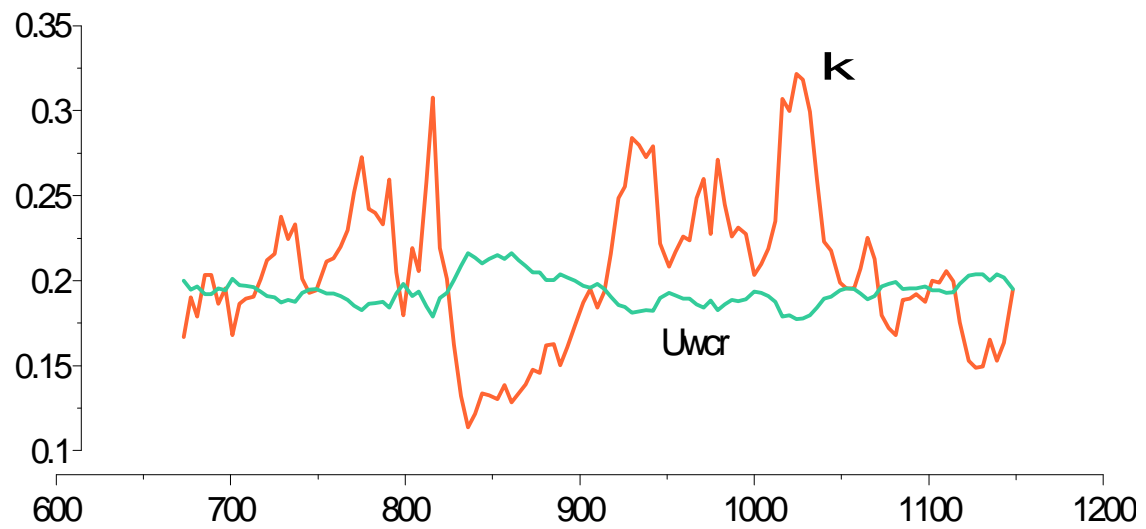
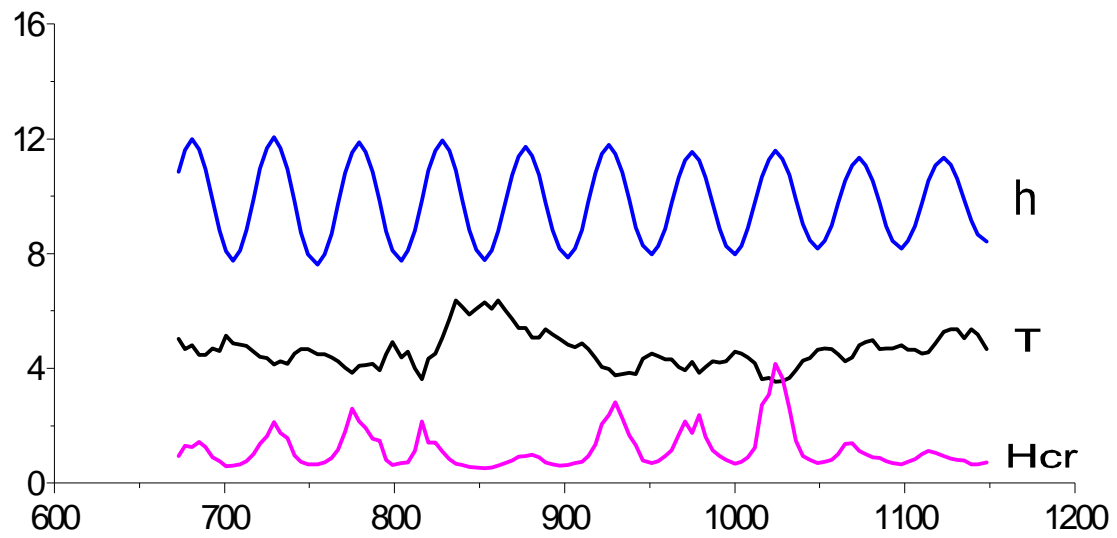
g = acceleration due to gravity

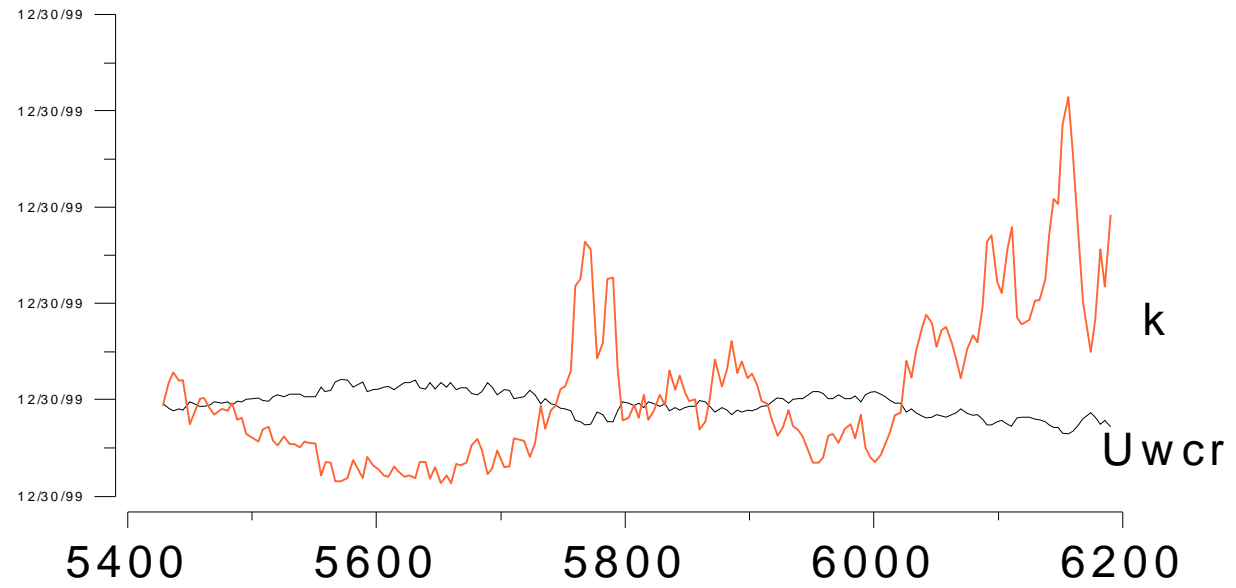
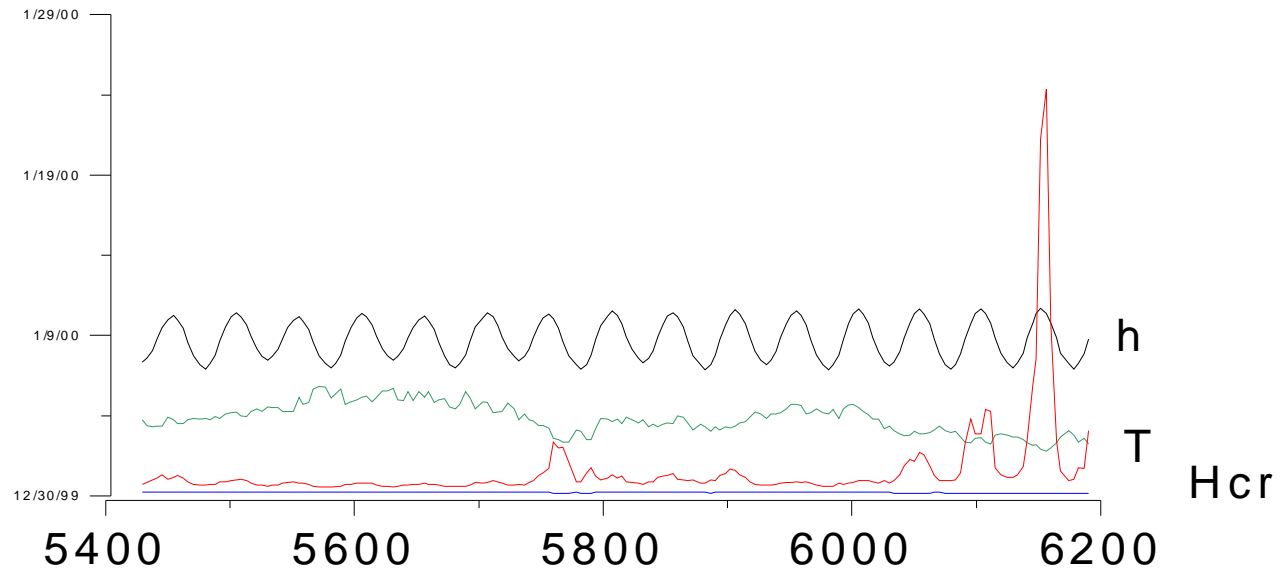
s = ratio of densities of grain and water ($\bullet s / \bullet w$)

T = wave period

d = grain size

$$U_{wcr} = \frac{\rho \cdot H_{cr}}{T \sinh(kh)}$$





SCOUR EFFECT

