The concept of triggers – staying ahead of (severe) weather developments

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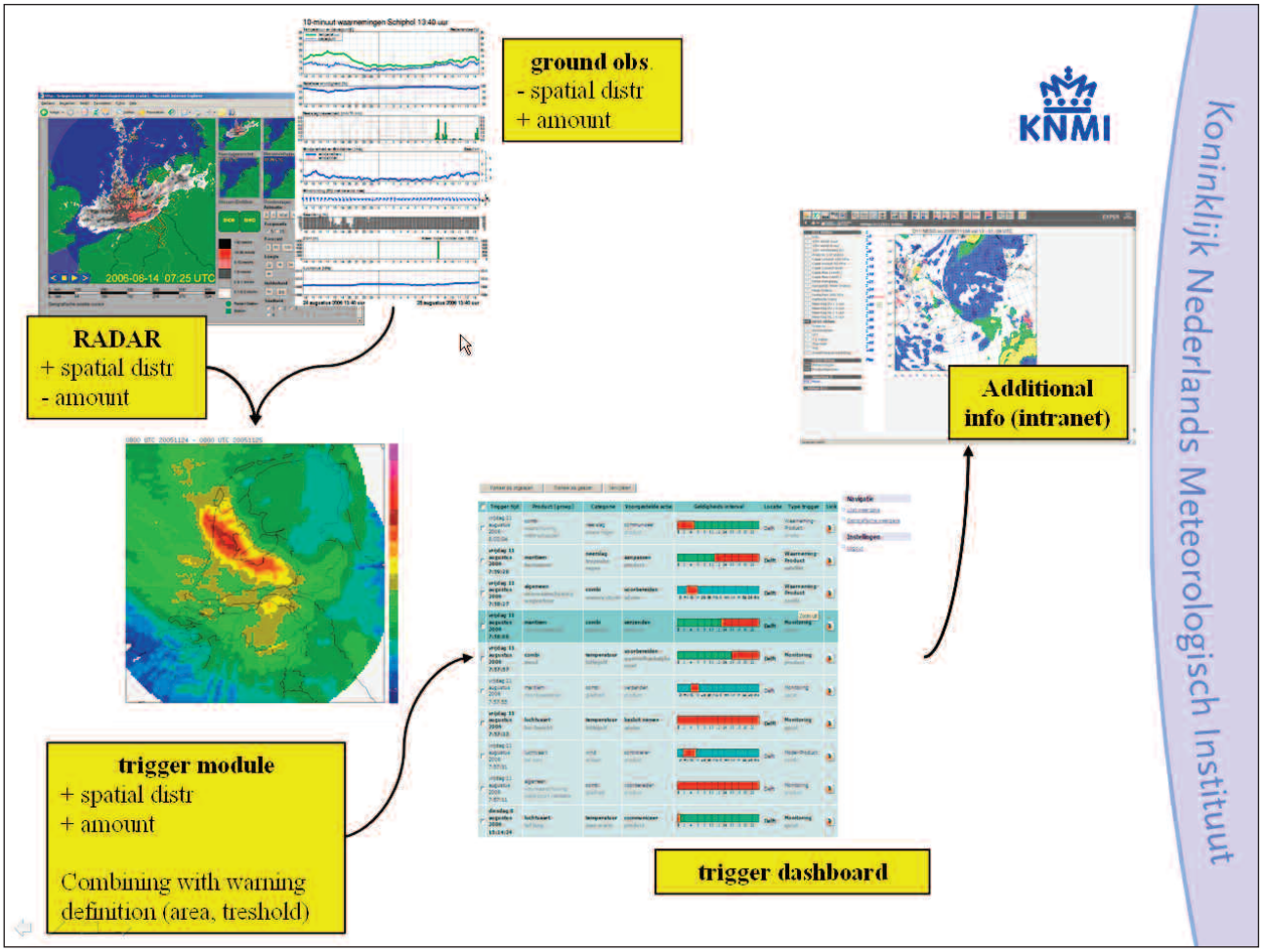
In a modern Met Service, the issuing of weather alerts and warnings is core business. The number of warnings has risen significantly as a result of the availability of more detailed models and improved skill in forecasts. At KNMI, forecasters have to monitor more then 25 warnings and alerts, each for a different weather parameter, region and forecast lead-time. Since some of these warnings are only issued a few days per year, it is very hard for a forecaster to stay alert and ahead of (severe) weather developments.

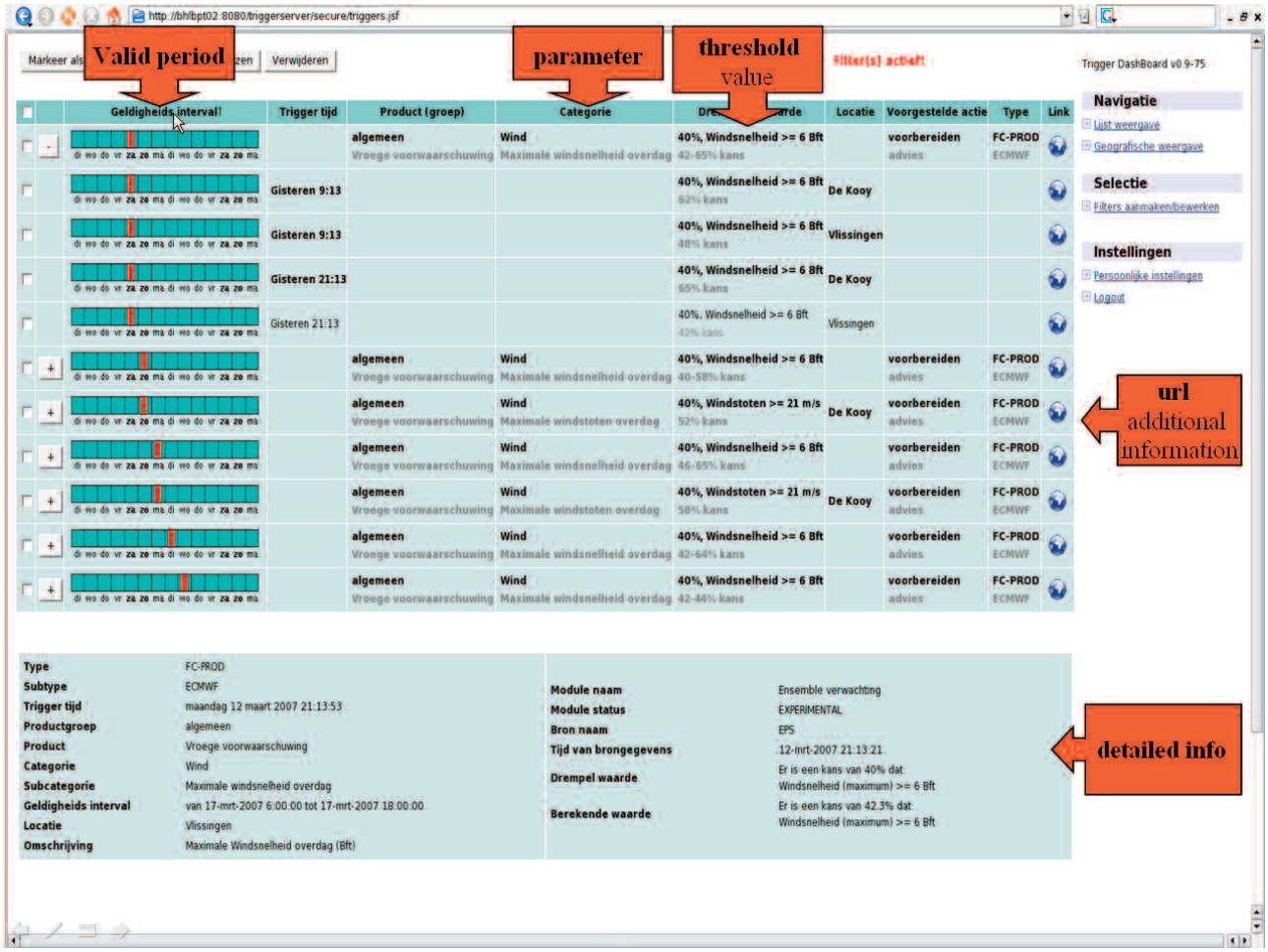
In 2005 a pilot project started at KNMI in which the main goal was to explore whether automatic determination of (severe) weather events could help the forecaster in putting him on the right track, at the right moment. Relevant information (a "trigger") is sent to the forecaster by a number of trigger-generating modules. These modules determine severe weather events by combining warning thresholds and area definitions with real time observations.

For example, in the post processing of the RADAR observations, the amount of precipitation in a predefined area (50x50 km) is calculated and, if the amount exceeds the threshold for a severe warning, a trigger is generated. Other modules determine upcoming severe weather events by combining warning threshold and area definition with model forecast (HIRLAM, ECMWF).



Trigger generation for deviations in actual products and observations will also be implemented. The trigger concept is also useable for monitoring automatic production. Here, a trigger is generated depending on the content of the product resulting in appropriate action (e.g. quality control) by the forecaster.

Trigger information is sent to a central dashboard in an XML trigger file. The information in the trigger is displayed on the dashboard and the forecaster gets a quick overview of relevant events. For further support, intranet pages are provided on which the forecaster can find more detailed information as well as production support.



The challenge of the project is to present a variety of triggers in such a way that forecasters find the system supportive, i.e. to make a system that effectively filters the amount of information, in stead of increasing it. If this challenge is met, the way forecasters work will change. They will most certainly more easily find the needle in the haystack of meteorological information.

Storm surge support at KNMI

- EPS winds in North sea coupled to
  - WOMOD (statistical model)
  - WAQUA (dynamic wind surge model)
- Extra surge shift
- Close cooperation with Dutch Storm Surge Warning Service
- Triggers not yet implemented

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Area's and tidal barriers of the Dutch Storm Surge Warning Service

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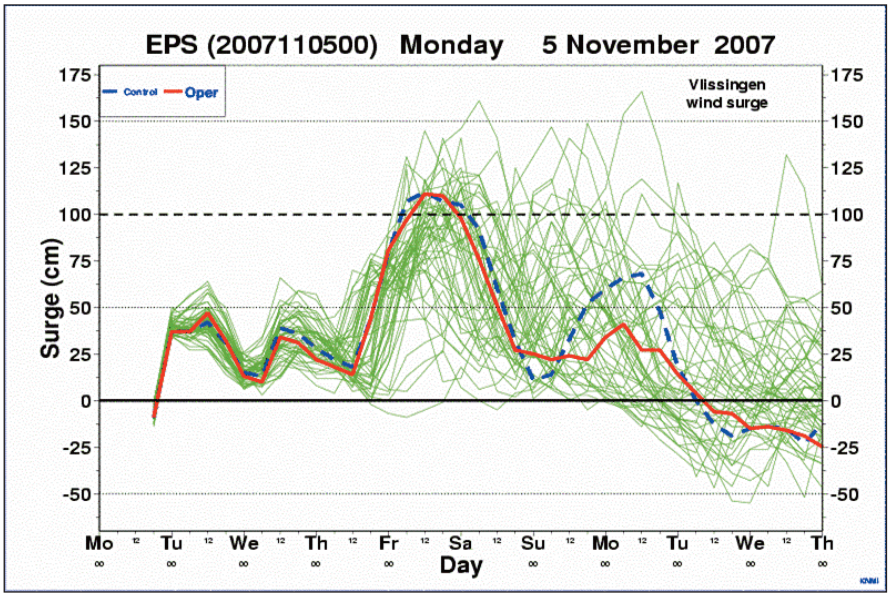
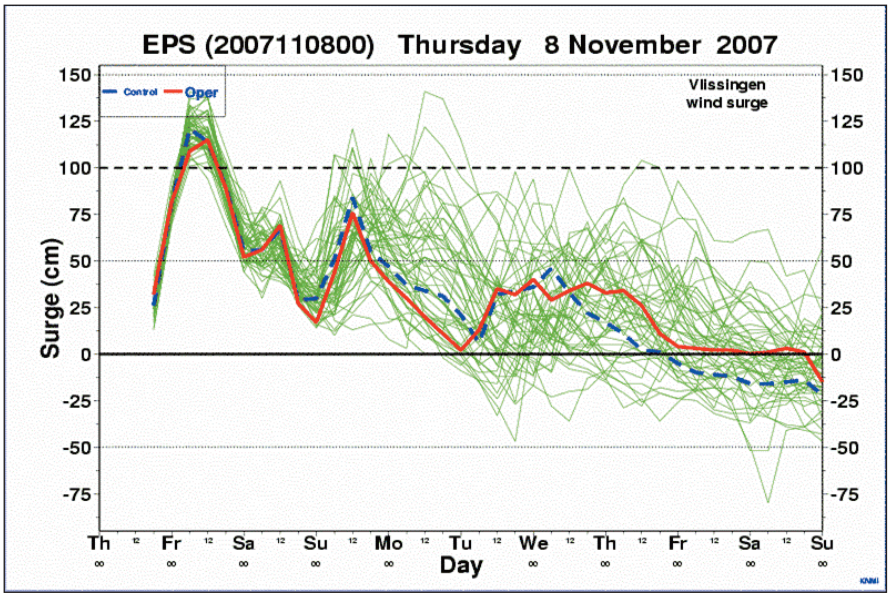
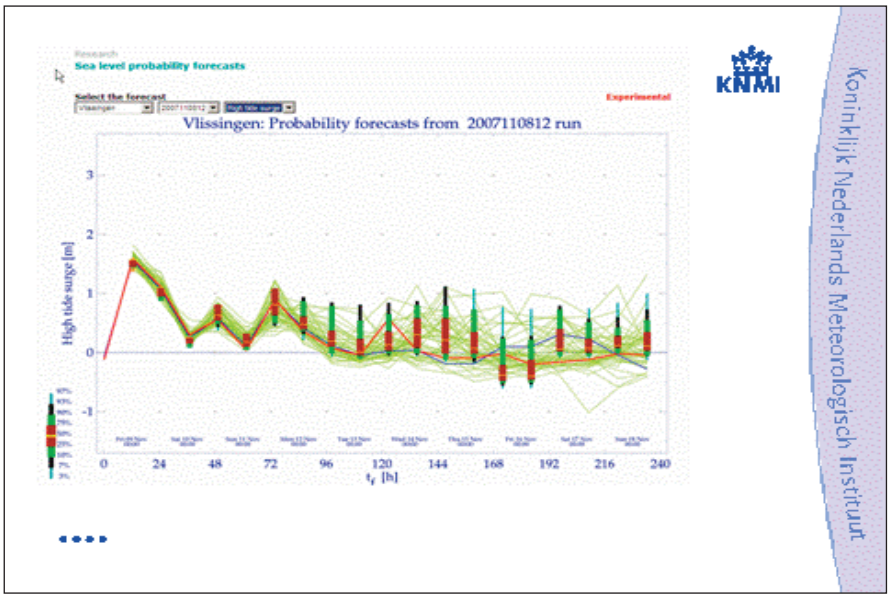

EPS (2007110500) Monday 5 November 2007
Control
Oper
Vlissingen
wind surge
Surge (cm)
175
150
125
100
75
50
25
0
-25
-50
Mo Tu We Th Fr Sa Su Mo Tu We Th
Day
KNMI


EPS (2007110800) Thursday 8 November 2007
Control
Oper
Vlissingen
wind surge
Surge (cm)
150
125
100
75
50
25
0
-25
-50
-75
Th Fr Sa Su Mo Tu We Th Fr Sa Su
Day
KNMI


Sea level probability forecasts
Experimental
Vlissingen: Probability forecasts from 2007110812 run
High tide surge [m]
3
2
1
0
-1
0 24 48 72 96 120 144 168 192 216 240
t_f [h]
KNMI
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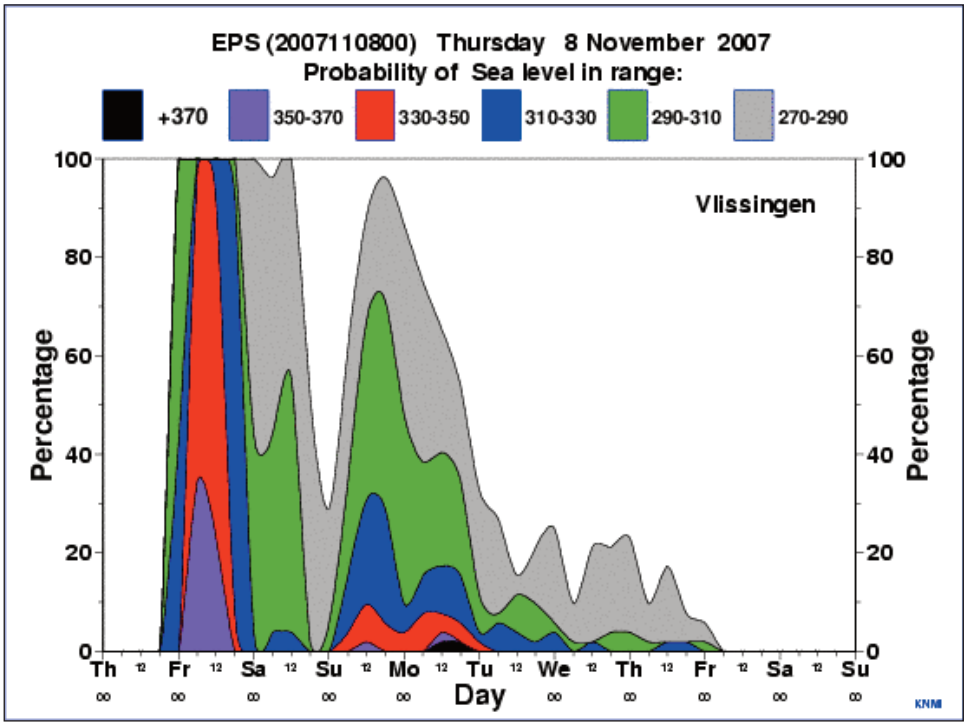

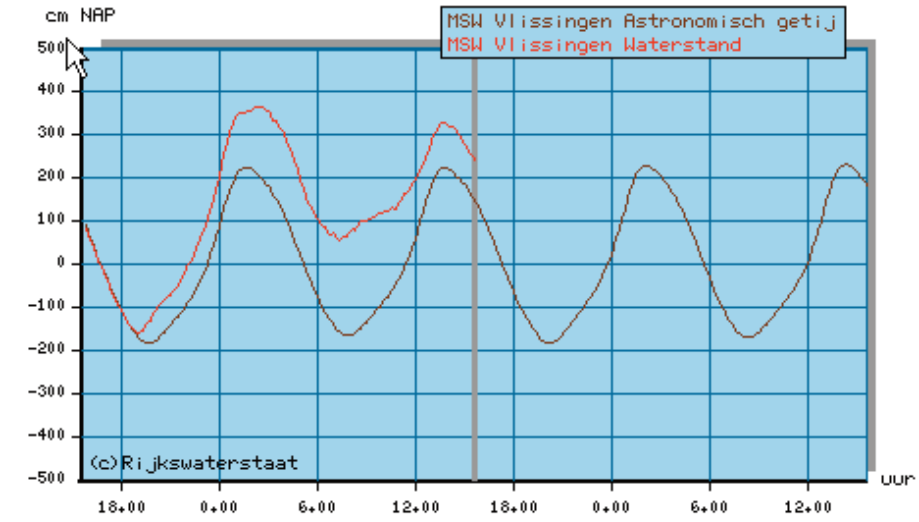

Het astronomisch getij op 09 november, 15:30 uur is 149 cm NAP
De waterstand op 09 november, 15:30 uur is 243 cm NAP

N.B. Bovenstaande gegevens worden ca. 6 keer per uur ververst.

Top-5 van de hoogste waterstanden sinds 1900 (in cm +NAP):

1.	455	1 februari 1953
2.	394	3 januari 1976
3.	392	12 maart 1906
4.	387	28 januari 1994
5.	384	27 februari 1990