Saint Nicolas Storm 5 December 2013

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Introduction

An active low pressure system moved east across the northern part of the North Sea during 5 and 6 December 2013. Because of this system, a weather alarm was issued for very strong gusts along our coast and further inland. This storm also caused water levels to rise along our coast because of the strong northwesterly winds at the western flank of the aforementioned low.

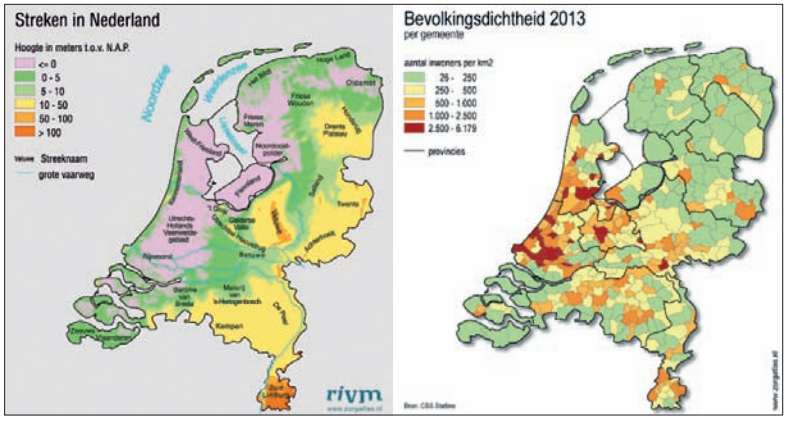
In this article I would like to give an overview of the development of the low pressure area, the model forecasts and the consequences that this storm had for our country. This will be done from the perspective of a marine forecaster and therefore water level forecasts will be mentioned as well. This is also the reason that this article will start with a short description of the vulnerability of The Netherlands to high water levels.

This case is called the 'Saint Nicolas' storm in the Netherlands because of a Dutch national celebration that takes place on the 5th of December.

Vulnerability

The Netherlands is, as the name indicates, a very low lying country. About half of the country is situated around or below sea level (figure 1). The area that is below sea level comprises the western part of the country. That is also the area where most people live (figure 2); important cities like Amsterdam, The Hague and Rotterdam are situated in this area

▼ *Figures 1 and 2*



The Netherlands is situated on the southern edge of the North Sea (figure 3). It is not hard to imagine that water levels along the Dutch coast can become critical when strong northwesterly winds push North Sea water towards the coast. Along our coast are several large dune areas that are able to withstand high water levels. Along other parts of the coast the Dutch had to build several water barriers to improve the coastal defence. The 'Hondsbossche Zeewering' is one of these examples (figure 4 a). Other famous barriers include the Maeslant barrier and the Oosterschelde barrier (figure 4 b and c). These two barriers are movable barriers and can be closed if necessary.

◀ *Figure 3*

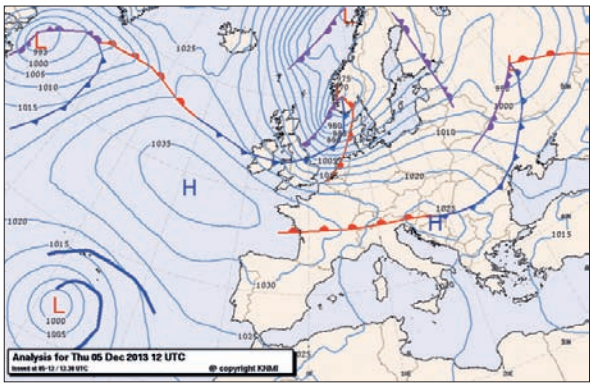
▲ *Figure 4 abc*

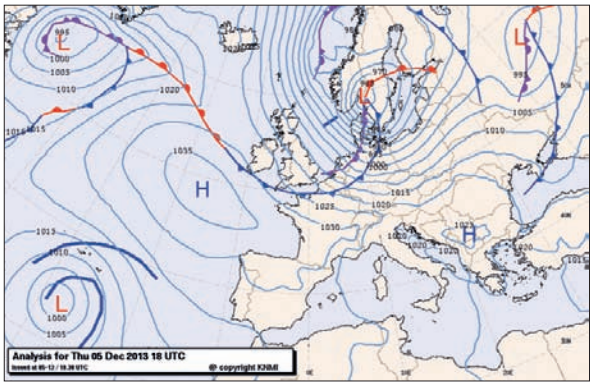
The Saint Nicolas Storm

Synoptic setting

An active low near Iceland moved eastwards and reached Norway on Thursday 5 December (figure 5 and 6). This low had a pressure core of 965 hPa. The Most Notable and important feature of this low pressure system was an active cold front that moved southeastwards over the North Sea. This front reached the Netherlands in the

afternoon. The cold front left the country early in the evening. The wind veered to a northwesterly direction directly behind the cold front which caused high water levels along the coast.

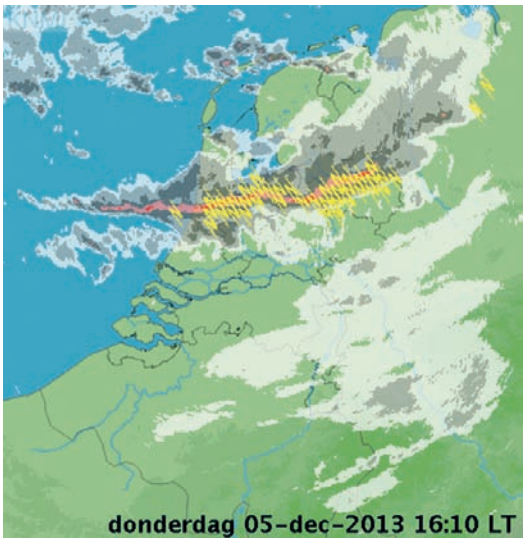




▲ *Figure 5*

Average wind speeds reached 9-10 Bft (figure 6). Highest wind speeds were measured just before passage of the cold front. The strongest gusts were measured during the passage of the cold front (figure 7).

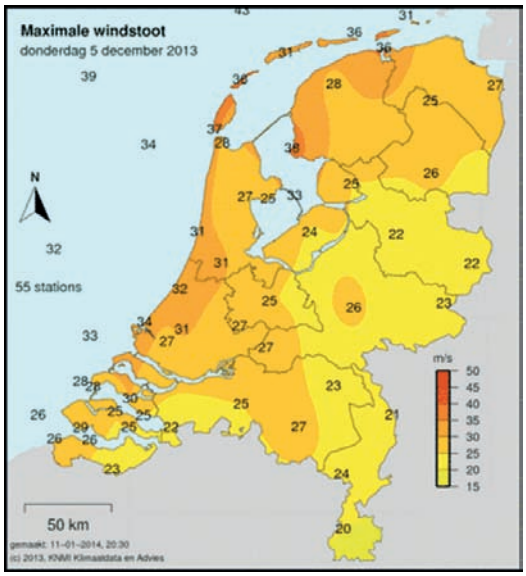
▶ *Figure 8*

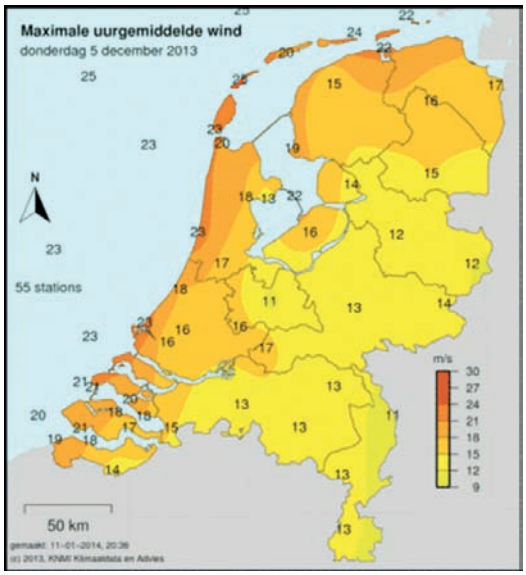


The passage of this front was accompanied by a narrow line of (thundery) showers (figure 8). These showers were responsible for the strongest gusts

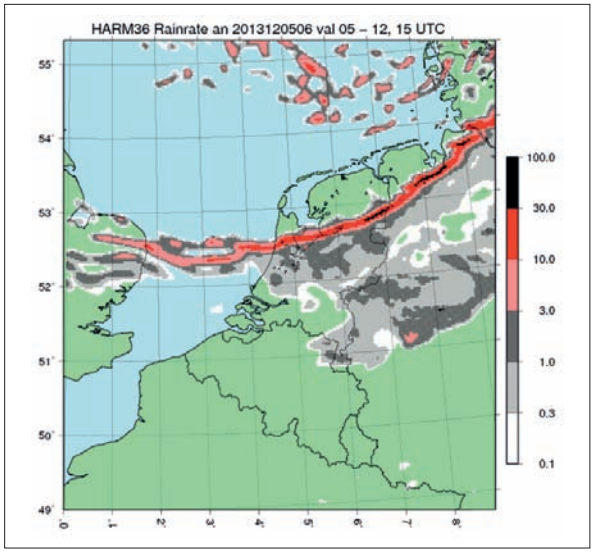
Model Output

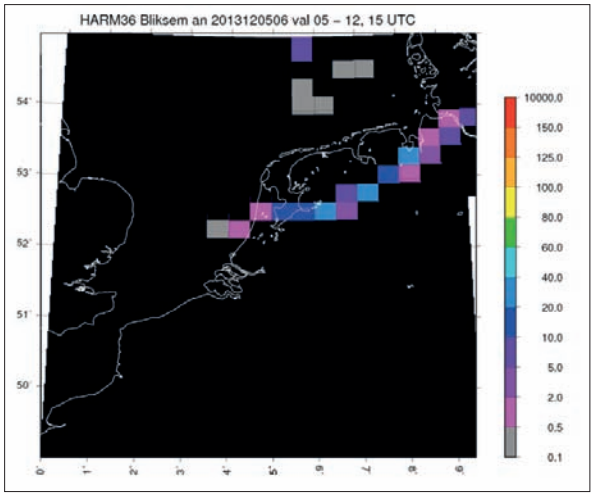
Meteorologists at KNMI make use of the following models; ECMWF, Hirlam and the newest and most detailed one, Harmonie. All models had a more or less similar forecast; strong gusts were predicted by all models and the timing of the cold front passage was also quite similar. In the end Harmonie turned out to be the most accurate model; the representation and prediction of thundershowers along the frontal zone was very accurate (figure 9 and 10) and also the forecast wind speed and wind gusts were described accurately (figure 11 and 12).

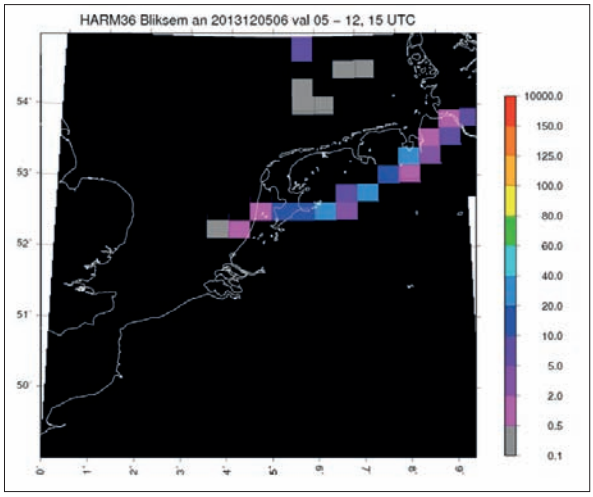




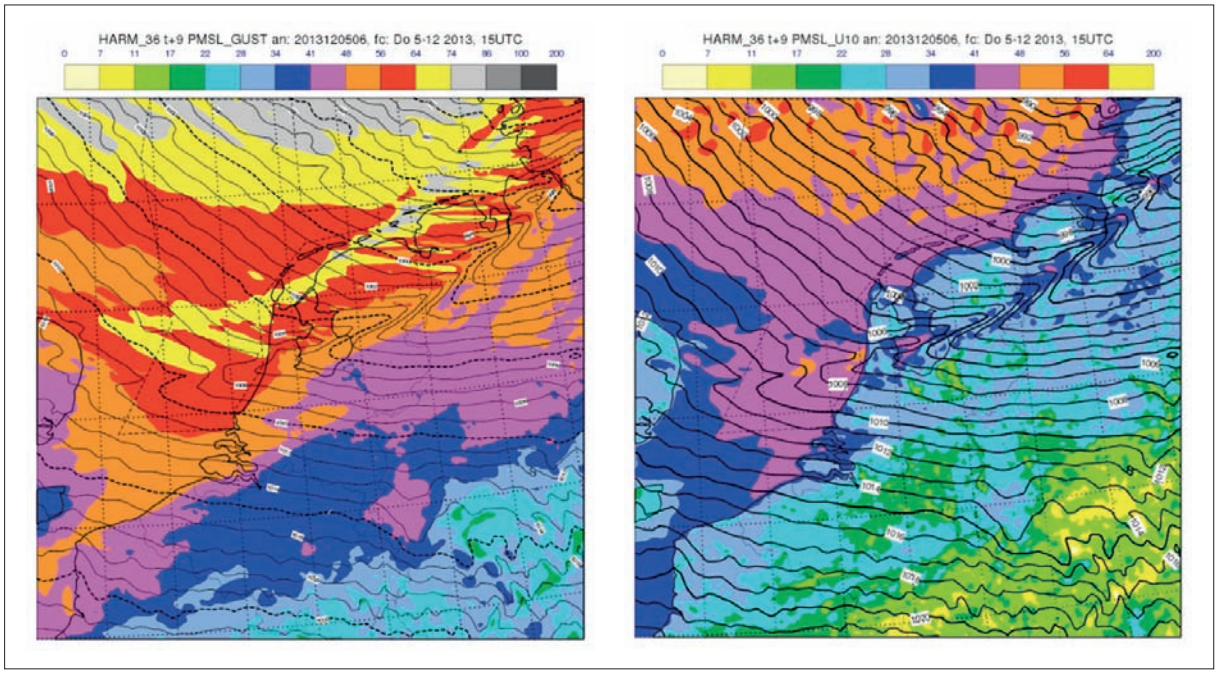
▶ *Figures 6 and 7*







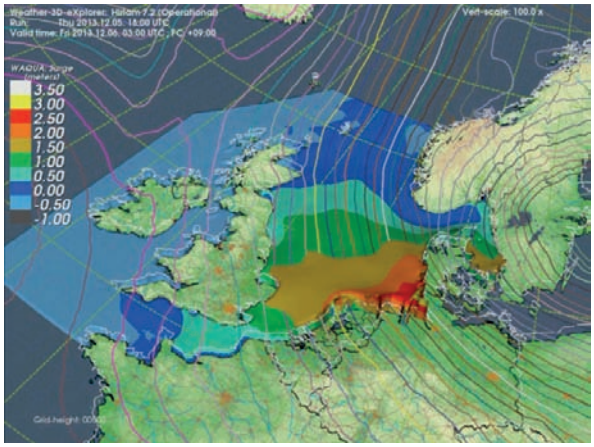
▲ *Figures 9 and 10*



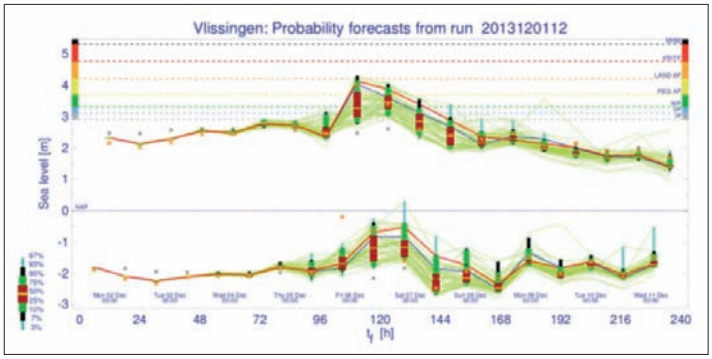
▲ *Figure 11 and 12*

Water levels

As mentioned above, water levels started to rise after the passage of the cold front. The synoptic charts show a northwesterly flow over a large part of the North Sea. This caused water levels to rise along the Dutch coast. ECMWF did calculate the storm depression in an early stage. That is why water level calculations showed a peak around the 5th of December as well. An example of this water level calculation can be seen in figure 13. Water levels are calculated by a water level model (WAQUA) and all ECMWF members are used as input for this water level model. As a consequence 52 water level members are represented. The colored dashed lines in this graph represent several important water level thresholds. A video capture of a 3D animation (figure 14) gives a representation of water levels along the Dutch coast.



▲ *Figure 13*



▲ *Figure 14*

Water related consequences of the storm

Near-record high water levels were reached in the northeastern part of the country. Also in other parts of the country very high water levels were reached; the moveable barrier in the Oosterschelde had to be closed (figure 15). The last time that this barrier was closed was in 2007. Some low lying houses were partly flooded.


Oosterscheldekering gesloten

05/12/13, 23:42 - bron: ANP

© ANP. De Oosterscheldekering

De Oosterscheldekering tussen de eilanden Schouwen-Duiveland en Noord-Beveland zit dicht. 'We hebben de knop om 22.52 uur ingedrukt. Het duurt ongeveer 1,5 uur voordat de kering volledig gesloten is', meldt een woordvoerster van Rijkswaterstaat. De zeewering sloot in 2007 voor het laatst vanwege een storm.


© EPA. Sommige straten in het centrum van Dordrecht zijn ondergelopen.

▲ *Figure 15*