Memo – *update*

To

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From
RWS/ Deltares

Subject
NOOS data exchange

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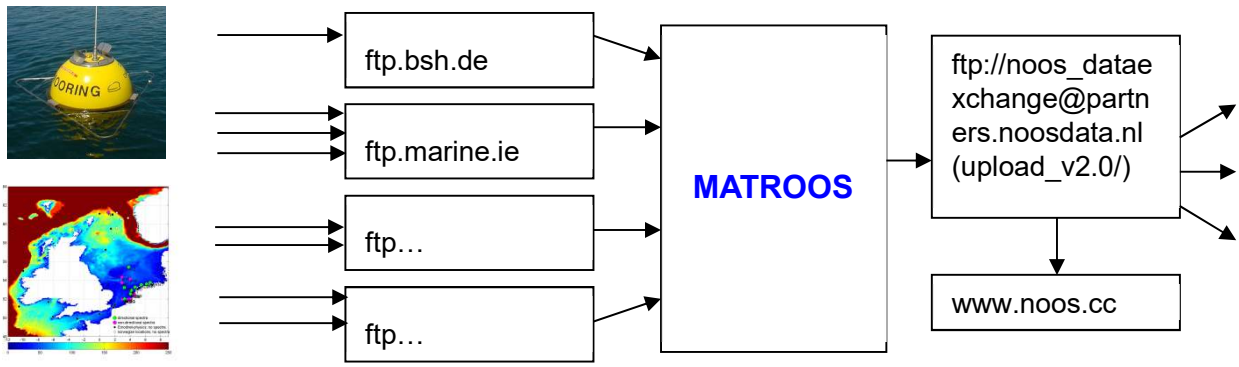
1 Introduction

This memo describes the Dutch data that is shared between the NOOS partners via the NOOS Matroos and the website http://noos.cc . Both predictions (water levels) and observations (measurements of waves, water levels and discharges) are available for exchange.

In short, the observations are collected and the predictions are produced by various institutes that place the data on one of their own ftp-sites. Next, the NOOS Matroos collects the data from the various ftp-sites and stores it in its own database. All data collected is freely available through the webinterface at http://noos.matroos.rws.nl. Rijkswaterstaat also collects, transforms and redistributes data from other partners to their ftp-server ftp://noos_dataexchange@partners.noosdata.nl. Last week's data can be found here (directory upload_v2.0) and can be downloaded by the NOOS partners for operational use.

Observed data is published in one tgz-file per day, called for example '201605020000.noos_observed.tgz'. This file is the basis for the observations visible at http://noos.cc. Model predictions from the different institutes are published in one tgz-file per institute/model/analysis time, called for example '201605021800.knmi.tgz. A list of the available parameters can be found in Chapter 3.



Figuur 1.1 *Brief overview of NOOS data flows from observations or model results to the noos-ftp and website.*

The scope of this report is to make clear how the Dutch dataflows, to the NOOS community, are organized. Observations and model results are distributed to the NOOS-ftp server, the NOOS-websites 'noos.matroos.rws.nl' and 'noos.cc' and to the NW Schelf data portal. This will not only reduce maintenance, but also offers the possibility for a more efficient data distribution. Furthermore, it can serve as a roadmap for other NOOS members and other ROOSes. This report is made with funding of both the NOOS-project by Rijkswaterstaat and EMODNet Physics (agreement dd June 10th, 2014).

The set up of this memo is as follows: After this introduction, Chapter 2 presents a list of the institutes involved and whether they offer observed data and/or model results. In Chapter 3 an explanation is given of what MATROOS is all about. Chapter 4 describes which tasks are executed by whom, starting from the datacollection, or model result collection, to the point data is published on the NOOS-ftp. It presents the data flow in a flow chart. In chapter 5 the process of data distribution, to the ftp, is presented. An overview of available datasets en viewers is presented in Chapter 6. The memo ends with conclusions in Chapter 7.

2 Institutes and their roles

The table below presents the institutes and how they contribute to the NOOS data flow, either by collecting or by distributing data. Not all institutes provide data, see column 4 and 5. The data distribution is mainly in hands of Rijkswaterstaat (the Netherlands), together with Deltares.

BSH also has a large role in the data flow. They host the website noos.cc (http://noos.cc/ = http://noos.bsh.de). Furthermore, BSH created the Northwest-shelf data portal to make marine observational data in the Northwest-Shelf region available and provide a primary access point for search, access, visualization and download of real-time and historical data. BSH acts as the Copernicus Data Management and Distribution Unit for the Northwest-Shelf, within the CMEMS InsituTAC. That means that BSH collects real time data preferably from the originators in the NOOS region. These data are additionally presented and distributed within NOOS via the NWS data portal http://nwsportal.bsh.de. The portal is hosted at BSH and was partly funded by the MyOcean-project [FP7/2007-2013 under grant agreement n°218812]. The observations are provided by a large number of EuroGOOS partners.

institute	**full name**	**country**	**Contribution measurements (source observed)**	**Contribution model data**	**prediction available at noos-ftp**
OD Nature	Royal Belgian Institute of Natural Sciences (MUMM)	Belgium	-	waterlevel predictions (source mumm_oper)	yes
MDK	Agentschap voor Maritime Dienstverlening en Kust	Belgium	collection of waves and waterlevels	waterlevel predictions (source mumm_omnecs_oper)	?

DMI	Danish Meteorological Institute	Denmark	collection of waves and waterlevels	waterlevel predictions (source dmi_oper)	yes
FCOO	Defence Centre for Operational Oceanography	Denmark	-	-	
CETMEF	Centre d'Etude Techniques Maritimes Et Fluviales	France	collection of waves and waterlevels (soon: via Ifremer and BSH)	-	
Ifremer	L'Institut Français de Recherche pour l'Exploitation de la Mer	France	-	-	
SHOM	Service Hydrographique et Oceanographique de la Marine	France	-	-	
BSH	Bundesamtes für Seeschifffahrt und Hydrographie	Germany	collection of waves and waterlevels	waterlevel predictions (source bsh_oper)	yes
HZG	Centre for Materials and Coastal Research	Germany	-	-	
MI	Marine Institute	Ireland	collection of waves and waterlevels	waterlevel predictions (imi_roms)	yes
Deltares	Deltares	Nether-lands	data distribution	-	
RWS	Rijkswaterstaat	Nether-lands	collection of waves and waterlevels	waterlevel predictions (sources starting with dcsm and rws)	yes
KNMI	Koninklijk Nederlands Meteorologisch Instituut	Nether-lands	waterlevels	waterlevel predictions (knmi_noos and knmi_noos_kalman)	yes
Metno	Meteorologisk Institutt	Norway	collection of discharges(tempo rarily?) stopped	waterlevel predictions (source dnmi_oper)	yes
IMR	Institute of Marine Research	Norway	-	-	
NERSC	Nansen Environmental and Remote Sensing Center	Norway	-	-	

SMHI	Swedish Meteorological and Hydrological Institute	Sweden	collection of waves and discharge	-	
CEFAS	Centre for Environment, Fisheries and Aquaculture Science	UK	-	-	
NERC/ NOC	Natural Environment Research Council/National Oceanographic Centre	UK	-	-	
UKMO	UK Met Office	UK	ukmo_marobs	waterlevel predictions (source ukmo_oper)	yes

Tabel 2.1 Overview of institutes involved in data exchange within NOOS

3 Matroos

3.1 Introduction

The central hub of data distribution is the Matroos system, which is owned by and hosted at Rijkswaterstaat (RWS). RWS has delegated the development and maintenance of the Matroos software to Deltares. Matroos is an acronym for Multifunctional Access Tool foR Operational Oceandata Services. (Did you know? The word ‘matroos’ means ‘deckhand’ in Dutch.) The Matroos software package is used for:

1 Archiving hydrological and meteorological data in a database. Data types are timeseries (0D), timeseries for a set of coherent locations (1D), and gridded data (2D). Data can be either observed data or data predicted by models (hindcasts and forecasts).
2 Access to the database with the possibility to download the data via a web interface and web services.
3 Presenting the Matroos data inside the NOOS.cc website.

Matroos provides easy access using your internet browser to all recent and historical model and monitoring data relevant to watermanagement.

At RWS there are several Matroos servers in use. For NOOS members http://noos.matroos.rws.nl is most relevant. It’s freely accessible and contains a subset of our data. For our own use and for specific customers we have a full archive of all data (matroos.rws.nl). For Rijkswaterstaat and partners in highly operational processes we have redundant systems (vitaal.matroos.rws.nl and vitaal.matroos.ad.rws.nl) which contain only a 2 week history. The latter one is also used for the production of the NOOS data sets. Further on we will call it the ODS_I Matroos, which stands for Operational Date Store Internal.

A source of confusion is that users often refer to these Matroos servers as “Matroos”, not meaning the software package but the web interface, without specifying which Matroos server is meant. All Matroos servers run the same software package, but the configuration may differ

and each instance has its own database. Changes to the Matroos software are documented (in Dutch) on the Wiki page (password protected) https://publicwiki.deltares.nl/display/MATROOS/Release+management.

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3.2 NOOS Matroos

Matroos is an important link in the exchange of data between the NOOS partners. The NOOS Matroos collects the data that are published on the ftp servers of the various partners and stores the data in its own database.

The NOOS and ODS_I Matroos follow the same procedure for the processing of NOOS-data:

1 Download of data from the ftp server of a specific NOOS partner to an import directory of Matroos.
Remark: Downloading the data was originally done by Matroos, but is currently fully taken care of by the new software package DIM (*Data Interface Module)*. For this document it is not really important which process organizes the download.

2 Conversion and normalizing of data.
Unfortunately, not all partners offer their data in NOOS format. If necessary, Matroos converts the data to NOOS format using special-purpose pre-process scripts.

3 Import of data to the Matroos database.

4 Uploading the most recent data to ftp server ftp://partners.noosdata.nl as *.tgz files containing NOOS data files (one file for each location-unit combination). Only the ODS_I Matroos performs this last step. Max. once per hour, new data is uploaded.

Besides the ftp server, the data is also available via the website noos.matroos.rws.nl. The website noos.cc is merely a viewer for the data.

3.3 Data distribution on FTP server

The NOOS data is distributed to the following ftp server: partners.noosdata.nl/upload_v2.0. This directory contains files of the following format: YYYYMMDDhhmm.provider.tgz. The first part is a date/time stamp of the data. The second part is one of the following providers:

Provider	Source name in Matroos	Remarks
noos_observed	observed	Contains observed data from meetnet, bsh_obs, cetmef_oper, imi_obs, dmi_obs, dmi_waves_obs, dnmi_obs, dnmi_waves_obs, smhi_oper, pegelonline
bsh	bsh_oper	
dmi	dmi_oper	
knmi	knmi_noos	
knmi_kalman	knmi_noos_kalman	
mumm	mumm_oper	
ukmo	ukmo_oper	

dnmi	dnmi_oper*	Source dnmi_oper does not exist, removed from configuration now
imi	imi_oper	imi_roms does exist, that seems to be model predictions. This is repaired on Dec 9th, 2016 and now available
cetmef*	cetmef_oper*	Source cetmef_oper does not exist, removed from configuration now
smhi	smhi_oper*	Source smhi_oper does not exist, removed from configuration now

Table 3.1; providers and source name offering observations or model results to the NOOS community (: removed)*

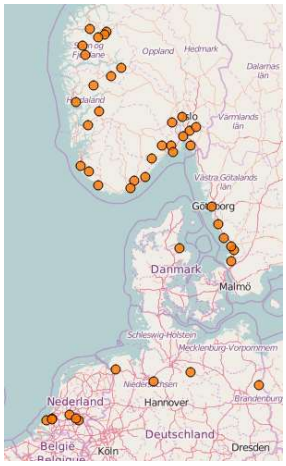
These zipped files contain for each location and parameter combination a file of the form location.parameter in which a timeseries of the data is available. Available parameters are:

Parameter name from Noos.cc	Unit	obs	model	Parameter name in Matroos
airpressure	mbar	v	-	air_pressure
discharge	m^3/s	v	-	discharge
salinity	PSU	v	-	salinity
sealev	m	v	v	waterlevel
sealev	m	-	v	waterlevel_model
surge	m	v	v	waterlevel_surge
swellwaveheight_hm0	m	v	-	swellwave_height_hm0
tide	m	v	v	waterlevel_astro
waterdir	degrees	v	-	water_direction
waterspeed	m/s	v	-	water_speed
watertemp	Celsius	v	-	water_temperature
wavedir	degrees	v	-	wave_direction
wavedir_th0	degrees	v	-	wave_dir_th0
wavedirspread_s0bh	degrees	v	-	wave_dirspread_s0bh
waveheight	m	v	-	wave_height
waveheight_h1d3	m	v	-	wave_height_h1d3
waveheight_hm0	m	v	-	wave_height_hm0
waveheight_hmax	m	v	-	wave_height_hmax
waveperiod	s	v	-	wave_period
waveperiod_th1d3	s	v	-	wave_period_th1d3
waveperiod_tm02	s	v	-	wave_period_tm02
waveperiod_tm-10	s	v	-	wave_period_tm10
waveperiod_tp	s	v	-	wave_period_tp
waveperiod_tz	s	v	-	wave_period_tz
winddir	degrees	v	-	wind_direction
windspeed	m/s	v	-	wind_speed

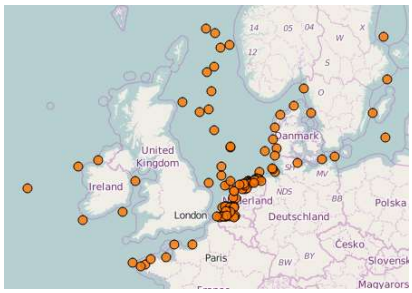
Table 3.2: parameters available on NOOS-ftp (v = available; - = not available)

Locations with water level data, discharge data and wave data respectively, are shown in the figures below (screenshots taken from noos.cc but also available on noos.matroos.rws.nl via the openstreetmap portal). However, not all presented locations have necessarily data available.

BMA locations



discharge locations



wave locations

RWS/Deltares made several alterations to these datasets and the one that is distributed on NOOS and incorporated in the NOOS website. See Chapter 6.

4 Overview of dataflow

The original data flows have a historical development and are not fully documented. A tough research has been performed to create an overview of the technical process, resulting in the figure below. It shows an overview of the situation when the research started.

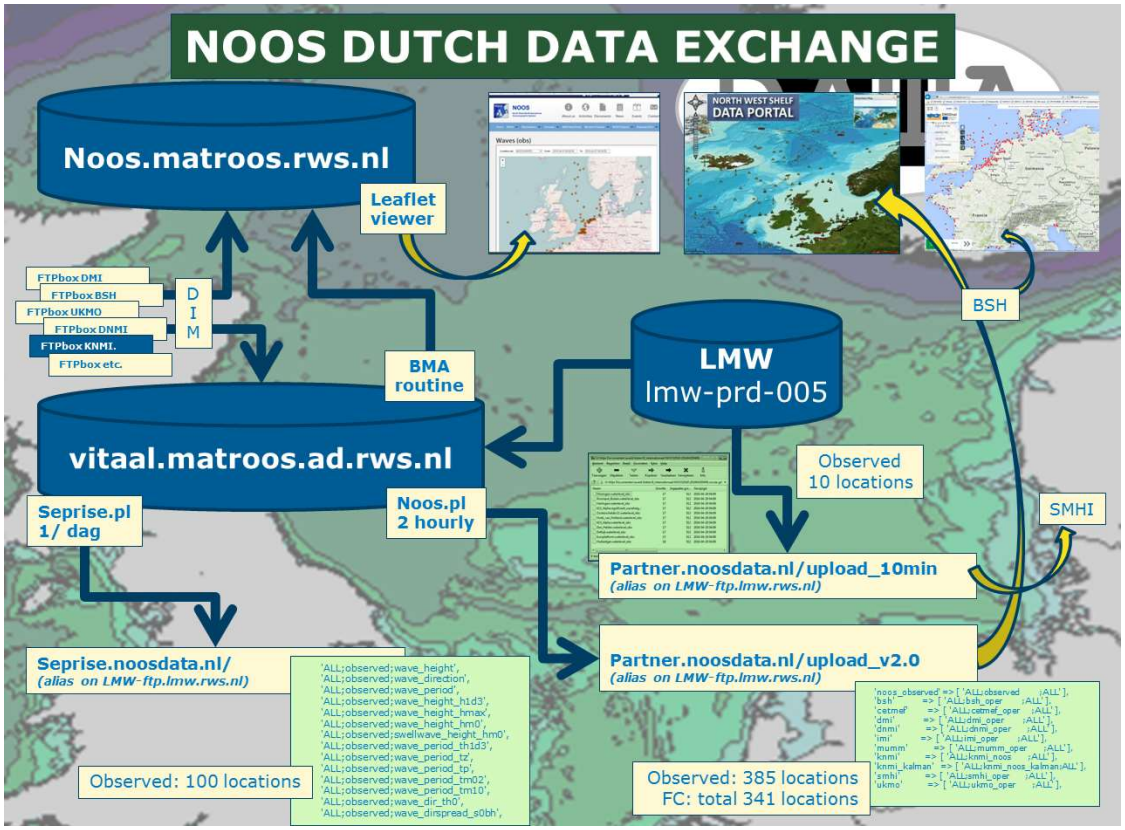


Figure 4.1 *NOOS data flows at the beginning of 2016 (The source LMW stands for the Dutch monitoring Network)*

Findings during this exercise are [in brackets measures we have already taken]:

- A separate script makes a dataset of observed wave information and puts it on the ftp, where NO ONE gathers the data. [we stopped this script]
- From our measuring network a special data push was scripted for the observations of 10 water level stations along the Dutch Coast. Only SHMI was gathering these data. [we offered a direct script to the NOOS-Matroos and SHMI altered their scripting. We stopped the push from LMW].
- Not all exports in the script NOOS.pl were correct. [We repaired or stopped the wrong ones].
- The ftp site is aliased with the name of our FTP site with “partner.noosdata.nl” which is nice but not necessary for our scripts. Every year this alias has to be arranged on personal costs of Martin Verlaan. [we will stop this alias and will ask partners to change to the direct link: ftp://LMW-ftp.lmw.rws.nl OR an alias within Rijkswaterstaat (e.g. ftp://noosdata.rws.nl].
- Remark: the FTP site will be replaced by an sFTP solution. For now it’s called: ‘wm-sftp.rws.nl’ but that could be subject to change. SSH connections are to be made

with mandatory key authentication (SSH-ECDSA 256 bits). These changes will take effect in Q1-2022 and details will be provided to all stakeholders.)

The new situation is more clear and straightforward now:

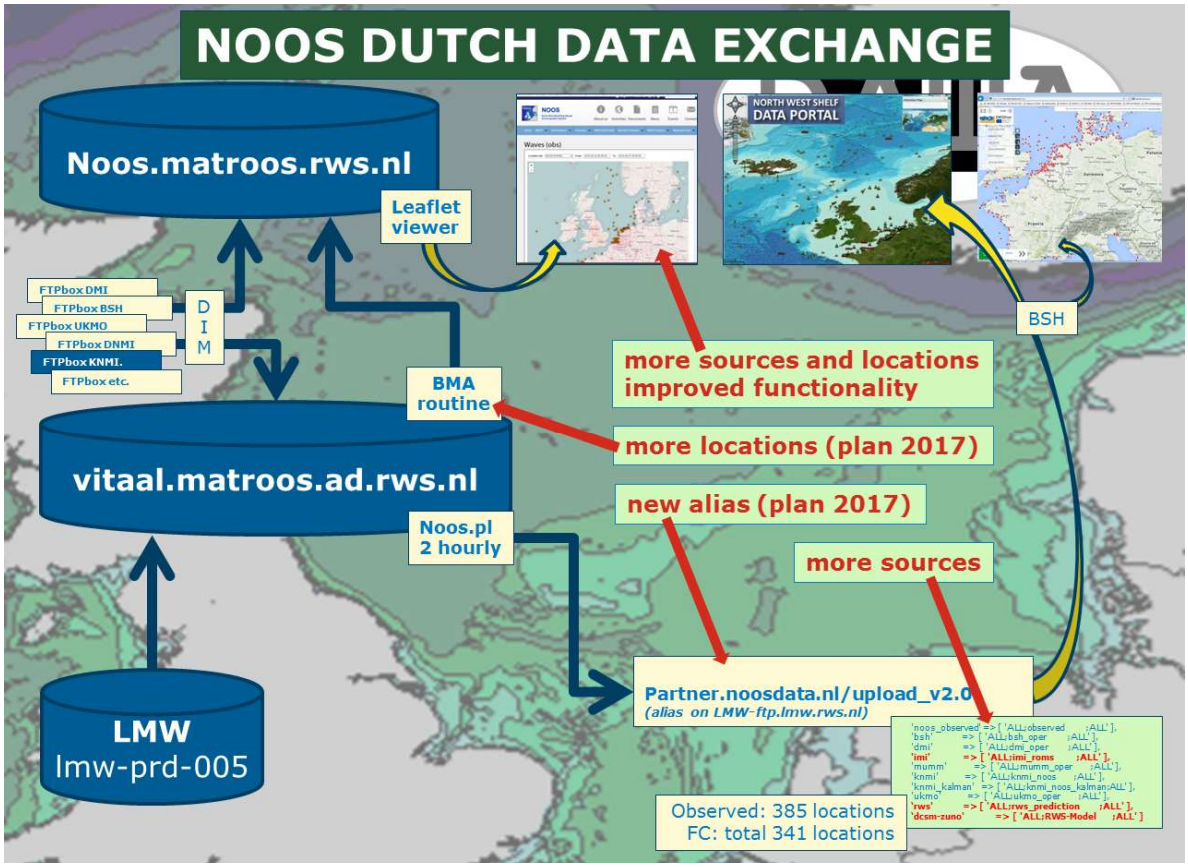


Figure 4.2 NOOS data flows at present (end 2016) and plans for 2017

5 Scheduling of data feeds

The import of (NOOS) information is scheduled in a dense interval. It is an intelligent import which will first look if the available data is new. Therefore an administration of successful imports is on our Matroos system. During this import the format is altered for archiving in Matroos.

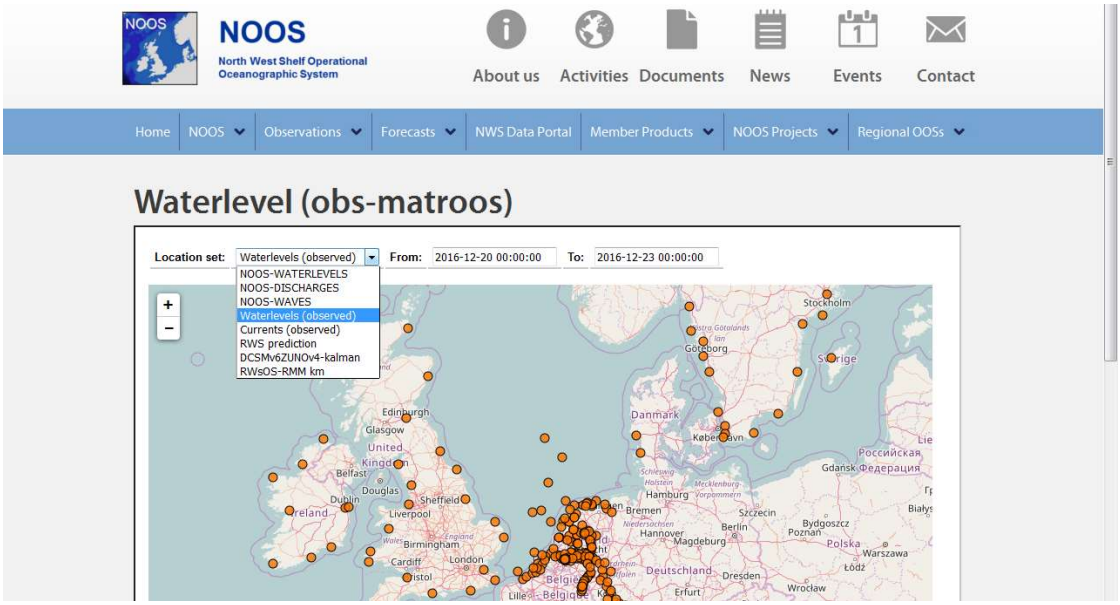
Export to ftp is done every 2 hours (now at uneven hour: 07). The NOOS format is used for these exports. Also there's some built in intelligence: only new information is distributed. Because of this, the NOOS partners have to take an extra aspect in mind: the content of TAR files of observed data with the same name (including date) will develop during the day. The same file already exists 2 days ahead and is filled with (astronomical) tide only.

The new forecast from RWS consists of the model results of our DCSMv6-ZunoV4 model, feeded with Harmonie40 winds/pressure and uses a Kalman filter to assimilate about 30

measurement locations. Based on several models and expert judgement we also deliver the RWS prediction. This set – based on different operational systems (models and forecasters are organised for different areas like North Sea, Lakes en River systems) - are gathered and placed with tag ‘rws’ on the ftp. Because of the different timing of the model runs, this file will contain different sets of locations. The RWS prediction contains a range of parameters, depending on the location.

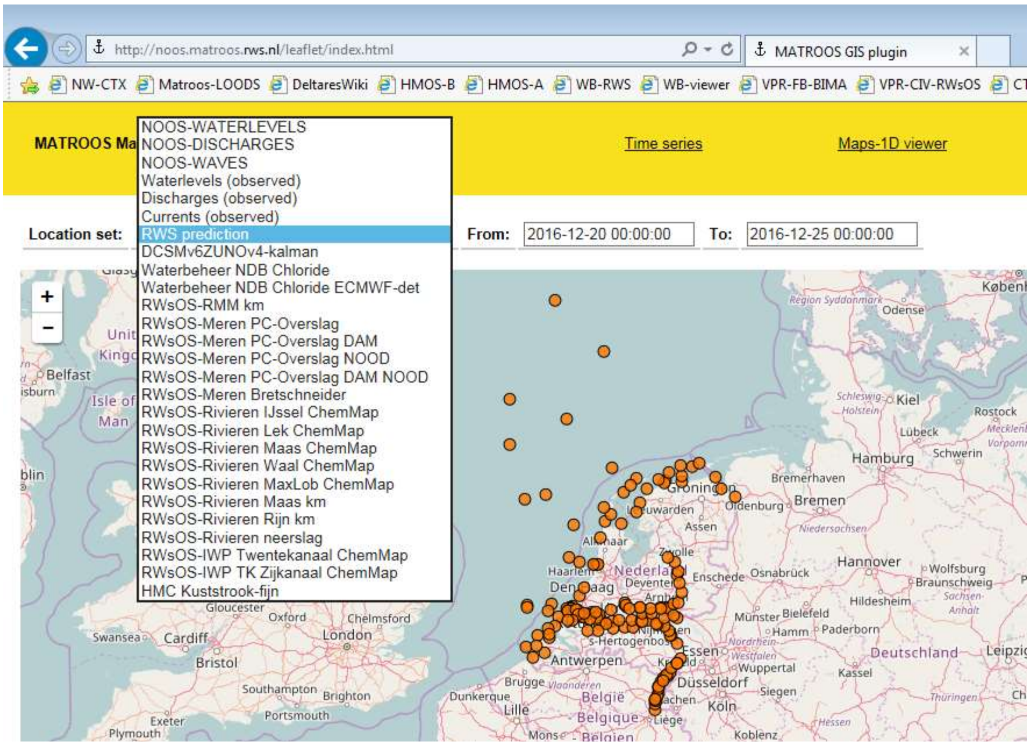
6 List of available data

With the considerations of Chapter 4 and 5, it will be difficult to give a full list of available locations and parameters. The scripts work with wildcards where possible. In this way new information from our partners and our own model will be added to the exports automatically, the README files will be updated automatically also.



The easiest way to explore the available data and locations is the Matroos viewer, available on http://noos.matroos.rws.nl and incorporated in the NOOS website noos.cc. We extended the data sets in the list (chose an entry on NOOS.cc and take another set from the Location set menu in the viewer). We added the feature that the locations plotted are depending on data availability in the selected period. For efficiency reasons this is performed in weekly periods only.

Note that in Matroos this list is extended with other (open) data sources.



http://noos.matroos.rws.nl/leaflet/index.html
MATROOS GIS plugin
NW-CTX
Matroos-LOODS
DeltaresWiki
HMOS-B
HMOS-A
WB-RWS
WB-viewer
VPR-FB-BIMA
VPR-CIV-RWsOS
Time series
Maps-1D viewer
Location set:
From:
2016-12-20 00:00:00
To:
2016-12-25 00:00:00
NOOS-WATERLEVELS
NOOS-DISCHARGES
NOOS-WAVES
Waterlevels (observed)
Discharges (observed)
Currents (observed)
RWS prediction
DCSMv6ZUNOv4-kalman
Waterbeheer NDB Chloride
Waterbeheer NDB Chloride ECMWF-det
RWsOS-RMM km
RWsOS-Meren PC-Overslag
RWsOS-Meren PC-Overslag DAM
RWsOS-Meren PC-Overslag NOOD
RWsOS-Meren PC-Overslag DAM NOOD
RWsOS-Meren Bretschneider
RWsOS-Rivieren IJssel ChemMap
RWsOS-Rivieren Lek ChemMap
RWsOS-Rivieren Maas ChemMap
RWsOS-Rivieren Waal ChemMap
RWsOS-Rivieren MaxLob ChemMap
RWsOS-Rivieren Maas km
RWsOS-Rivieren Rijn km
RWsOS-Rivieren neerslag
RWsOS-IWP Twentekanaal ChemMap
RWsOS-IWP TK Zijkanaal ChemMap
HMC Kuststrook-fijn

6.1

The available sources and units at the partners.noosdata.nl ftp are:

Source file	# locations	units
noos_observed.tgz	539	*[various]*
bsh.tgz	46	sealev, surge, tide
bsh_waves.tgz	11	swellwaveheight_hm0, waveheight, waveheight_hm0, waveperiod, waveperiod_tm02, waveperiod_tp
dcsm_zuno.tgz	188	sealev, surge, waterdir, waterspeed
dcsm_waves.tgz	104	swellwaveheight_hm0, wavedir, wavedirspread_s0bh, waveheight_hm0, waveperiod_tm-10, waveperiod_tp
dmi.tgz	33	sealev, surge, tide
dmi_waves.tgz	13	swellwaveheight_hm0, waveheight_hm0, waveperiod_tm02, waveperiod_tp
dnmi.tgz	67	sealev, surge
fcoo_waves.tgz	18	swellwaveheight_hm0, waveheight, waveheight_hm0, waveperiod, waveperiod_tm02, waveperiod_tp, waveperiod_tz
imi.tgz	29	sealev
knmi.tgz	28	sealev, surge, tide
knmi_kalman.tgz	28	sealev, surge
kuststrook_waves.tgz	91	swellwaveheight_hm0, wavedir, wavedirspread_s0bh, waveheight, waveheight_hm0, waveperiod, waveperiod_tm-10, waveperiod_tp
mumm.tgz	56	sealev, surge, tide
mumm_waves.tgz	6	swellwaveheight_hm0, waveheight_hm0, waveperiod_tm02
rws.tgz	32	sealev
ukmo.tgz	76	sealev, surge, tide
ukmo_waves.tgz	13	waveheight, waveheight_hm0, waveperiod, waveperiod_tm02, waveperiod_tp

Note that the tgz files contain a README file which sometimes suggests more available locations and units than actually present in the tgz.

The available locations for the astronomical tide (Matroos source = observed and parameter = waterlevel_astro) are:

A121, Aberdeen, AWG, bath, bergse diepsluis west, BG2, BG8, borkum, Bournemouth, Bremerhaven, buesum, Cadzand meetpaal, Cromer, cuxhaven, D151, DelfzijlDen Helder, den oever, dordrecht, Dover, eemshaven, esbjerg, europahavenEuroplatform, F161, F3, felixstowe, goidschalxoord, gouda brughagestein beneden, hansweert, Haringvliet 10, Harlingen, hartelhaven, Helgolandhellevoetsluis, Hoek van Holland, holwerd, Huibertgat, husum, ijmond stroompaalIJmuiden, Immingham, J61, K13a, K14, keizersveer, kinlochbervie, kornwerderzandkrammersluizen west, krimpen a/d ijssel, krimpen a/d lek, Lauwersoog, LeithLichteiland Goeree 1, Liverpool, Lowestoft, maassluis, maeslantkering zeezijdemoerdijk, nes, Newhaven, Newlyn, nieuwe statenzijl, NieuwpoortNorth Cormorant 1, North Shields, oostende, oosterschelde 04, oosterschelde 14OS11, oude schild, portsmouth, Q11, rak noord, roompot binnen, Roompot buitenrotterdam, rozenburgsesluis noordzijde, Scheveningen, Schiermonnikoog WaddenSheerness, spijkenisse, Stavanger, stavenisse, stellendam buiten, Stornowayterneuzen, Terschelling Noordzee, texel noordzee, Tregde, vlaardingenVlakte vd

Raan, vlieland haven, Vlissingen, vuren, werkendam buitenWest-Terschelling, westkapelle, weymouth, Whitby, Wick, Wierumergrondenzeebrugge

The viewer suggests some more locations, but no recent data is available for these locations:

Aukfield platform, den oever buiten, hoekvanholland stroompaal 1, K141, Kornwerderzand buiten, L91, maeslantkering rivierzijde, Noordwijk meetpost, Petten zuid, petten_obsolete

Past and present BMA data sets are:

Series:

- bma_noos_fc, bma_noos_05, bma_noos_95
  These series sources are no longer available.
- bma2_fc, bma2_05, bma2_25, bma2_50, bma2_75, bma2_95
  These series data are identical to the maps1d source bma2.

Maps1d:

- bma2 (alias: bma2_waterlevel)
  Has units: waterlevel, waterlevel_surge
  Contains: BMA forecast and 5 percentiles (5, 25, 50, 75, 95)
  Is calculated for the following locations:
  aberdeen, borkum, bournemouth, bremerhaven, cuxhaven, delfzijl, denhelder, dover, esbjerg, harlingen, helgoland, hoekvanholland, husum, ijmuiden, immingham, liverpool, lowestoft, newhaven, newlyn, northshields, oostende, roompotbuiten, sheerness, smogen, stornoway, vlissingen, wick
- bma2_wave_height_hm0 (alias: bma2_waves)
  Has unit: wave_height_hm0
  Contains: forecast and 5 percentiles (5, 25, 50, 75, 95)
  Is calculated for the following locations:
  A122, Buoy M3, Buoy M4, Europlatform, North Cormorant, Platform K13, Vaderoarna, Westhinder
- bma2_swellwave_height_hm0 (alias: bma2_swell)
  Has unit: swellwave_height_hm0
  Contains: forecast and 5 percentiles (5, 25, 50, 75, 95)
  Is calculated for the following locations:
  A122, Europlatform, North Cormorant, Platform K13

7 Conclusion

Delivery of measurements and forecasts in the Netherlands is well organized, though several systems and departments contribute to produce, gather and distribute the information. Evolving in time every now and then a full analysis must be performed resulting in better insight and up2date deliverance of data to our (international) partners.

For the NOOS data feeds this is done with the financial aid from EMODNET-Physics. Although aimed for NOOS, this improvement may also help other partners and makes the maintenance more efficient. Besides that the reliability will improve and the restore time in case of malfunction will decrease.

The awareness, to the data flows, has improved at Rijkswaterstaat, the goal is to maintain this energy for further improvements and to spread the news (and data!).

A part of the energy must be spent to maintain infrastructure and documentation, so operational availability is well secured and alterations (adding and removing) can be done swiftly without disturbing the use of this important data.