



Deltares

Delft-FEWS Stable 2022.01 New features

Delft-FEWS User Days Australia

Delft-FEWS Product Management

Marcel Ververs and Gerben Boot

August 2022



Introduction...

- Welcome
- What's new (in 2022.01)?
 - Benchmarks & some highlights from 2021.02
 - Delft-FEWS Ecosystem
 - Open Archive, Webservices, WebOC
- Documentation and software maintenance
- Outlook to 2022.02

As usual: [Links for more info](#)

 [Link to documentation](#)



But first...the development team!

- **Developments:** new features, bugfixing, refactoring
 - Java based (platform independent)
 - ± 9 full/part time developers
 - 2 stable releases/year (Spring/*.01 and Autumn/*.02)
- **Stand-ups**
 - 5x/week (physically / MS Teams / hybrid) – 15mins
 - Daily (Tue: a bit longer...)
- **Stuurgroep ('assessment board')**
 - Discussion & estimating new features
 - Gerben (FEWS-PM), Onno (main developer) + Hydrologist (Peter, Klaas-Jan or Marc)
 - Ad hoc additions: PLs, other developers
 - Every Monday at 13:00

	Name	Since	Expertise
	Onno vd Akker	2003	sr developer Main architect
	Andre Grijze	2008	sr developer Open Archive Modifiers
	Jitka Tacoma	2003	Displays NetCDF
	Camiel Van Breugel	2010	Databases Backend components and installations
	Rudie Ekkelenkamp	2014	FEWS webservices Cloud
	Erik Pelgrim	2012	Model Adapters Samples, Statistics
	Bart Adriaanse	2019	Model adapters, schematic status display (+webservice)
	Orshi Egressy- Molnar	2019	(server) imports, transformation, open archive
	Mozhan Soltani	2020	jr developer Dashboards, development process

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Let's not forget: Support & Maintenance & Backend Experts

	Name	Department	Expertise
	Andre Speelmans	ZWS-OWM	LINUX
	Gerrit Niestijl	ZKS-HAF	WINDOWS

2nd line (config-experts)

1st line (e-mail)

	Name	Department	Role
	Jan Talsma	ZWS-OWM	Delft-FEWS Support Officer
	Boyan Domhof	ZWS-OWM	Delft-FEWS Support Officer
	Bob Van Rongen	ZKS-HAF	Delft-FEWS Support Officer
	Olav Van Duin	ZWS-OWM	Delft-FEWS Support Officer
	Thies Blokhuijsen	ZKS-HAF	Delft-FEWS Support Officer (<i>rookie</i>)
	Klaudia Horvath	ZWS-OWM	Delft-FEWS Support Officer
	Pieter Verdoorn	DSC-MDS	DSC Support Officer (1 st line)
	Sonny De Wit	DSC-MDS	DSC Support Officer (1 st line)

Delft-FEWS 2021.02 Benchmarks



159 new features



444* bugs reported (403 fixed)



13 new import modules



18 new features in FEWS-webservices



6 improvements to the admin interface



6 new features in timeseries display

(*majority of bugs found and resolved during testing)

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6 new data transformations



9 new features in the FEWS Explorer



6 new export modules



5 improvements to the open archive



1 new display



1 improved/matured concept (CF)

[Delft-FEWS International User Days presentation](#)
[Release Notes + documents \(wiki\)](#)
[New Features 2021.02 Webinar](#)

Some highlights from 2021.02...

- Auto Calibration using Delft-FEWS

Parameter name	KLCA2LWR		
	original value	modified value	AC
SCF	1	0.243	AC
MFMAX	0.85	0.85	AC
MFMIN	0.1	0.1	AC
NMF	0.15	0.15	AC
UADJ	0.05	0.05	AC
SI	9999	9999	AC
DAYGM	0	0	AC
MRASF	0	0	AC

Auto Calibration

Workflow start time:	10-01-1975 00:00
Calibration start time:	10-01-2012 00:00
Calibration end time:	07-01-2013 00:00
Min improvement percentage	0.0
Shuffling Loops for min Improvement	2
Number of complexes	1
Maximum number of evaluations	10
OpenDA Debug	<input type="checkbox"/>
Auto calibrate	Cancel

- Sample Viewer extensions

Location Name	Sample Id	Namespace	X_m...	Y_nr
Woerden Wijkpark Molenvliet Woerden (95)	18-21095_WD95_OW_ECO	NL14		
Woerden Wijkpark Molenvliet Woerden (95)	18-21095_WD95_OR_ECO	NL14		
Houten Imkerpark (296)	18-21296_HT296_OW_ECO	NL14		
Houten Imkerpark (296)	18-21296_HT296_OR_ECO	NL14		

Location Name	Parameter Name	Value	Unit	Comment	Taxontype	Biotaxon
1	2	172	1	1	1	2
21112 Woerden ...	Bedecking[%]	3 %	Edited		Macrofyten	Nuphar lutea
21112 Woerden ...	Bedecking[%]	1 %			Macrofyten	Ceratophyllum demersum
21112 Woerden ...	Bedecking[%]	0 %			Macrofyten	
21112 Woerden ...	Bedecking[%]	0 %			Macrofyten	
21112 Woerden ...	Bedecking[%]	5 %			Macrofyten	
21112 Woerden ...	Bedecking[%]	0 %			Macrofyten	
21112 Woerden ...	Bedecking[%]	5 %			Macrofyten	
21112 Woerden ...	Bedecking[%]	1 %			Macrofyten	
21112 Woerden ...	Breedte[m]	17 m			Macrofyten	

Some highlights from 2021.02...

- Annotations Display

(Notes on location level instead of time series & time step level)

Actions	Location	Start time	End time	Annotation ▾	User
KNMI-RADAR			30-12-2020 14:00:00	Zelfs nog beter	
KNMI-RADAR			30-12-2020 14:00:00	Zelfs nog beter	
KNMI-RADAR				Z	
62079_Debiet...			09-12-2020 14:00:00	Veranderde locatie en eindtijd	
KNMI-RADAR				Text close after apply	
KNMI-RADAR		18-11-2020 14:00:00		Nog beter2	Erik Pelgrim
EPS_SCHIP_WI...		09-12-2020 14:00:00		My second	
NEERSLGDB-R...				My first annotation	
KNMI-RADAR		09-12-2020 14:00:00		Is	
KNMI-RADAR		18-11-2020 14:00:00	30-12-2020 14:00:00	Heel Goed	

Create new annotation Filter for selection

Map Grafiek2 Grafiek Annotation Display

Delft-FEWS Admin Interface - Module Run Times						
System Status		Forecast Tasks				
Scheduled Tasks		Running Tasks				
Module Run Times						
Spatial_Fracing_ECMWF_ENS_EXT	Dummy	0s	0s	22/04/2021 13:13:54	22/04/2021 13:13:54	
Spatial_Fracing_ECMWF_ENS	Dummy	0s	0s	22/04/2021 13:13:53	22/04/2021 13:13:53	
Spatial_Fracing_DWD_ICON_EU	Dummy	0s	0s	22/04/2021 13:13:54	22/04/2021 13:13:54	
Spatial_Fracing_DWD_ICON	Dummy	0s	0s	22/04/2021 13:13:54	22/04/2021 13:13:54	
Spatial_Fracing_DWD_COSMO_LEPS	Dummy	0s	0s	22/04/2021 13:13:53	22/04/2021 13:13:53	
Rhine_WFLow_HBV_Spatial_Fracing_Update	GENRE_CalculateRain	0s	0s	22/04/2021 13:13:53	22/04/2021 13:13:53	
Rhine_WFLow_HBV_Spatial_Fracing_Update	CalculateHourlyTemp	4s	0s	22/04/2021 13:13:57	22/04/2021 13:13:57	
Rhine_WFLow_HBV_Forecast	Rhine_WFLow_HBV_Forecast	54s	0s	10/05/2021 16:30:54	10/05/2021 16:30:54	
Rhine_WFLow_HBV_Forecast	HYRAS_Temperature_ModelGrid	23s	0s	10/05/2021 16:30:23	10/05/2021 16:30:23	
Rhine_WFLow_HBV_Forecast	RHMAS_Temperature DEM	22s	0s	10/05/2021 16:30:22	10/05/2021 16:30:22	
Rhine_WFLow_HBV_Forecast	Export_Rhine_WFLow_HBV_Forecast	3m 52s	0s	10/05/2021 16:33:52	10/05/2021 16:33:52	
Rhine_WFLow_HBV_Forecast	CalculateDailyTemp	1s	0s	10/05/2021 16:30:01	10/05/2021 16:30:01	
Rhine_Spatial_Fracing_Update	GENRE_CalculateRain	0s	0s	22/04/2021 13:13:53	22/04/2021 13:13:53	
Rhine_Spatial_Fracing_Update	CalculateHourlyTemp	9s	0s	22/04/2021 13:14:02	22/04/2021 13:14:02	
Rhine_NO_RAIN	Dummy	0s	0s	10/05/2021 16:15:00	10/05/2021 16:15:00	
Rhine_ECMWF_HRES	Rhine_MeteorPreprocessing	1s	0s	11/05/2021 01:00:01	11/05/2021 01:00:01	
Rhine_ECMWF_HRES	Dummy	2s	0s	11/05/2021 01:00:02	11/05/2021 01:00:02	
Rhine_ECMWF_ENS_EXT	Dummy	0s	0s	22/04/2021 13:13:54	22/04/2021 13:13:54	
Rhine_ECMWF_ENS	Dummy	0s	0s	11/05/2021 09:00:00	11/05/2021 09:00:00	

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Delft-FEWS 2022.01 Benchmarks



106 new features (implemented)



258 bugs reported (**215** fixed)



6 new import modules



10 new features in FEWS-webservices



1 webservice: National Register (NL)



6 new features in timeseries display



4 new data transformations



9 new features in the FEWS explorer



8 new export modules



14 improvements to the open archive



1 new display



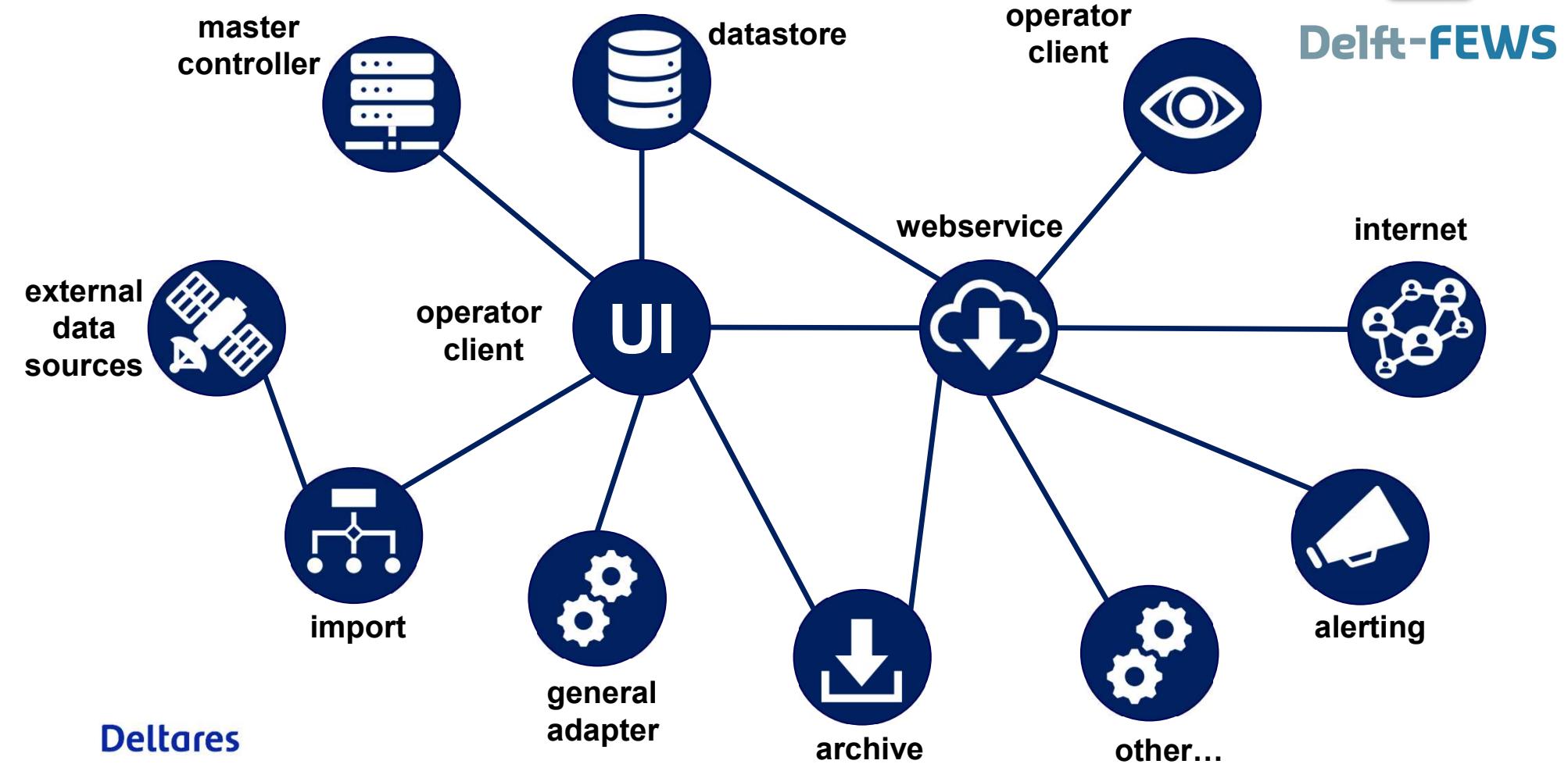
4 improvements to WhatifEditor

[Pilot: dynamic Release Notes](#)

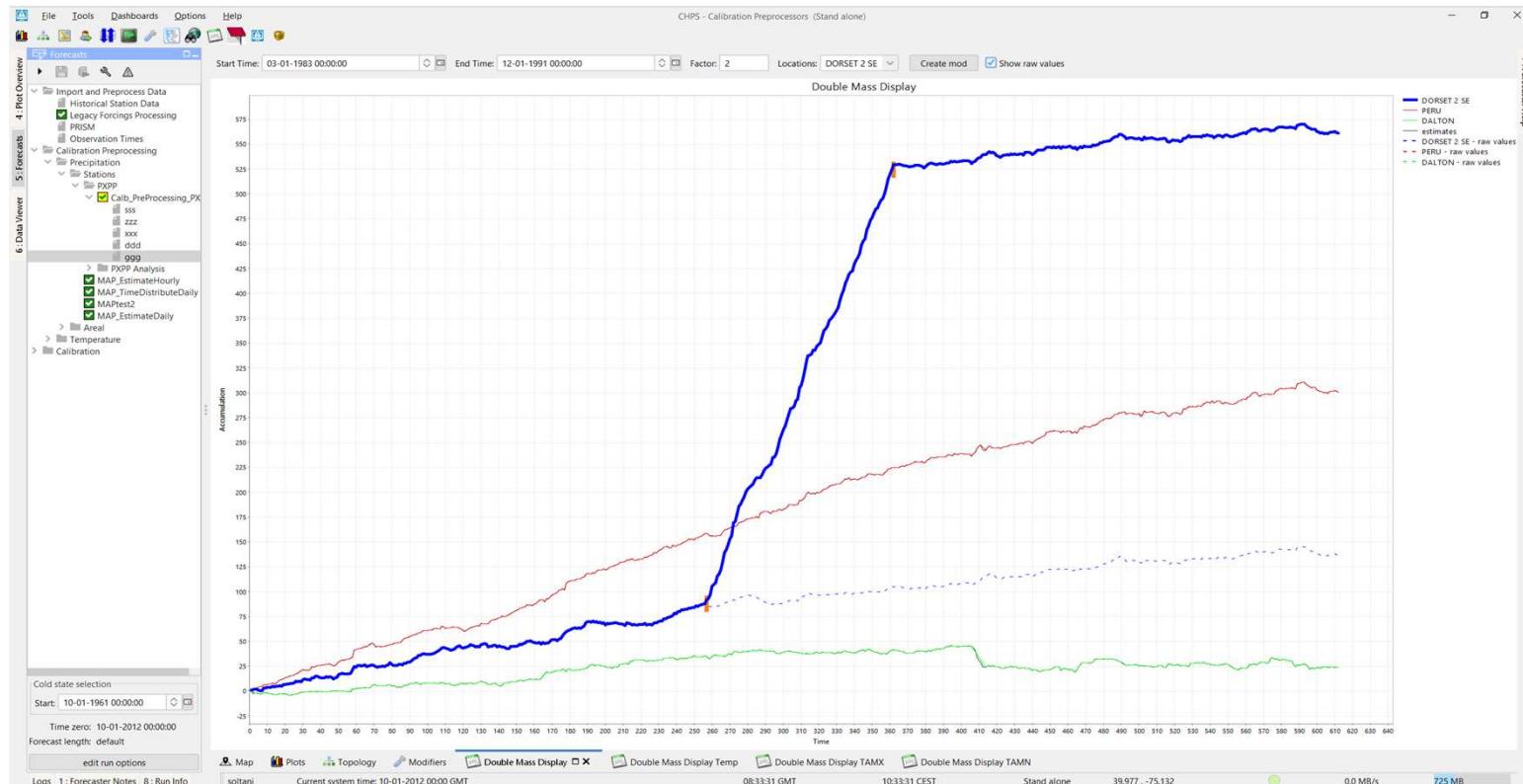
[Release Notes + documents \(wiki\)](#)



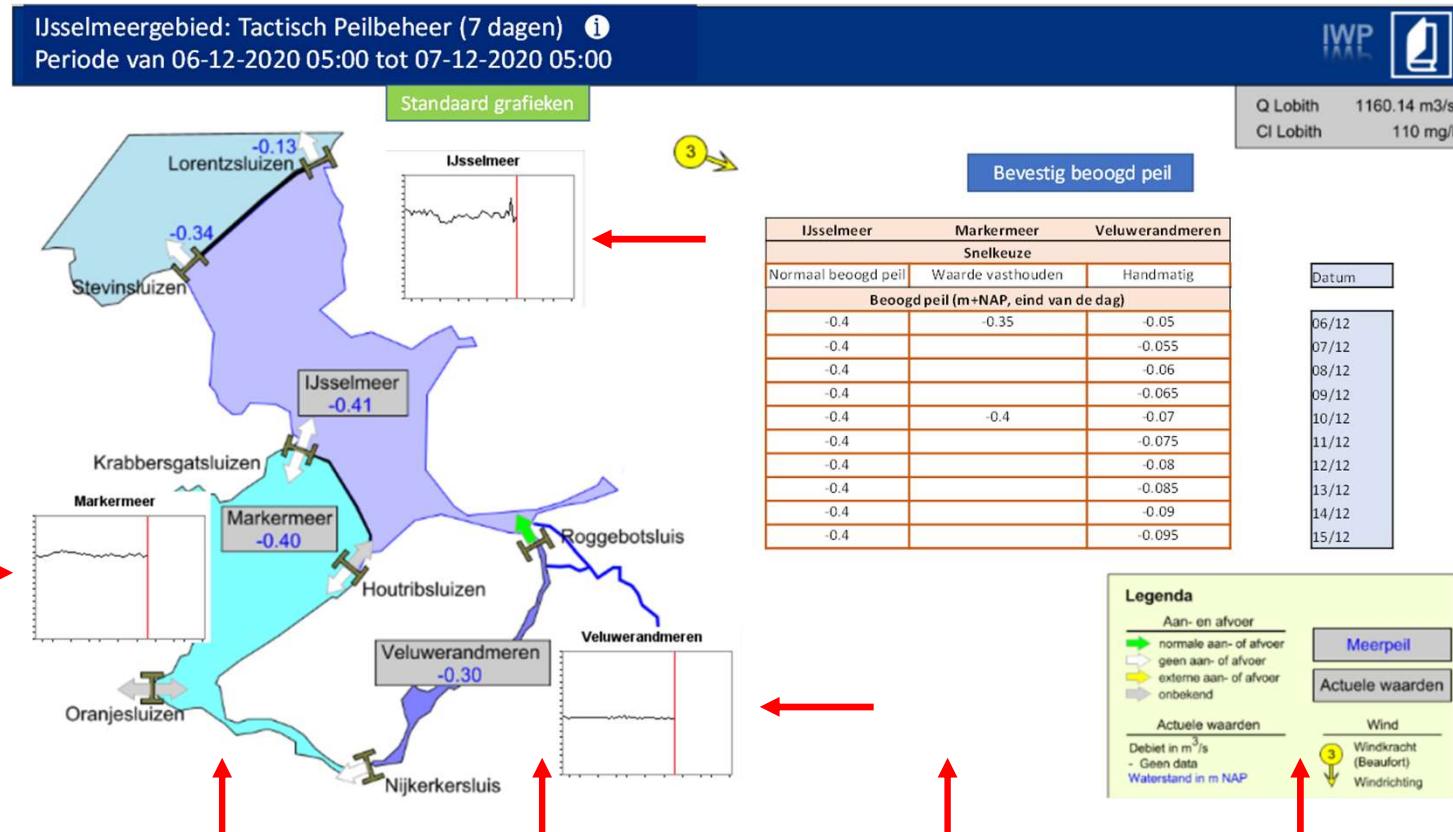
Delft-FEWS Ecosystem



Client – Interactive Double Mass Display



Client – Thumbnails in Schematic Status Display

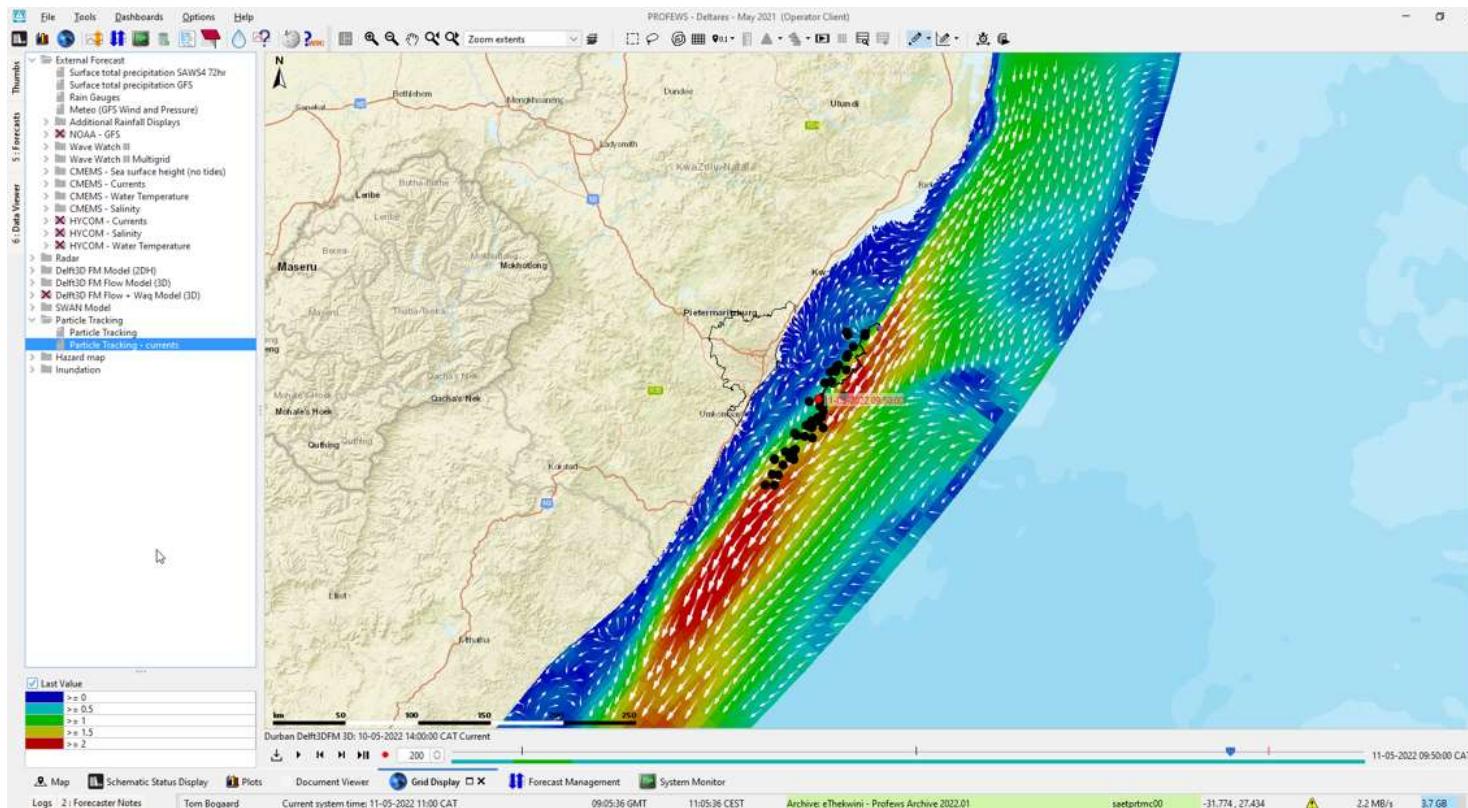


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UI

Client – Spatial Display

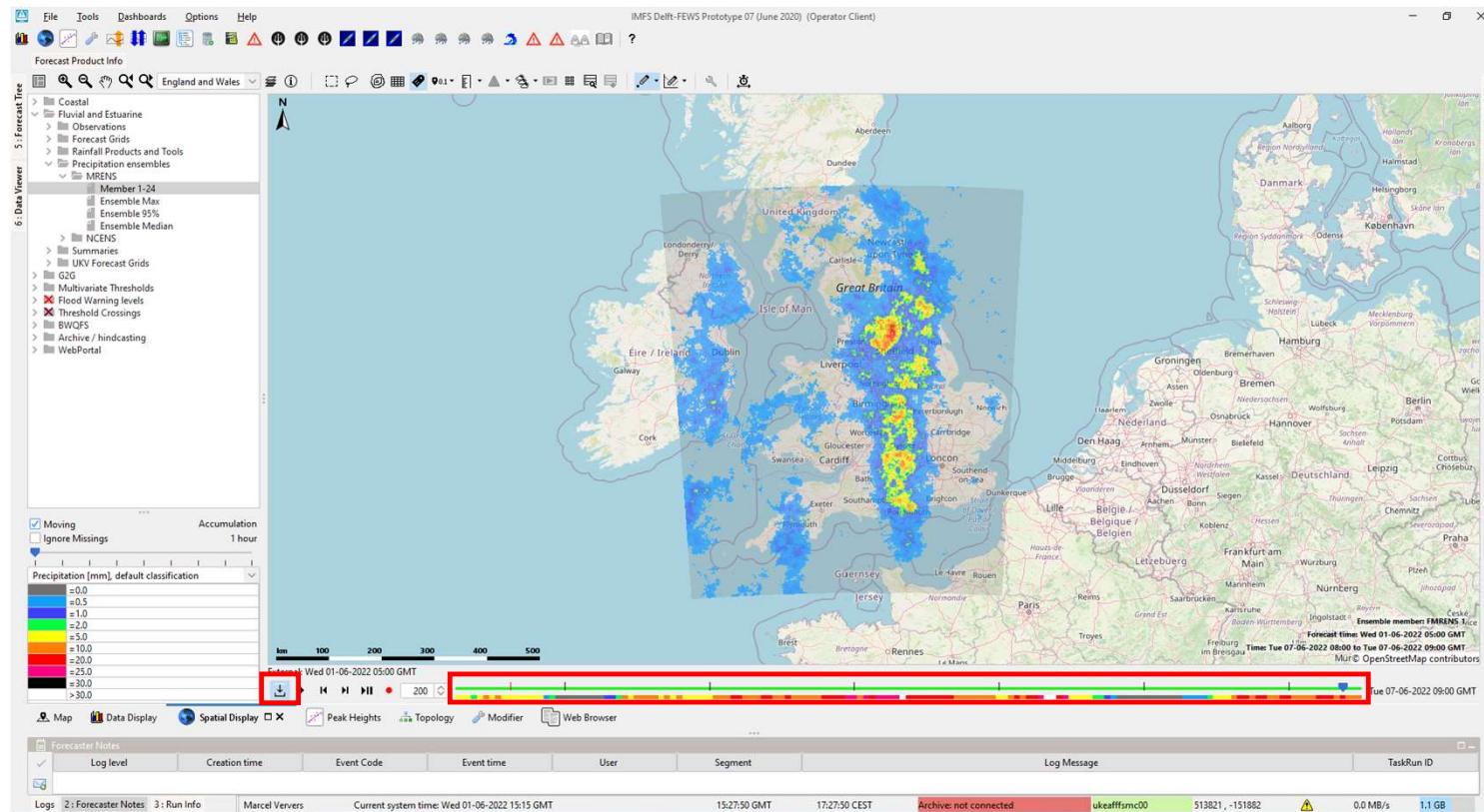


Deltires



UI

Client – Spatial Display

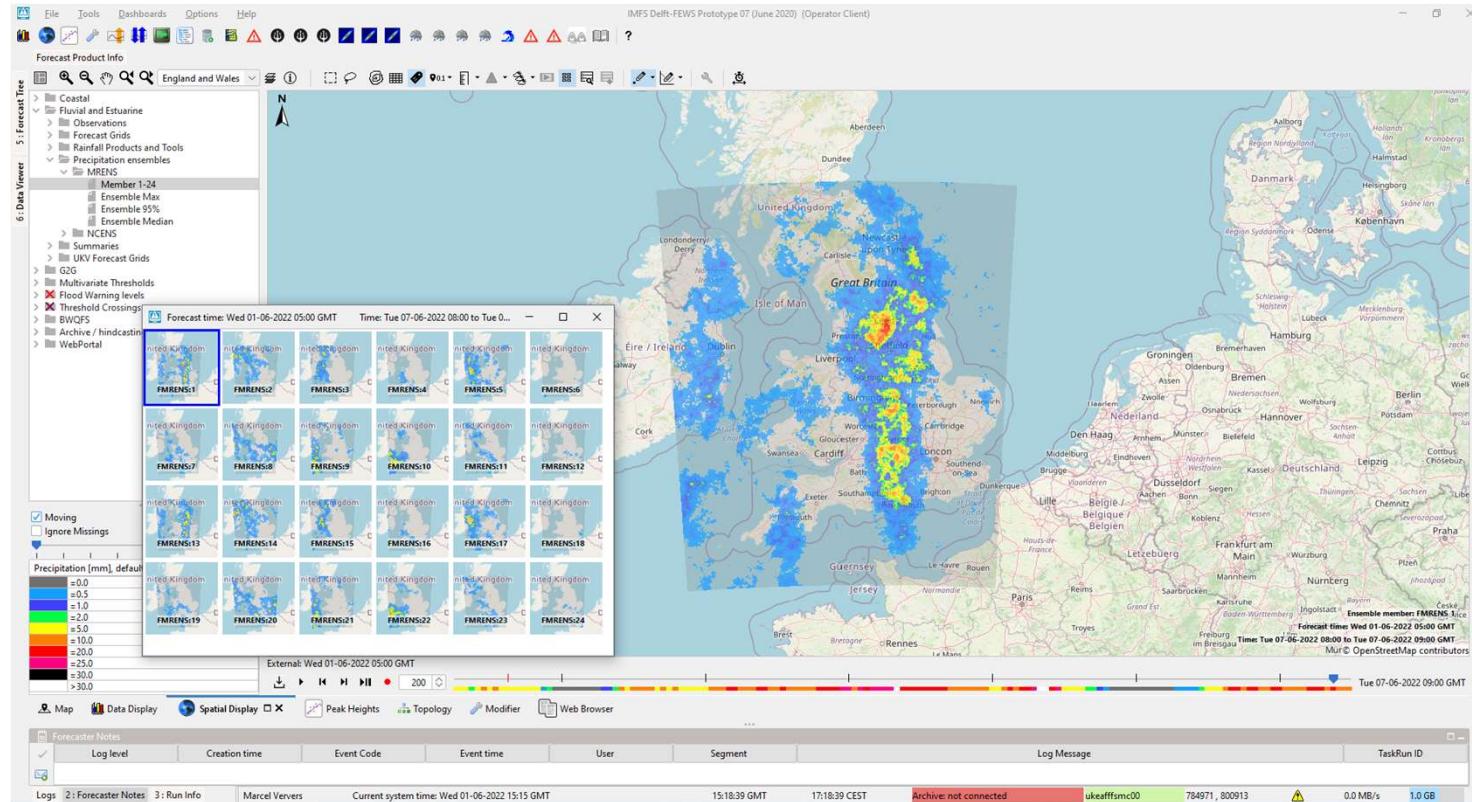


Deltares



UI

Client – Spatial Display



Deltaires

Client – Spatial/Map Display

- Use a geoJSON files instead of shape files for your maps
- Support geoJSON for defining LocationSets

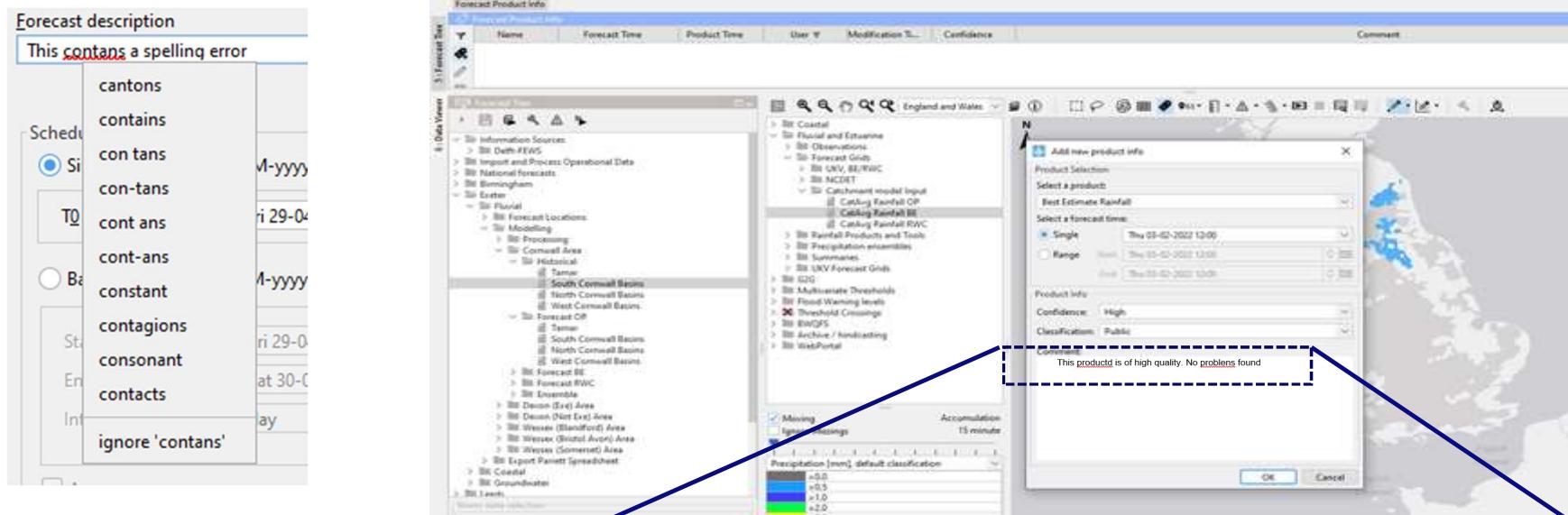
Demo geoJSON file

```
<geoJsonLayer id="geojson">
  <file>provinces.geojson</file>
  <shapeType>polygon</shapeType>
  <visible>false</visible>
  <lineColor>black</lineColor>
  <fillColor>light yellow</fillColor>
</geoJsonLayer>
```

```
<locationSet id="Provinces">
  <geoJsonFile>
    <file>provinces.geojson</file>
    <shapeType>polygon</shapeType>
    <id>%name%</id>
    <name>%name%</name>
    <attribute id="level">
      <number>%level%</number>
    </attribute>
  </geoJsonFile>
</locationSet>
```

Client – Spell checker added to various panels

- Spelling checker functionality has been added to: **Annotation panel, Forecast Product Info panel, Data search panel, Manual Forecast dialog and Timeseries Dialog** (comment editor) and is available for Dutch, English (UK, US, AUS), Spanish and French.

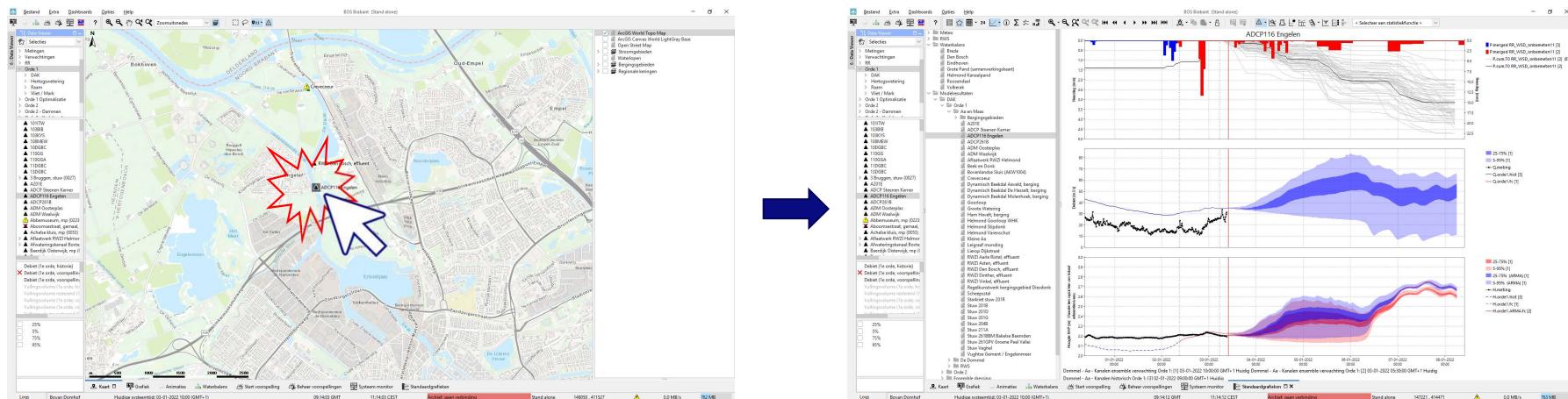


Deltaires

This productd is of high quality. No problem found

Double-click on location in map or list opens chart

- New option `<doubleClickLocationEnabled>` in `displayGroups.xml`

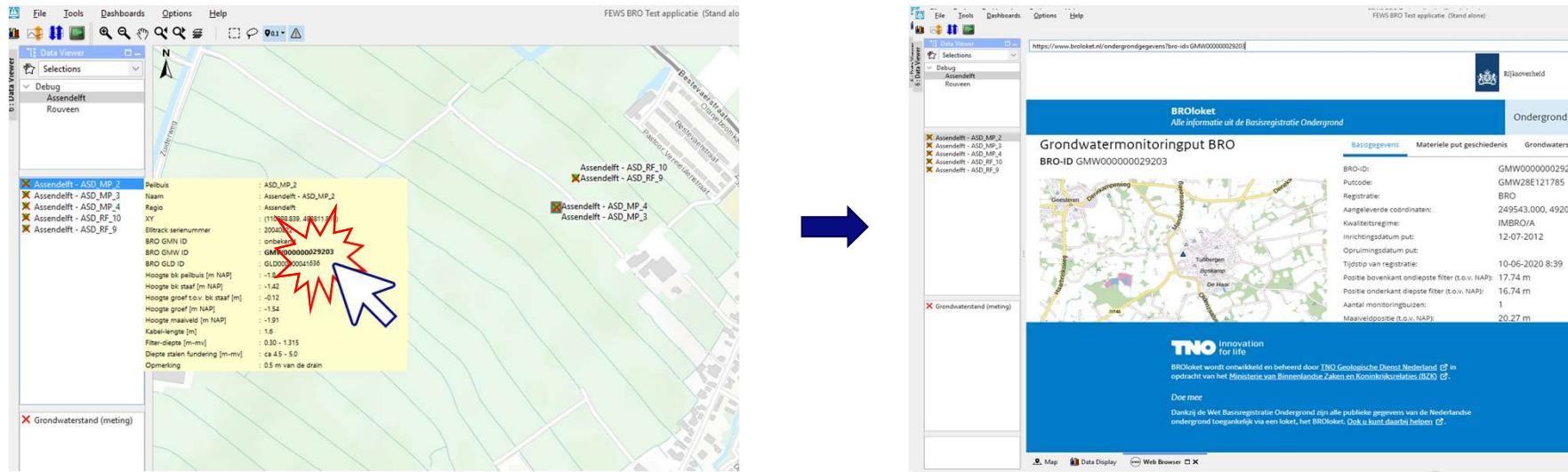




UI

Client – Display hyperlinks in tooltips in embedded Web browser

- Hyperlink can be included in a location tooltip. The <href> (url) configured there can be opened in the default/internal Web Browser Display. Web Browser Display must be configured for this, including some settings must be specified. Settings are: pages must be whitelisted in WebBrowserDisplay.xml



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Client - <F12> menu now permission-aware

- Enable <F12> menu if the user has **debugMenuPermission**. If this is not configured, then the F12 menu is accessible by everyone.

DebugMenuPermission

If the user has the debug menu permission, by pressing F12, the debug menu appears. Please note, if this permission is not configured, then the debug menu can be accessed by all users. An example of how to configure the debug menu permission and an screenshot of the debug menu follow:

```
<debugMenuPermission>admin</debugMenuPermission>
```



Time dependent locations (datum)

- Long term (observed) timeseries may change in datum (z).
- To assess the timeseries as one, the settings ‘before’ and ‘after’ this change (date) can be configured.

```
<locationSet id="LocationSetWithTimeDependentAttributes">
  <csvFile>
    <file>TimeDependentLocationSet.csv</file>
    <id>%id%</id>
    <x>0</x>
    <y>0</y>
    <attributeFile>
      <csvFile>TimeDependentLocationSetAttributes.csv</csvFile>
      <id>%id%</id>
      <startDateTime>%START%</startDateTime>
      <endDateTime>%END%</endDateTime>
      <z>%z%</z>
      <attribute id="timeDependentAttribute">
        <text>%timeDependentAttribute%</text>
      </attribute>
    </attributeFile>
  </csvFile>
</locationSet>
```

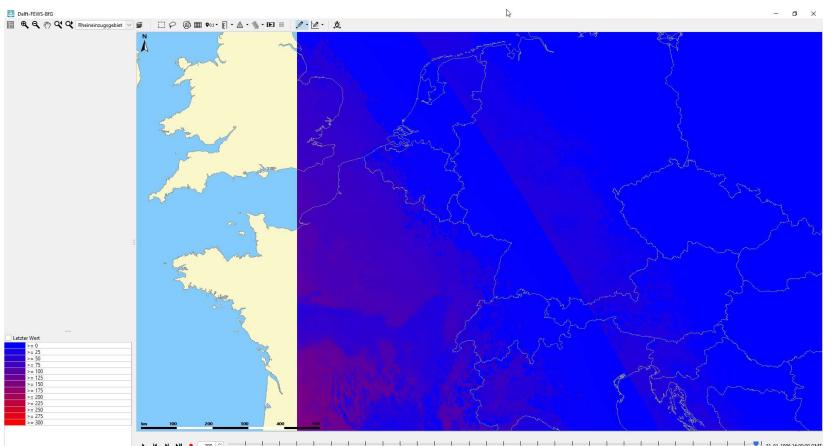
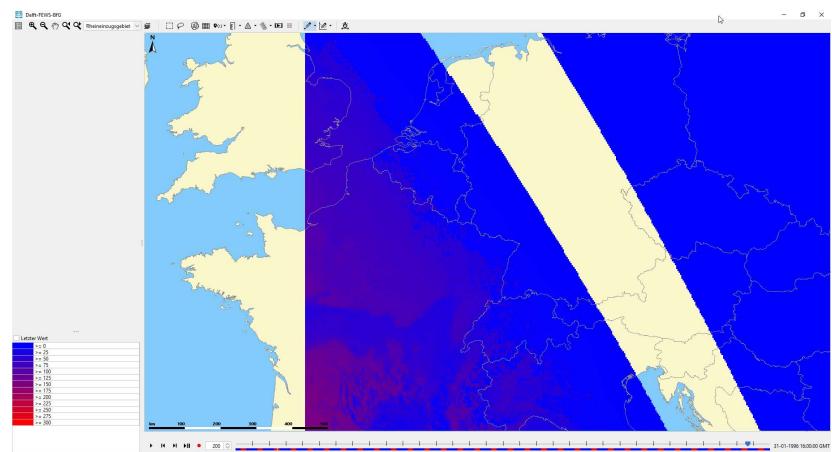
ID	START	END	timeDependentAttribute	z
TD_Loc1	19000101	21000101	A	1
TD_Loc2	19000101	19850103	A	2
TD_Loc2	19850103	21000101	B	3
TD_Loc3	19000101	19850103	B	4
TD_Loc3	19850103	21000101	A	5
TD_Loc4	19000101	19850103	A	6
TD_Loc4	19850103	21000101	B	7
TD_Loc5	19000101	19850103	A	8
TD_Loc5	19850103	21000101	B	9



Transformation: InterpolationSerial Linear for grids

- Besides filling full grid ‘gaps’ in time, you can now also interpolate missing single pixel by linear interpolation between values before and after the time of the missing data.

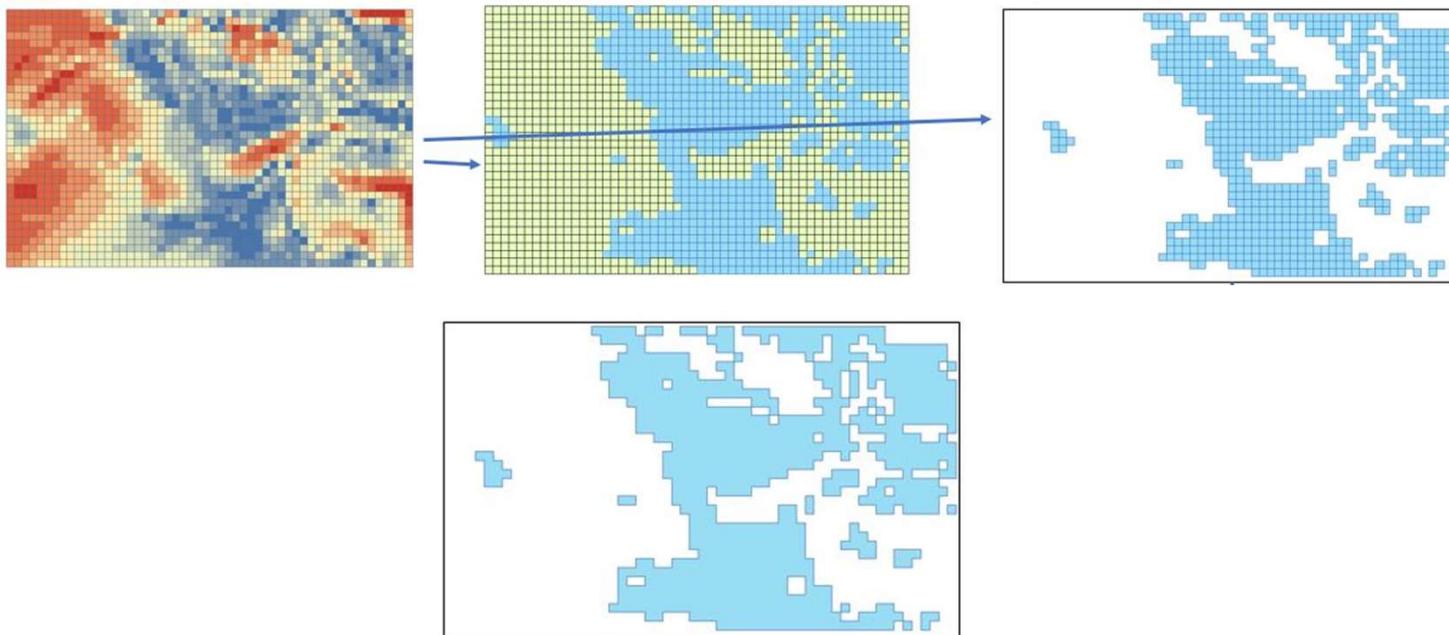
```
<transformation id="fill_gap">
  <interpolationSerial>
    <linear>
      <inputVariable>
        <variableId>Click to edit</variableId>
      </inputVariable>
      <maxGapLength>6</maxGapLength>
      <interpolateMissingGridCells>true</interpolateMissingGridCells>
      <outputVariable>
        <variableId>TMP_GLOB_FILLED</variableId>
      </outputVariable>
    </linear>
  </interpolationSerial>
</transformation>
```





Transformation: Convert (regular) grid cells to polygons based on certain class breaks

- Create (and export) nice **polygon shape files** (incl. prj) based on gridded data, e.g. flood extent. The polygons are created on the basis of **class breaks** which can be configured





Export module: configuration option to export changes

- A new option has been added to the export timeseries module to only export changes in a configured period.
- Use the configuration option **<exportChanges>**

```
<general>
    <exportType>PI</exportType>
    <folder>$EXPORT_FOLDER$</folder>
    <exportFileName>
        <name>exportedTimeSeries.xml</name>
    </exportFileName>
    <exportChanges>
        <dbChangeViewPeriod unit="day" multiplier="2"/>
    </exportChanges>
</general>
```



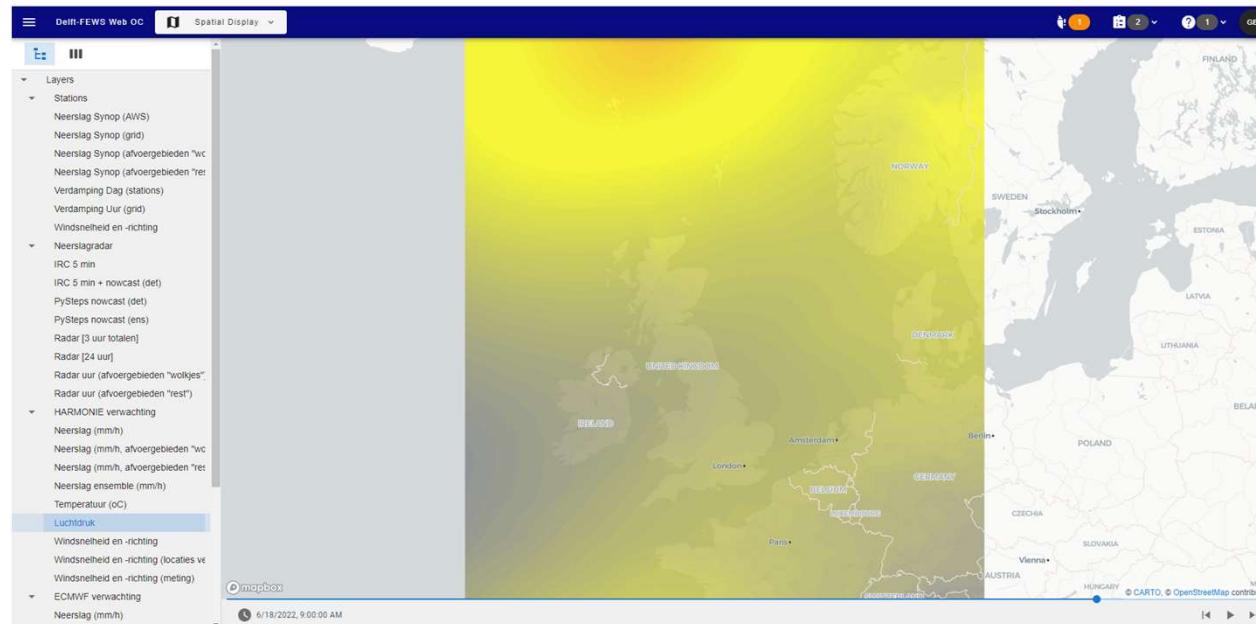
Export module: other features

- Improvements to [CAP exports](#) (CAP= Common Alerting Protocol)
- Shape file exports
 - [PRJ file](#) added
 - Add [configurable attribute table](#) (e.g. polygonId or pointId for joining GIS data)
- NetCDF file export
 - Delft-FEWS [attributes can be exported](#) as metadata of a NetCDF file



Delft-FEWS Webservices

- Calling “getMap” is now much easier since a default time is returned for external historical and external forecasting timeseries. By default the **last timestep** is returned.
- Security improvements by enabling support for **Open ID Connect** to authorize API requests. It's also possible to integrate Delft-FEWS User Groups & Permissions configurations with Open ID Connect.



Source: web oc test client (Deltaires)



Open Archive

- MongoDB + Seamless integration (improved [Open Archive database API](#))
- Search options improved with custom-IDs (provided at export) to be used as filters
- Import datasets from Archive into client-server system is possible (but default off)
- Direct download (via Archive display, Archive catalogue) without OpenDAP
- Look & feel ([Archive admin console](#))

The screenshots illustrate the updated user interface of the Archive admin console:

- Catalogue:** Shows the status of the archive (running with process ID 1000), disk usage (Data folder archive: 300 MB, Free space (GB): 763 GB), and a log entry indicating the catalogue is running.
- Tasks:** Displays scheduled tasks with columns for task name, start time, end time, run interval (seconds), status, last run time, and controls for run now, stop, log file, and activated.
- Metrics:** Shows system metrics including CPU, memory, and disk usage, along with a log entry about the scheduler being configured.



Computational Framework

- Delft-FEWS in *scenario mode* (not strictly in the ‘now’ time frame).
- Introducing the new ‘what-if’ concept (including modifiers) → also for ‘normal’ client-server systems
- Difference functionality between scenarios (TSD) now also works longitudinal profiles
- Multi-value attribute modifier
- Typical Profile Modifier (to be finalized) → client-server context (last missing piece)
 - Works with synchronizing and DDA clients
- Modifier editing panel embedded in Whatif-Editor
- <F12> option to get warning in case of ‘old what-if’ usage detected or present

The screenshot illustrates the Delft-FEWS software's 'Computational Framework' features. The top window shows the 'Tasks' pane with a tree structure of what-if tests. The bottom window shows the 'Data Viewer' pane for a 'basecase WB' scenario, displaying its properties, actions, and modifier properties.



Modifiers: introducing a multi-value attribute

- A multi-value attribute modifier is intended to modify multiple location attributes in one go.
E.g. both 'head' and 'discharge' of a pump curve.

Node: AllLocations

Mod type	Name	Summary	Locations	Start	End	Valid Time	User	Creator	Creation time	Active	Priority	Delete	Copy
Attribute...	AttributesTable	discharge=10.5,20.5,30.5,50.5,	AGSI4	--	--	--	Jitka Taco...	Jitka Tac...	06-04-2022 07:0...	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>

Create mod

Modifier Properties: AttributesTable

Name: AttributesTable

ModifiableGroup A

location	January	head-discharge	February
AGSI4	1.6	table	2.6
AMEI4	1.6	table	2.6
OKMI4	1.6	table	2.6

head-discharge location AGSI4 (AGSI4)

head	discharge
2.3	10.5
2.5	20.5
3.5	30.5
5.5	50.5

OK Cancel

```

<locationAttributeModifier id="AttributesTable" name="AttributesTable">
  <modifiableGroup name="ModifiableGroup A">
    <locationSetId>AllLocations</locationSetId>

    <attribute id="January"/>

    <attributesTable id="head-discharge">
      <attributeId>head</attributeId>
      <attributeId>discharge</attributeId>
    </attributesTable>

    <attribute id="February"/>

    <tabularLayout>
      <showOriginalValues>true</showOriginalValues>
      <locationOrientation>row</locationOrientation>
    </tabularLayout>
  </modifiableGroup>
</locationAttributeModifier>

```



Third Party Library upgrades

- NetCDF libraries have been upgraded to version 5.5.2 (and supporting NetCDF-C library to 4.8)
- Chromium browser (JCEF package) for **Web Browser Display**: one version supports all Delft-FEWS versions. One download required for Windows or LINUX

Downloads

The JCEF package, which is a Java wrapper for CEF is provided for both Windows and Linux and as of April 2022

For FEWS branches older than 2020.01 you need the most recent FEWS patch to be able to use this package. Th

CEF / Chromium version	Windows	Linux
100.0.14+g4e5ba66 / 100.0.4896.75	jcef.zip	jcef.zip

Upgrade and update strategy

Introduction

This (internal) page is meant for discussing, defining and detailing the Delft-FEWS upgrade/update strategy .

- Supported versions of (central) databases: Oracle, PostgreSQL and SQLServer
- Supported versions of operating systems (linux, Windows)
- Java JDK
- Important middleware: Tomcat, ElasticSearch, Thredds, JCEF
- Important third party libraries (e.g. log4j)

Central database

*) expiry date is regular expiry date, infinite extended support possible

database	expiry date	release version
Oracle 21c	Apr 2024*	tested on XE only
Oracle 19c LTS	Apr 2024*	2018.02 and later
Oracle 18c	Jun 2021*	
Oracle 12c	Nov 2020*	
PostgreSQL 14	Nov 2026	untested
PostgreSQL 13	Nov 2025	2021.02-2025.01
PostgreSQL 12	Nov 2024	2018.02-2024.01



Documentation

- Improvements to the WIKI
 - [Stable version based pages](#) for **installing and upgrading Delft-FEWS**
 - [Stable version based pages](#) for **installing and upgrading the Open Archive**
 - [Stable version based pages](#) for **hardware and software requirements**
 - Easier to update, maintain and understand
- Extended – dynamic and generated content: <https://fewsdocs.deltares.nl/>
 - Delft-FEWS schemas (XSD)
 - Granted features for future versions
 - Delft-FEWS webservices (Open API style)
 - Admin Interface API (Open API style)
 - **NEW:** Dynamic Release Notes → currently in pilot for FEWS [release 2022.01](#), final for FEWS release 2022.02

Deltarès

The screenshot shows the Delft-FEWS Documentation homepage. On the left is a blue sidebar with the text "DELFT-FEWS DOCUMENTATION". To the right are four main sections: "Delft-FEWS XML Schemas" (with links to Schema XSDs), "Delft-FEWS Web Services" (with links to REST Service, WMS Service, and SSD Service), and "Admin Interface API" (with a link to Admin Interface API). The "Delft-FEWS Web Services" section includes a note about the latest documentation at [https://fewsdocs.deltares.nl/Delft-FEWS-Web-Services](#).

Contents

- Delft-FEWS Admin Manuals
- Delft-FEWS Connectivity guides
- What's new in the installation process
 - What's new in the installation process - 2022.01
 - What's new in the installation process - 2021.02
 - What's new in the installation process - 2021.01
 - What's new in the installation process - 2020.02
 - What's new in the installation process - 2020.01
 - What's new in the installation process - 2019.02
 - What's new in the installation process - 2018.02
 - What's new in the installation process - 2017.02

Outlook 2022.02 Features

- Granted features (daily updates) via <https://fewsdocs.deltares.nl/jira/fews-jira/>

Estimated & granted (154)

Components
Total Issues: 154

Plugin - Module - Data Import	14
System - Continuous Deployment	13
System - FEWS webservices - PI REST	13
App - Admin Interface	11
Plugin - Gui - Time Series	11
App - Archive	9
Plugin - Gui - Grid Display	6
Plugin - Module - Data Export	5
App - Archive - Harvester	4
App - Operator Client Gui (Explorer)	4
Other...	78

Implemented (43)

Components
Total Issues: 43

App - Archive	4
Plugin - Gui - Grid Display	4
System - FEWS webservices - PI REST	4
App - Operator Client Gui (Explorer)	3
Plugin - Gui - Time Series	3
Configuration	2
Database - Datastore	2
Plugin - GUI - IFD - Forecasts	2
Plugin - Module - Data Export	2
Plugin - Module - Data Import	2
Other...	17

Estimated & on-hold (101)

Not estimated & on-hold (45)

Developments themes: GUI

- Important element (within the ‘limits’ of Java)
- Digital Accessibility
- Look & Feel: menus, icons, colors, maps, graphs, tables, user-experience
- Improving the GUI is an evolution, not a revolution...
 - Color schemes, font size %
 - Windows 10, flat look & feel (“flatlaf”)
 - New default icons on buttons
- Coming in 2022.02: consistent and more ‘slick’ icons...



Developments themes:

- **Connecting to models:** in-memory data-exchange (and write once!) to prevent time loss during opening/closing files (in case of ‘many fragmented imports or model runs).
- **Computational Framework:** non-operational / Scenario Mode of Delft-FEWS: finalizing
- **Open Archive** storage solutions, in combination with **seamless integration** + archiving options to merge edited and archived NetCDFs (HyFS work) and development of a “Product Service” for the archive...
- **Water Coach:** ‘replay events mode’ of Delft-FEWS to train forecasters (separate presentation)
- **FEWS Webservices:** start from SA (and OC) + patchable – 2022.02
- **WebOC** (separate presentation)
- ...and many more to look forward to!

Delft-FEWS Community...!

- NL / B User meeting
- German User Meeting
- Canadian meeting (@hydro conference)
- Community Talks! **Community Talk**
- **Save the date** for the International Delft-FEWS User Days:

9th + 10th of Nov '22.

Canadian Delft-FEWS User Workshop

"Connecting Research to Operations"

as part of the annual CWRA conference
June 5-9, Canmore, AB, Canada



Deltas

Alberta



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Contact

 www.delft-fews.com

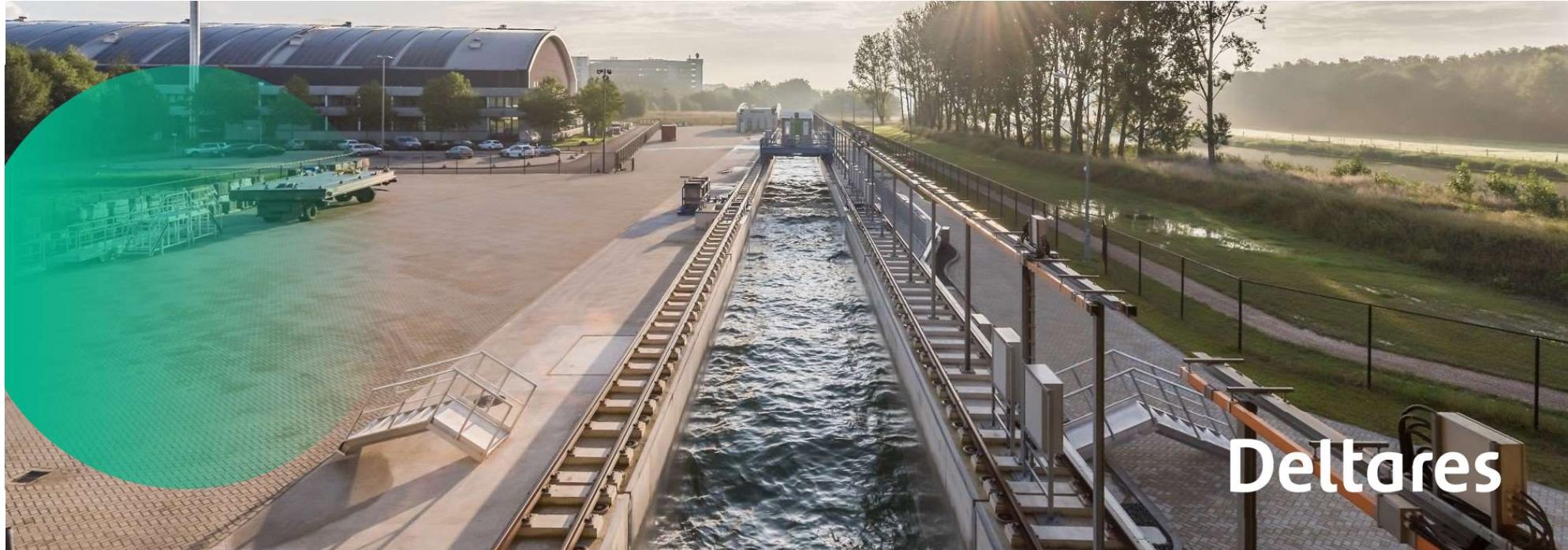
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Deltares



Datastore

- A single time series with more than 20164 time steps can now be stored in a single blob
- TableLocalModificationTimes table is now a memory optimized table
- Support of Azure SQLServer Managed instances
- It is now possible to have multiple FEWS schemas/systems in a single (managed) database instance





Workflow Test Runner

- Internal module (originally meant for testing purposes) to run workflows automatically (and logs about it)...

Purpose
To automatically assess the effect of changed configuration...
(results should be the same)
- New feature: output of this Workflow Test Runner can be written in Junit XML → allows for integration with common tooling for CI/CD and automated testing ([Azure DevOps](#))



System - Continuous Deployment

Use Azure pipelines to roll out complete FEWS system in Kubernetes:

- Create FEWS schema in PostgreSQL database
- Create Docker image with MC/AI/FSS software
- Configure MC and AI with database connection
- Upload selected Delft-FEWS configuration via AI-API
- Upload MC-FSS settings for Delft-FEWS configuration via AI-API
- Remove entire MC system from Kubernetes





Configuration – Load moduleInstances from CSV (with possibility to add extra attributes)

```
<?xml version="1.0" encoding="UTF-8"?>
<moduleInstanceDescriptors xmlns="http://www.wldelft.nl/fews" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="http://www.wldelft.nl/fews
    http://fews.wldelft.nl/schemas/version1.0/moduleInstanceDescriptors.xsd" version="1.0">
    <moduleInstanceDescriptorsCsvFile>
        <file>moduleInstanceDescriptors.csv</file>
        <id>%ID%</id>
        <name>%NAME%</name>
        <attribute id="test">
            <text>%test%</text>
        </attribute>
        <attributeFile>
            <csvFile>moduleInstanceDescriptors_attributes.csv</csvFile>
            <id>%ID%</id>
            <attribute id="EXTERNAL_ID">
                <text>%EXTERNAL_ID%</text>
            </attribute>
        </attributeFile>
    </moduleInstanceDescriptorsCsvFile>
</moduleInstanceDescriptors>
```