

Cycle 48r1

Data access and format, testing & practicalities

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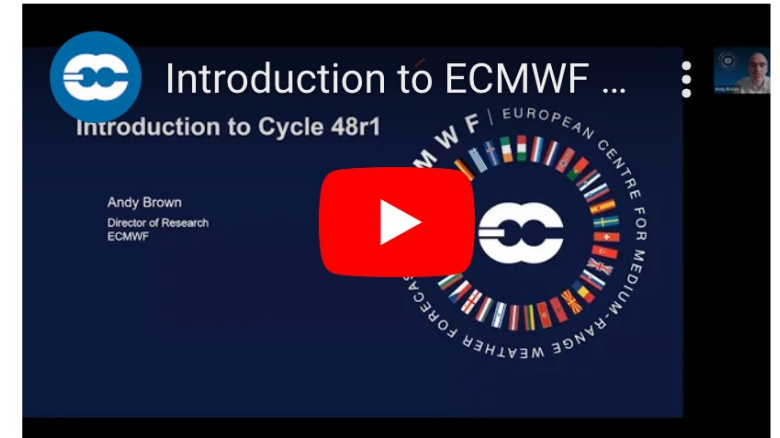
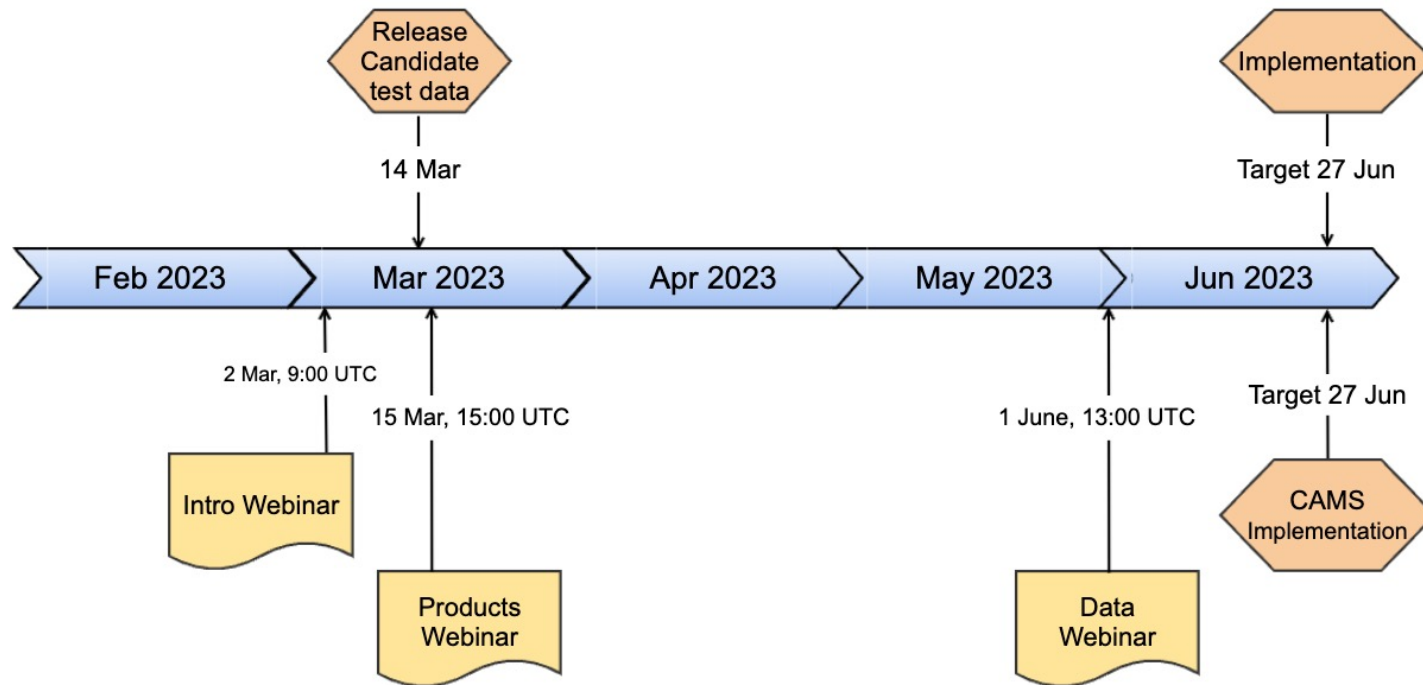
#IFS48r1 #newfcsystem @ECMWF

Cycle information



#IFS48r1 #newfcsystem @ECMWF

48r1 Implementation timeline - reminder



Release Candidate Phase started 14 March

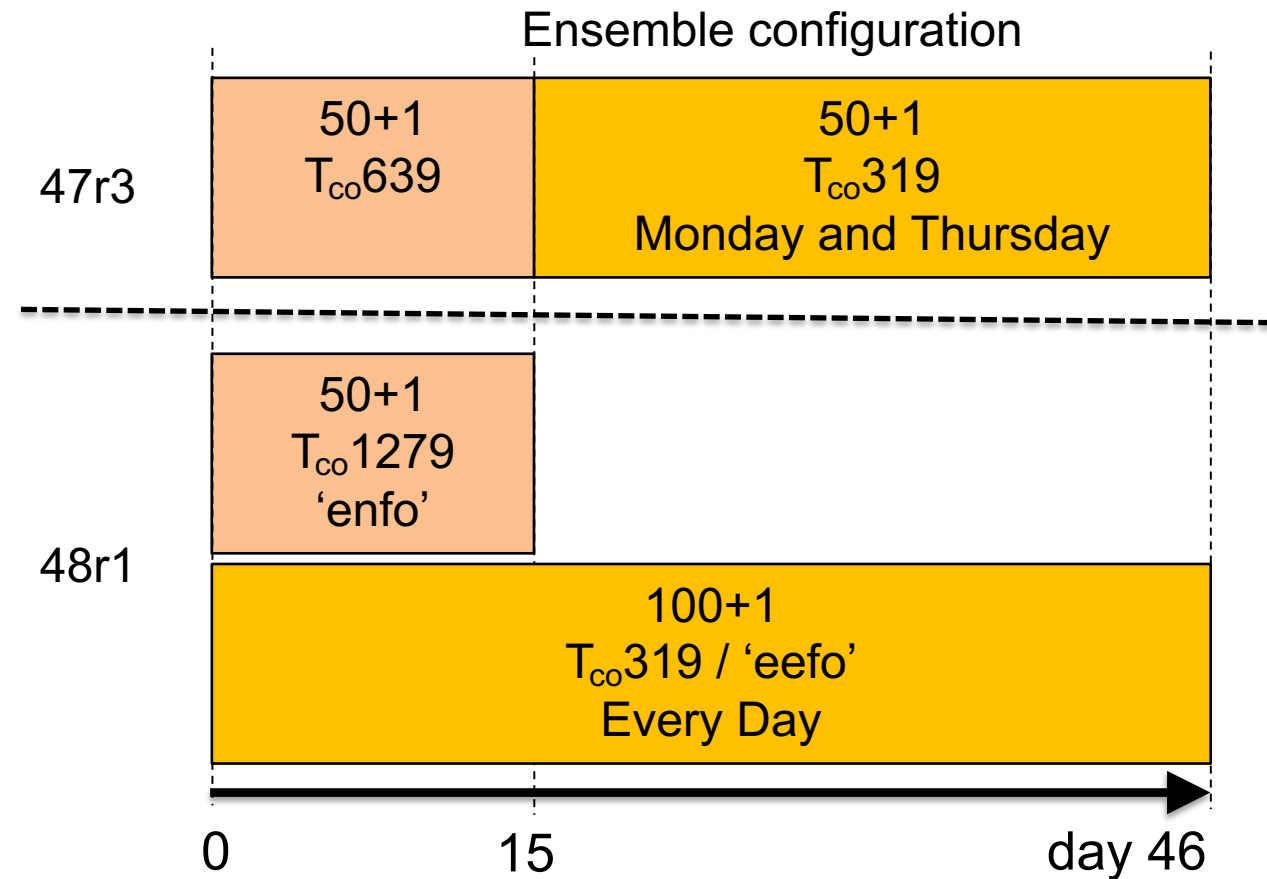
Reminder: New target cycle implementation date = 27 June

For details "Watch": <https://confluence.ecmwf.int/display/FCST/Implementation+of+IFS+Cycle+48r1>

Edit Save for later **Watching** Share ...

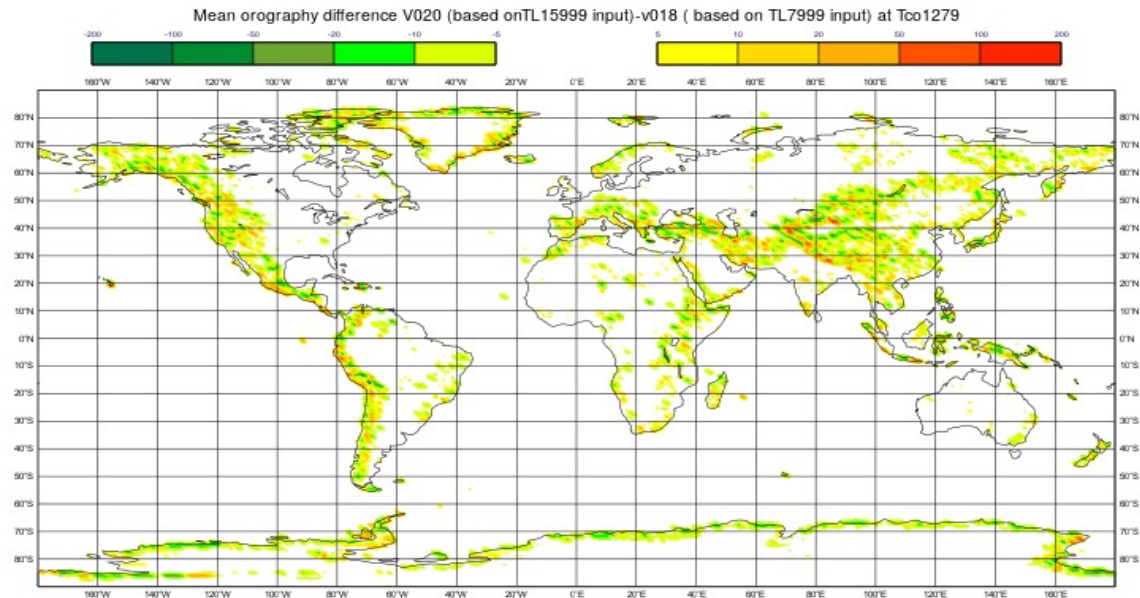
48r1: Key configuration changes

- ENS horizontal resolution increase from 18 to 9 km
- Major upgrade to ENS extended configuration
 - Resolution
 - Number of members
 - Frequency
 - Discontinuation of streams
 - Re-purpose of streams
 - New streams and products
- 2 hindcast sets
 - 1 medium range
 - 1 extended range
- New CCSDS packing type for gridded GRIB2 data only



Updated climate fields – orography, land-sea mask, lakes and glaciers

- Climate fields have been updated, including:
 - Orography
 - Land-sea Mask
 - Lake cover – up-to-date coverage including lakes appearing due to permafrost thaw
 - Lake depth
 - Glacier mask
- The fields are now based on more up-to-date and higher resolution information
- For applications it is essential to use the 48r1 climate fields together with any other model parameters
- Note that some climate fields have been added to the test Open Data and will become available in ECMWF Open Data as standard.



ENS Extended Weekly Product Configuration - dissemination

- Users will receive a daily update of the upcoming Mon-Sun week except on a Monday which will pertain to the current week instead.
- With Cycle 48r1, weekly products will be computed for every run of the extended-range forecast and they will always be valid for calendar weeks (00UTC Monday to 00UTC Monday).

Please refer to the documentation for more information regarding the weekly product configuration:

<https://confluence.ecmwf.int/display/FCST/Implementation+of+IFS+Cycle+48r1#ImplementationofIFSCycle48r1-WeeklyproductconfigurationsforENSextended>

Compression Information

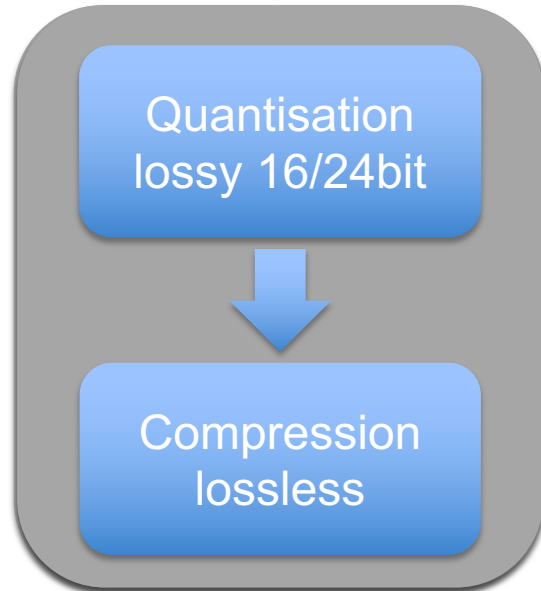


#IFS48r1 #newfcsystem @ECMWF

How does Compression come in?

Encode

Raw 64bit Array Floats
[3.134E6 ... 2.71E6]



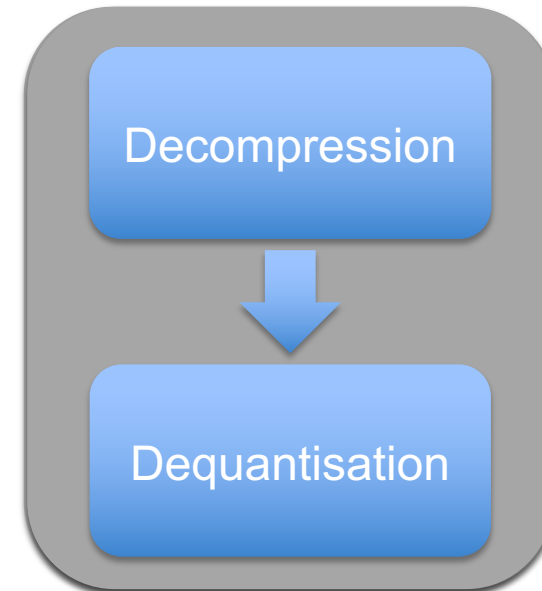
Packed Data
[1001101 ... 1101001]

Compression is an addition internal to GRIB

Lossless Compression has no scientific impact.

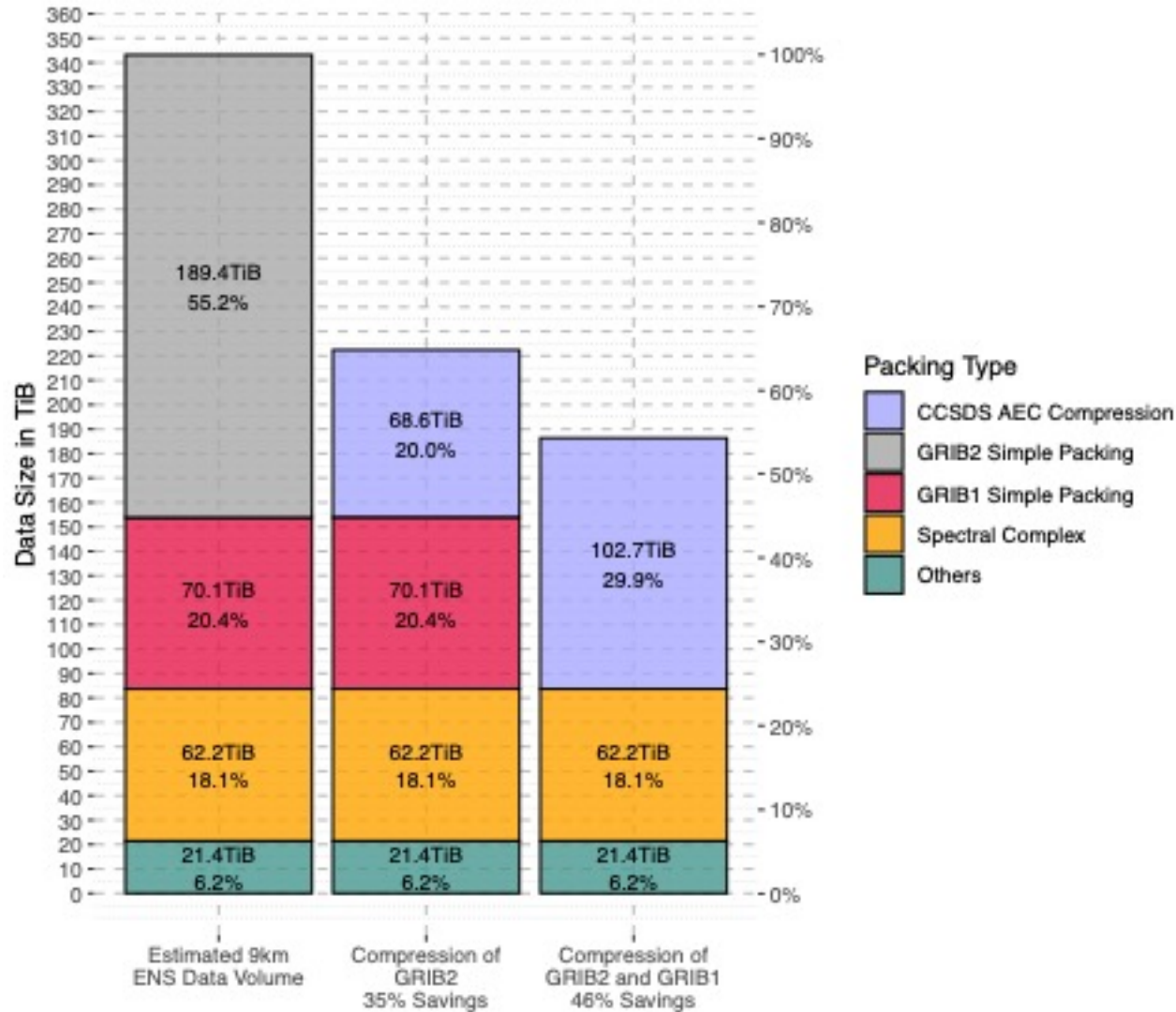
Decode

Packed Data
[1001101 ... 1101001]



Raw 64bit Array Floats
[3.134E6 ... 2.71E6]

Compression – Data-volume savings for 9km ENS in 48r1



Volume saved in using GRIB2(*compressed*), from:

– GRIB2 (*uncompressed*): **35%**

– ~~GRIB1: 46%~~ **Note: does not apply in 48r1!**

Scales with resolution!!!

You will not notice any difference, if you use ecCodes

Technical Memo



900

Impact of GRIB compression on weather forecast data and data-handling applications.

Eugen Betke, Tiago Quintino, Simon Smart, Tomas Wilhelmsson
August 2022

Handling compression data

Getting the data as usual ...

```
grib_get_data ccsds.grib
```

command line

```
import eccodes  
...  
values = codes_get_values(grib)
```

python

Transforming from CCSDS compressed to uncompressed (simple-packing)

```
grib_set -r -s packingType=grid_simple in.grib out
```

command line

```
codes_set(grib, "packingType", "grid_simple")  
codes_set_values(grib, values)
```

python

Transforming from Uncompressed (simple-packing) to CCSDS

```
grib_set -r -s packingType=grid_ccsds in.grib out
```

command line

```
codes_set(grib, "packingType", "grid_ccsds")  
codes_set_values(grib, values)
```

python

Benefits from Adopting CCSDS Compression

- **Reduced** data volumes model output, data archive and dissemination streams

- helps to offset the ENS resolution increase

- Compressions is **Lossless**

- No impact on the data.

- Once decoded, the data values are **exactly** the same

- Compression is **scalable**

- Improved for future higher-resolution

- Example:

when compressed, lsp is 12.07x smaller @ O8000 (1.25km)

Compression Factor vs Simple packing

		grid_ccsds										
		O320	O400	O640	O800	O1024	O1280	O1600	O2000	O2560	O4000	O8000
Parameter	smlt	33.67	36.51	44.35	48.70	54.20	59.51	65.21	71.63	78.89	94.53	124.87
	sro	21.47	28.48	34.06	37.52	41.33	45.33	50.46	55.68	62.07	76.14	102.28
	istl1	16.58	17.98	20.68	22.13	23.77	25.12	26.55	27.96	29.76	32.84	36.52
	ci	15.39	16.45	18.86	20.29	21.77	23.18	24.48	26.12	27.98	31.79	40.61
	sf	8.44	8.94	10.15	10.75	11.53	12.22	12.97	13.75	14.69	16.56	19.68
	rsn	7.21	7.71	9.10	9.80	10.67	11.45	12.32	13.23	14.26	16.37	20.61
	ro	4.22	4.92	5.69	6.13	6.62	7.04	7.69	8.31	9.07	10.65	13.99
	ssro	4.26	4.17	4.81	5.17	6.10	5.93	7.10	7.67	8.37	9.83	12.95
	asn	3.16	3.49	4.30	4.74	5.30	5.81	6.42	7.06	7.85	9.50	13.35
	lsp	3.54	3.78	3.68	4.75	5.20	5.65	6.17	6.74	7.46	9.00	12.07
	pev	3.46	4.05	4.11	4.80	5.08	5.31	5.58	5.83	6.12	6.70	7.51
	tciw	2.40	2.52	3.23	2.95	3.62	3.83	4.06	4.31	4.61	6.41	8.04
	swvl1	2.72	2.90	3.26	3.46	3.67	3.84	4.09	4.32	4.58	5.08	6.01
	uvb	2.26	2.32	2.44	2.49	2.55	2.59	2.64	2.69	2.73	2.83	2.77
	dsrp	1.96	2.00	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.50	2.53
tclw	1.49	1.52	1.97	1.64	1.87	1.93	2.25	2.33	2.44	2.68	3.10	
sst	1.51	1.55	1.66	1.71	1.77	1.82	1.89	1.97	2.06	2.25	2.62	
tcwv	1.41	1.44	1.51	1.55	1.59	1.64	1.68	1.73	1.79	1.92	2.16	
v10n	1.32	1.46	1.51	1.54	1.58	1.61	1.64	1.68	1.73	1.84	2.03	
lspf	1.25	1.28	1.38	1.43	1.49	1.55	1.61	1.68	1.76	1.92	2.17	
blh	1.37	1.39	1.44	1.46	1.49	1.52	1.56	1.59	1.63	1.73	1.91	
u10n	1.33	1.34	1.38	1.40	1.43	1.45	1.48	1.51	1.54	1.80	1.98	

Key Points

- CCSDS compression will **ONLY** apply to GRIB2 gridded fields
 - No change to Spherical harmonics, Wave spectra, or GRIB1 fields
- CCSDS compression is the **default packing**
 - but can be disabled in real-time data dissemination with 'packing=simple'

Input field	MARS output packing type (with keyword grid=...)	Dissemination output packing type (with keyword grid=...)
GRIB1/GRIB2 gridded	inherited from input	inherited from input
GRIB1 SH	simple	simple
GRIB2 SH	simple	CCSDS

- CCSDS has long been a standard in WMO GRIB and supported in ecCodes for many years
 - Needs to be linked with AEC library (libaec)
 - For a recent enough ecCodes, *changes should be transparent*
 - Minimum version **ecCodes** \geq **2.15.0**, recommended \geq **2.30.2** for new parameters

Data Access & testing



#IFS48r1 #newfcsystem @ECMWF

Changes to data configuration

ENS (15-day forecast) remains under **stream=enfo/waef**

ENS-Extended data (46-day forecast) is now under **stream=eefo/weef**

A hindcast has been introduced for the 15 days forecast (ENS) twice per week (Mon/Thurs) for bias correction – **stream=enfh/enwh/efhs/wehs**

The ENS-Ext 46-day hindcast is under a new **stream=eefh/weeh/eehs/wees**

The hindcast for both ENS-Ext and ENS will still be **twice per week, Mon/Thurs**

The weekly products for ENS-Ext will be produced **daily**

The overlap step produced in **stream=efov/weov/efho/ewho** will no longer be required and have been removed from real-time data requirements.

Extended range configuration - streams

Stream: Extended-range probabilistic forecasts

Grib Code	Mars Abbreviation	Long Name
1120	eefh	Extended ensemble forecast hindcast
1121	eehs	Extended ensemble forecast hindcast statistics
1122	eefo	Extended ensemble prediction system
1123	weef	Wave extended ensemble forecast
1124	weeh	Wave extended ensemble forecast hindcast
1125	wees	Wave extended ensemble forecast hindcast statistics

For more, see: <https://codes.ecmwf.int/grib/format/mars/>

Open data & WMO data

- ECMWF Open Data is in GRIB2 format and will be provided with the CCSDS packing from 27 June onwards
- Test data for ECMWF Open Data is available here:
<https://xdiss.ecmwf.int/ecpds/home/opendata/>
- Report any issues via the ECMWF Support Portal

- WMO Essential and WMO Additional datasets will **not** use CCSDS packing

Access methods – MARS Archive

- 48r1 data in MARS Archive
- Experiment version = 78 is available for all affected streams (e.g. oper, scda, enfo, waef, eefo, etc.).

On 27 June, 48r1 will be under expver 0001.

- Note that expver=78 data may not be available before February 2023.

Current selection

year: **2023**

type: cf, cm, cr, ed, efi, efic, em, ep, es, icp, **pf**, sot, tf

expver: 1, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 45, 46, 47, 50, 51, 53, 55, 58, 60, 62, 63, 64, 67, 69, 70, 71, 72, 73, 74, 75, 76, 77, **78**, 1002, 2001, 5011, 5012, 5014, 5015, 9016, 9063, 9069, 9074, 9076, 9077, 9078, 9369, 9373, 9574, 9576, 9772, 9799, 9967, 9969, 9972, 9974

stream: amap, ammc, cher, cwao, dcda, dcwv, edzw, eefh, eefo, eehs, efhc, efho, efhs, efov, egrr, ehmm, elda, enda, enfh, **enfo**, enwh, esmm, ewda, ewhc, ewho, ewla, fgge, kwbc, lfpw, lwda, lwww, maed, mawv, mfam, mfhm, mfhw, mfwf, mhwm, mmsa, mmsf, mnfc, mnfh, mnfm, mnfw, mnth, mofc, mofm, msmm, ocea, oper, rjtd, scda, scwv, seas, sens, sfmm, smma, supd, swmm, toga, waef, wamf, wamo, wasf, wave, weef, weeh, wehs, weov, wmfm

class: at, be, c3, ce, ch, co, cs, de, dk, dm, dt, e2, e4, ea, ei, el, em, en, ep, er, es, et, fi, fr, gw, ie, it, l5, la, lw, mc, me, ms, nl, no, nr, **od**, pt, pv, rd, rm, rr, s2, se, te, ti, to, tr, uk, ul, ur, yp, yt

Access methods - Test Product Requirements Editor (TPREd)

Product Requirements (Esuite) Help Emma Pidduck

Search...

Home

Categories

Publication requests 1 open

Pick-up times

Activity

MS or CS NMS > ECMWF > DSC > TE

DSC:TE

UPDATE FEED REMOVE FEED

```
1 disseminate,  
2 stream = oper,  
3 time = 00/06/12/18,  
4 type = an,  
5 levtype = ml,  
6 levelist = 1/to/137,  
7 grid = 0.1/0.1,  
8 area = 90/-180/-90/179.9,  
9 param = T,  
10 step = 0  
11  
12
```

Settings

Ready to migrate ? OFF ON

Dissemination DELAY

Test feed ? OFF ON

Expiry date ? N/A

Actions

View changes

Discard changes

TPREd – Key Points

- TPREd has a red banner and an additional feature called 'Ready to Migrate'
- Users should configure their 48r1 changes in the TPREd system.
- Once tested, click the 'Ready to Migrate' button. This will tell ECMWF that the requirements have been tested in the system and you are happy with the changes.
- Streams that have NOT been marked as 'Ready to Migrate' will be used in production for the new cycle but ECMWF may have to make assumptions regarding the content to ensure it does not cause failures in the product generation.
- Any that are not 'Ready to migrate' will have packing=simple on implementation.

TPREd – Key Points 2

- Changes made in the production system must **also** be made in the test system.
- ECMWF will not be able to synchronise requirements on the day of the cycle.
- Access to the TPREd and PREd will be frozen at close of business on **21st June 2023** for **all user types**.

- **Changes to data will not be possible in the production or test system between 21st June 2023 and 28th June 2023.**

Please test as much as you can before the 21st June to ensure your workflows are functional on 27 June 2023.

Configuration options with 48r1 – Extended Range

- Users can decide whether to install daily or twice weekly Extended range data (use=Monday/Thursday will be honoured only for Extended range)
- Users can take 50 or 100 members and either option will be a representative distribution
- We have made assumptions when launching the TPRED:
 - Enfo beyond step 360 is now 'eefo' (and so on for the wave and hindcast)
 - Enfo at grid=0.2 and use=Monday/Thursday went to grid=0.4
- Please review the changes we have made and test the data!

Access method – test ECPDS

Test ECPDS system available here: <https://xdiss-monitor.ecmwf.int/>

ECMWF
Destination DSC

ECPDS-XDISS Home > Transmission > Destinations > DSC

Transmission

Data Transfers

Destinations

Transfer Hosts

Transfer History

Transfer Methods

Transfer Modules

DSC (Idle)

Parameters

Data Rates

Aliased From

Aliases To

Transfer Timeline

Transfer History

Metadata

Monitoring

Destination

Create

Edit

Delete

ECMWF Data Services

Time critical Notify to

Status Idle Last Transfer Last Error Started Monitor no Filter lbzip2 Parallel Acquisition no Enabled yes

Dissem_Str	All (419)	T1 (290)	TD (5)	TI (124)		
Data_Str	All (419)	00-GEEFO (5)	00-GENFO (145)	12-GENFO (145)	00-GWAEF (62)	12-GWAEF (62)
Base_Time	All (419)	00 (212)	12 (207)			
Status	All (419)	StandBy (419)				
Prod_Date	All	Thu_01	Wed_31	Tue_30	Mon_29	Sun_28
					Sat_27	Fri_26

419 items found, displaying 1 to 25. [First/Prev] 1, 2, 3, 4, 5, 6, 7, 8 [Next/Last]

Current selection: All/All/All/All/2023-05-31/* Current date 2023-06-01 11:49:34

S	Host	Sched. Time	Start Time	Finish Time	Target	TS	%	Mbits/s	Status	Prior	Actions	Select
✓	[not-transferred]	31 May 20:04:16	[n/a]	[n/a]	TDF053100000710___78	41	0	[n/a]	StandBy	90		
✓	[not-transferred]	31 May 20:03:31	[n/a]	[n/a]	TDF053100000703___78	34	0	[n/a]	StandBy	90		
✓	[not-transferred]	31 May 20:02:46	[n/a]	[n/a]	TDF053100000626___78	27	0	[n/a]	StandBy	90		
✓	[not-transferred]	31 May 20:02:02	[n/a]	[n/a]	TDF053100000619___78	20	0	[n/a]	StandBy	90		
✓	[not-transferred]	31 May 20:01:17	[n/a]	[n/a]	TDF053100000612___78	13	0	[n/a]	StandBy	90		
✓	[not-transferred]	31 May 19:40:00	[n/a]	[n/a]	TIW053112000615120078	360	0	[n/a]	StandBy	50		
✓	[not-transferred]	31 May 19:40:00	[n/a]	[n/a]	T1E053112000615120078	360	0	[n/a]	StandBy	40		
✓	[not-transferred]	31 May 19:39:00	[n/a]	[n/a]	TIW053112000615060078	354	0	[n/a]	StandBy	50		
✓	[not-transferred]	31 May 19:39:00	[n/a]	[n/a]	T1E053112000615060078	354	0	[n/a]	StandBy	40		

Testing Member and Co-operating State time-critical applications

Option 1 – simple time-critical jobs

- ECaccess ‘events’ can be used for testing user scripts with IFS 48r1 test data

4303	e_ms096	At this stage, the e-suite step 096 (HRES-BC) has been generated.
1634	e_ms144	At this stage, the e-suite step 144 (ENS-BC) has been generated.
1635	e_ms240	At this stage, the e-suite step 240 (HRES) has been generated.
1636	e_ms360	At this stage, the e-suite step 360 (ENS) has been generated.

- For these events, the **MSJ_EXPVER** environment variable is set to 0078
 - use `expver=$MSJ_EXPVER` in MARS retrievals to specify the IFS 48r1 test data

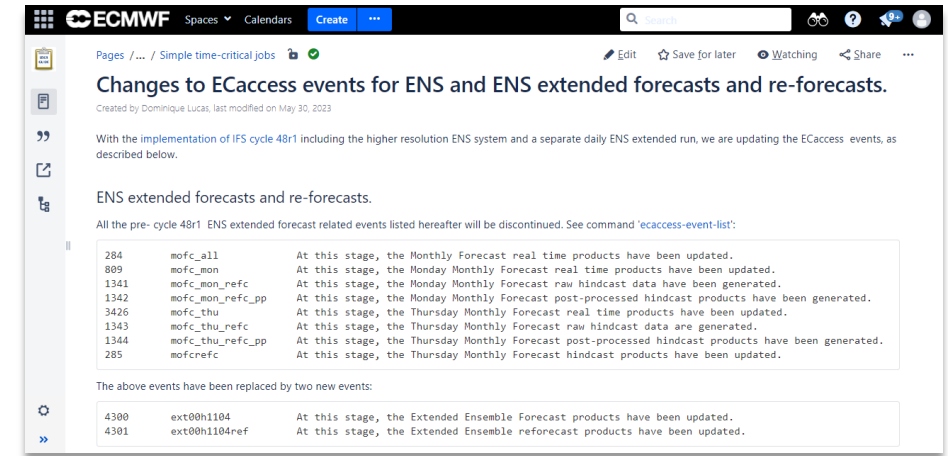
Options 2 and 3

- Applications should be tested with the IFS 48r1 test data retrieved from MARS or in dissemination

Member and Co-operating State time-critical applications

- **Option 1 – changes to simple time critical jobs for ENS and ENS extended**

- The pre-48r1 ENS extended ‘mofc’ ECaccess ‘events’ will be discontinued
- These have been replaced by the two new ‘events’
 - ext00h1140 (triggered daily) and
 - ext00h1104ref (triggered on Mon and Thu)
- ENS forecasting system has its own reforecasts with event
 - ef00h360ref
- For details see [Changes to ECaccess events for ENS and ENS extended forecasts and re-forecasts](#)

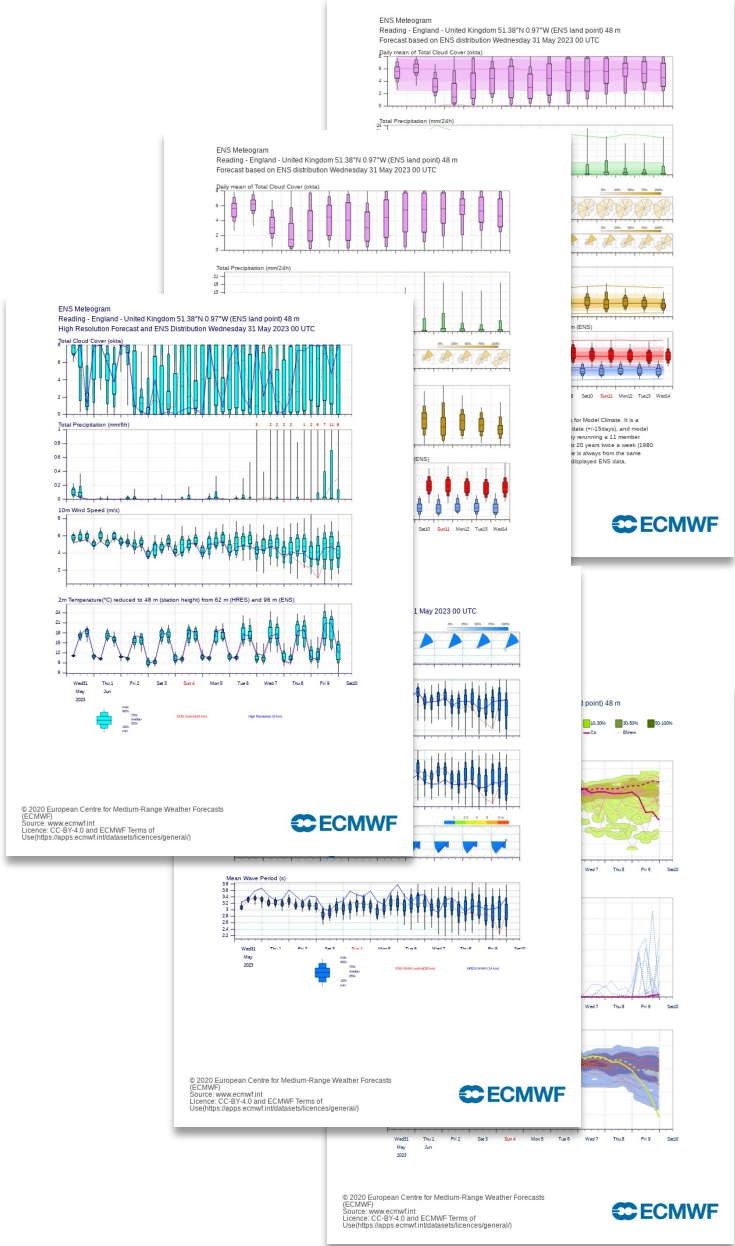


- **ECMWF will not migrate user jobs subscribed to the mofc events**
- **Users will need to adapt existing jobs and submit to one of the new events**
- **Remember to use the MSJ_ variables in your ECaccess time-critical jobs**
 - **Use \$MSJ_EXPVER in the MARS requests so jobs will work before and after IFS 48r1 implementation**

ENS Meteograms, Wavegrams and Plumes

- ENS grid resolution has changed
- Coordinates of the nearest grid point will generally be closer to the input coordinates
- The same applies to timeseries in BUFR
- This can impact the ENS Meteogram products
 - close to coasts
 - close to areas with steep orography

- **Users should review and, if necessary, update the coordinates used for station locations**



Licensing & commercial matters



#IFS48r1 #newfcsystem @ECMWF

Licensed user testing pathway

- Users with access to TPRED – please log in, make changes and ‘request publication’ or automated delivery
- Users without access to TPRED (Basic or Bronze users) – please raise a ticket in the ECMWF Support Portal.

Amendments to licences due to 48r1

- The changes for 48r1 mean that some users could receive around 9x more data (if they take all changes without the new compression).
- Users exceeding the current volume limit of 1.5TB per day will require a second licence.
- The Information Cost will NOT apply for the second licence, only the volume/service charges.

ECMWF will release a new **Product Requirements Catalogue** in early June for users to investigate the impacts of the 48r1 changes.


Users mid-way through their contract should contact their licensor to terminate their agreement to take advantage of the new fees.

Reminder for new and renewing licences!
The Maximum Charge licence fee has been reduced from €100,000 per year to €70,000 per year from 01 July 2023.
The EPU rate has been reduced from €0.5 to €0.25 from 01 July 2023.

Licensing the new data and new fees

- Users wishing to take advantage of the cycle upgrade from 27 June should have tested their data by 21 June 2023 and chosen their configuration for this date.
- Users who wish to upgrade the following aspects will need their licence amended:
 - Increase to 9km resolution for ENS
 - Increase to 100 members for ENS-Ext
 - Increase to daily forecasts for ENS-Ext
- The date of amendment will be from 01 July 2023.
- If users are wishing to amend their licence for 48r1 AND terminate with 3 months notice, all amendments need to be completed before the termination is complete.
- Note that once a licence is terminated, users cannot amend the data until the new licence starts.
- Users are encouraged to report their request to terminate with 3 months effect and then to complete any amendments during the 3 months as required.

“Check list” for users

- ✓ Study the 48r1 implementation page and  Watch for updates
- ✓ Check that you can handle gridded GRIB2 test data with CCSDS packing
 - Using ecCodes 2.30.2 this should be transparent
- ✓ Check that your processing chains work correctly with the test data
 - Resource requirements and run-times might change
- ✓ For data from MARS/dissemination be aware of the default behaviour reg. packing type
 - Override the default if you cannot handle CCSDS compressed data
- ✓ If you use extended-range ensemble products
 - Pay attention to configuration change and modify requests accordingly
 - Address the discontinuation of fields from overlap streams efov, efho, weov and ewho
 - If you are a recipients of real-time data, please let us know your intentions via a support ticket
- ✓ Once tested successfully, mark dissemination streams as “Ready to migrate”
- ✓ Please report any issues or feedback via the Support Portal: <https://www.ecmwf.int/en/support>

Questions?

