Introduction to Cycle 49r1

New products, reforecast overview and test data access

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ECMWF

With contributions from many in ECMWF – thank you!

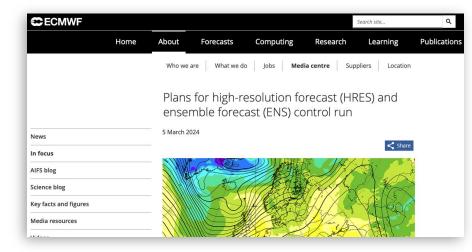


Cycle information



HRES *versus* ENS Control – the harmonisation

- In cy48r1: ENS members and HRES have the same horizontal resolution ...
 - HRES now plays a similar role to the ENS "control" run (unperturbed)
 - HRES and ENS Control are still 2 separate unperturbed runs with different outputs
 - HRES 00 and 12 UTC are 10-day long; ENS Control 00 and 12 UTC are 15-day long.
 - HRES is disseminated earlier than the full ENS
- In cy49r1 (November 2024)
 - Both ENS Control and HRES will be computationally identical
 - Both will run to 15 days for 00 and 12 UTC and to 6 days for 06 and 18 UTC
- In cy50r1 (Q4 2025)
 - Current "ENS Control" run will be stopped
 - Data Stream currently called "HRES" will be the "Control" run
 - This "Control" run will be available on the same schedule as the current "HRES" (earlier than the perturbed ENS forecasts)





Users are recommended to continue to retrieve "stream=oper, type=fc"



HRES versus ENS Control – the harmonisation

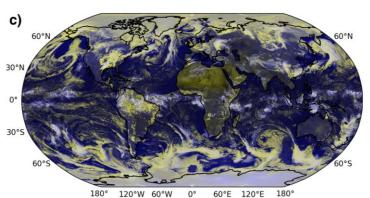
Naming update

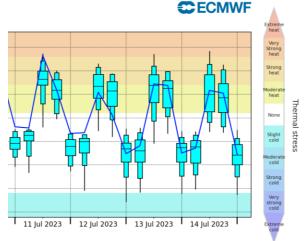
- During 49r1:
 - HRES or "High Resolution Forecast" will be renamed "Control Forecast (ex HRES)" or CTRL as the short version
 - ENS extended or "extended-range forecast" will become: "Subseasonal forecast"
 - New Acronyms will be:
 - Control Forecast: IFS-CF
 - Subseasonal Forecast: IFS-SUBS

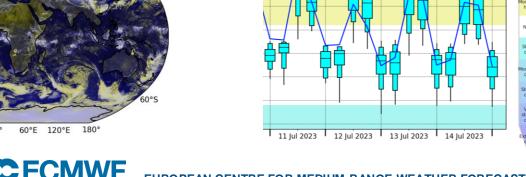


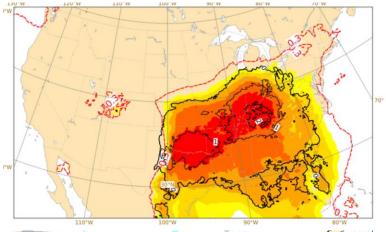
What's changed? - Parameters

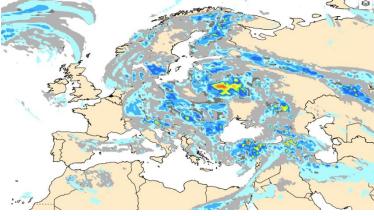
- Convection (CAPE/CIN) *modified!*
- Clear Air Turbulence (CAT) *modified!*
- Changes in 2D wave spectra output *modified!*
- Changes in Sea Surface Temperature values over land modified!
- Simulated satellite image product (visible channel) New!

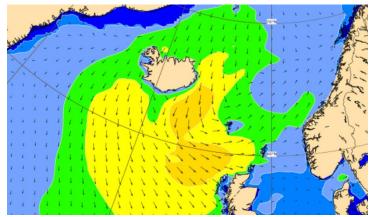












Revised parameters – Convection

Before Cy47r3:

CAPE/CIN



From Cy47r3:

CAPE/CIN MUCAPE MLCAPE50/MLCIN50 MLCAPE100/MLCIN100



From Cy49r1:

MUCAPE/MUCIN
MLCAPE50/MLCIN50
MLCAPE100/MLCIN100

MUCAPE = Most Unstable Convective Available Potential Energy
MUCIN = Most Unstable Convective INhibtion

- In 49r1: "cleaning" of CAPE/CIN in all applications/products to only use MUCAPE/MUCIN.
 - CAPE (paramID=59) will be <u>discontinued</u>.
 - CIN (paramID=228001) will be replaced with MUCIN (paramID=228236).
 - Therefore CIN (paramID=228001) will not exist anymore.
- With these changes, we finally output the following 3 CAPE/CIN pairs:
 - MUCAPE/MUCIN
 - MLCAPE/MLCIN in the lowest 50 and 100hPa (mixed-layer parameters)
- MUCAPE and MUCIN will be archived in reforecasts
 - Will replace CAPE and CIN.



Revised parameters – Convection

Before Cy47r3: CAPE/CIN





• In 49r1: "cleaning" of CAPE/CIN in all applications/products to only use MUCAPE/MUCIN.



For users receiving data via ECMWF Dissemination system (ECPDS), deprecated/revised parameters have already been replaced by the new parameters where applicable and can be tested in the 49r1 test platform.

These configurations will be migrated to production on the day of cycle implementation.



MUCAPE/MUCIN
MLCAPE50/MLCIN50
MLCAPE100/MLCIN100

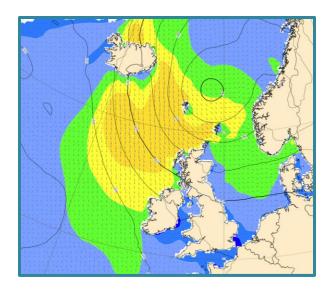
- MUCAPE/MUCIN
- MLCAPE/MLCIN in the lowest 50 and 100hPa (mixed-layer parameters)
- MUCAPE and MUCIN will be archived in reforecasts.
 - Will replace CAPE and CIN.



Changes to Wave model horizontal grid

The wave model will use the same grid as the atmospheric model in all configurations

- 14km reduced lat-lon grid to ~9km O1280 (Tco1279) grid for ENS
- 56km reduced lat-lon grid to ~36km O320 (Tco319) grid for Subseasonal



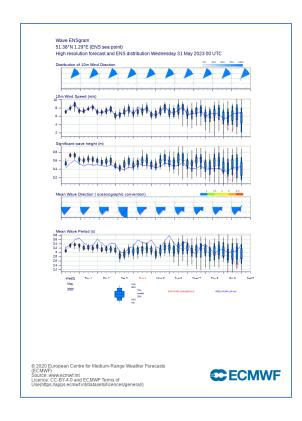


- Users are encouraged to request ENS wave data on a 0.1° x 0.1° regular lat-lon grid or directly on the native Tco grid (sub areas are possible) rather than on 0.125° x 0.125°
- If you use ENS wave data
 - Trial and consider updating your resolution to 0.1° x 0.1°



Change of Wave grid and ENS Wavegrams

- Coordinates of the nearest grid point will have changed with the change of Wave grid resolution
- This can impact the ENS Wavegram products
 - Some grid points that were land points at IFS cy48r1 may be sea points at IFS cy49r1 (and vice-versa)
- The improved wave model resolution will give better representation of waves near the coasts, so Wavegrams should be better for near-coast points





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



Changes in 2D wave spectra output

Number of frequencies in wave spectra output <u>reduced</u> from 36 to 29 frequencies.

- For Medium-range ENS configurations for which we have 2D wave spectra output, the number of frequencies output will be reduced from 36
 - to 29, keeping the same first 29 frequencies (*) as before
 - the last 7 frequencies will not be archived
- The number of the directions stays as before (36).

```
(*) 29 frequencies: 0.03452 0.03797 0.04177 0.04595 0.05054 0.05560 0.06116 0.06727 0.07400 0.08140 0.08954 0.09850 0.10835. 0.11918 0.13110 0.14421 0.15863 0.17449 0.19194 0.21114 0.23225 0.25548 0.28102 0.30913 0.34004 0.37404. 0.41145 0.45259 0.49785 Hz
```

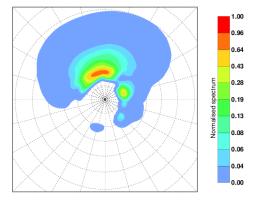
NORMALISED 2-D SPECTRUM for 0001 wave od 06:00Z on 27.03.2016 at P0003 (62.00 , 0.00)

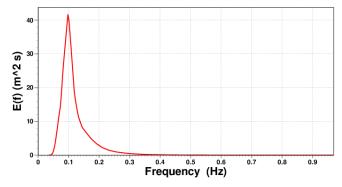
Hs= 6.08 m, Tm= 9.50 s, Tp=10.15 s

Peakedness Qp = 1.18, Directional Spread = 0.64 MWD = 354 degrees PWD = 340 degrees

Propagation direction is with respect to North North is pointing upwards

Concentric circles are every 0.05 Hz







Changes in 2D wave spectra output – in dissemination and MARS

In dissemination



For users receiving parameter 2DFD via Dissemination, the number of frequencies will be automatically adjusted in your data requirements in the test system

In MARS



Users will need to adjust the number of frequencies in their retrieval scripts

```
retrieve,
    class = od,
    stream = wave,
    type = an
    date = 2024-08-14,
    time = 00
    domain = g,
    expver = 1,
    direction = 1/to//36,
    frequency = 1/to/36,
    param = 251.140,
    target="2dfd_an.grib"
```



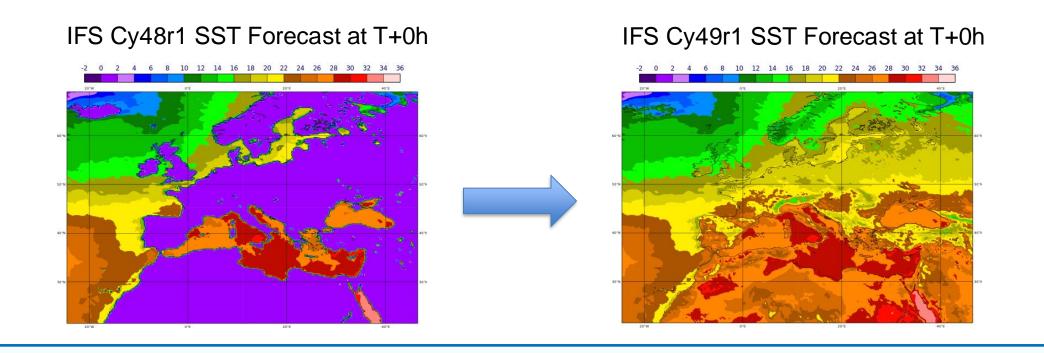
```
retrieve,
   class = od,
   stream = wave,
   type = an
   date = 2024-08-14,
   time = 00
   domain = g,
   expver = 79,
   direction = 1/to/36,
   frequency = 1/to/29,
   param = 251.140,
   target="2dfd_an.grib"
```

On implementation of IFS cy49r1, data will be archived as expver=0001



Change to Sea-Surface Temperature over land

• Forecast fields of SST will change over land, from being a constant 273.16K to have the values of the lake mix-layer temperature at forecast step=0





If you use SST you might need to change scripts if they rely on old values to identify land



New Parameters - overview

Param ID	Short name	Name	Units	Component & type	GRIB edition	Lev. type
260242	2r	2 metre relative humidity	%	ENS / CTRL (ex HRES)	2	sfc
<u>261001</u>	utci	Universal thermal climate index	K	ENS / CTRL (ex HRES)	2	sfc
261002	mrt	Mean radiant temperature	K	ENS / CTRL (ex HRES)	2	sfc
<u>260004</u>	heatx	Heat index	K	ENS / CTRL (ex HRES)	2	sfc
<u>260005</u>	wcf	Wind chill factor	K	ENS / CTRL (ex HRES)	2	sfc
<u>260255</u>	aptmp	Apparent temperature	K	ENS / CTRL (ex HRES)	2	sfc
<u>261016</u>	hmdx	Humidex	K	ENS / CTRL (ex HRES)	2	sfc
<u>261018</u>	nefft	Normal effective temperature	K	ENS / CTRL (ex HRES)	2	sfc
<u>261015</u>	gt	Globe temperature	K	ENS / CTRL (ex HRES)	2	sfc
<u>261014</u>	wbgt	Wet bulb globe temperature	K	ENS / CTRL (ex HRES)	2	sfc
261022	wbpt	Wet-bulb potential temperature	K	ENS / CTRL (ex HRES)	2	sfc
<u>140131</u>	tdcmax	Time domain maximum individual crest height	m	ENS-WAM	2	sfc
<u>140132</u>	tdhmax	Time domain maximum individual wave height	m	ENS-WAM	2	sfc
<u>140133</u>	stcmax	Space time maximum individual crest height	m	ENS-WAM	2	sfc
<u>140134</u>	sthmax	Space time maximum individual wave height	m	ENS-WAM	2	sfc



49r1 – new reforecast configurations for medium-range and subseasonal

Reforecast = hindcast = retrospective "ensemble" forecasts (over the past years)

In Cycle 48r1

Subseasonal: 10 perturbed + 1 control forecast **every Monday and Thursday**, over past 20 years.

Medium-range: 10 perturbed + 1 control forecast **every Monday and Thursday**, over past 20 years

In Cycle 49r1

Subseasonal: 10 perturbed + 1 control forecast every odd day of the month (1,3,5,...), over past 20 years (excluding 29 February).

Medium-range: 10 perturbed + 1 control forecast every other odd days of the month (1,5,9,...), over past 20 years (excluding 29 February) – (every four days)



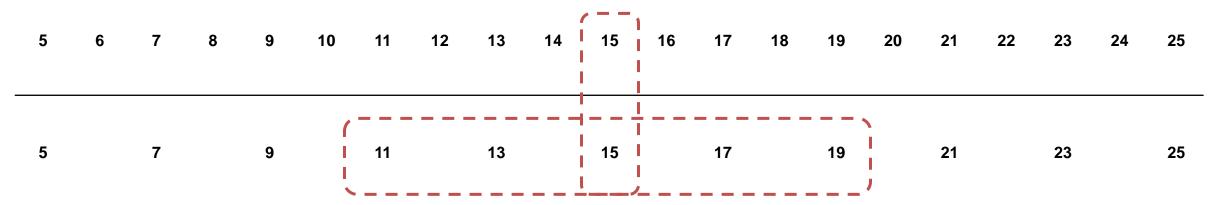


Building a model climate! - Subseasonal

Data will be disseminated sufficiently far enough ahead for you to build a model climate with the following configuration.

For subseasonal reforecasts, the model climate can be built from <u>5 reforecasts</u> (1 central + 2 ahead + 2 behind) – annotated by **the red dashed line**

Forecast Date (daily 'eefo')



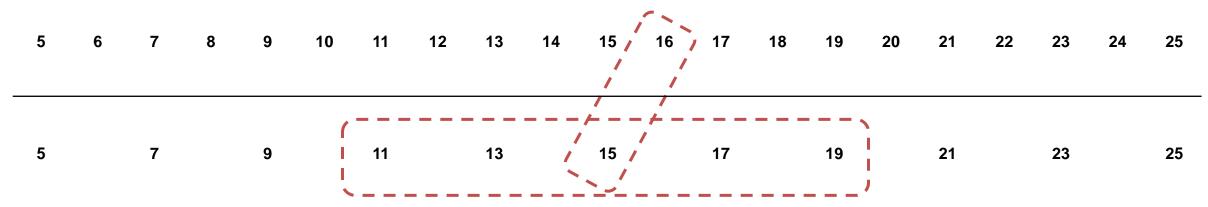


Building a model climate! - Subseasonal

On <u>even</u> days, it's not possible to use a centralised reforecast so we recommend using the previous reforecast as the 'central' and then 2 either side.

Basically, you can use the same model reforecast for 2 days in a row EXCEPT at the end of a 31-day month...

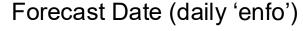
Forecast Date (daily 'eefo')

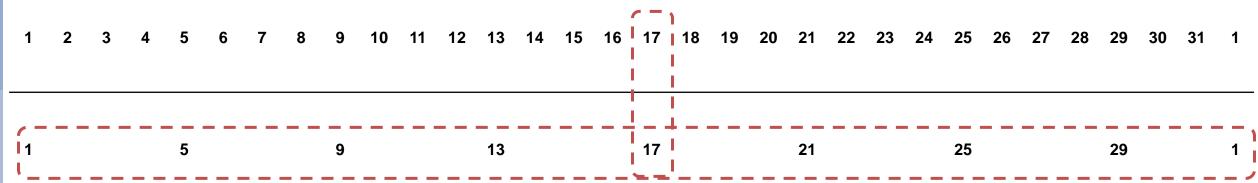




Building a model climate! - Medium Range

For medium-range reforecasts, the model climate can be built from 9 reforecasts (1 central + 4 ahead + 4 behind) – annotated by the red dashed line





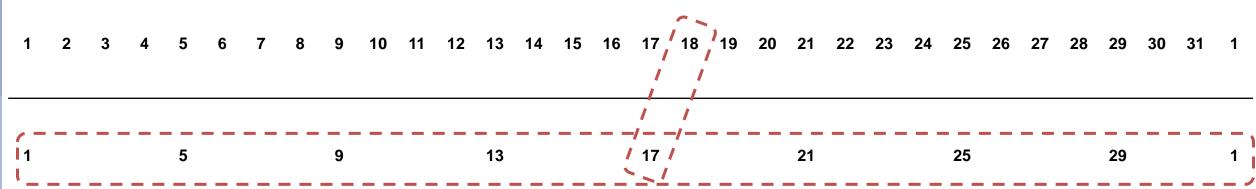


Building a model climate! – Medium Range

On <u>even</u> days, it's not possible to use a centralised reforecast so we recommend using the closest reforecast as the 'central' and then 4 either side.

Basically, you can use the same model reforecast for 4 days in a row EXCEPT at the end of the month...

Forecast Date (daily 'enfo')



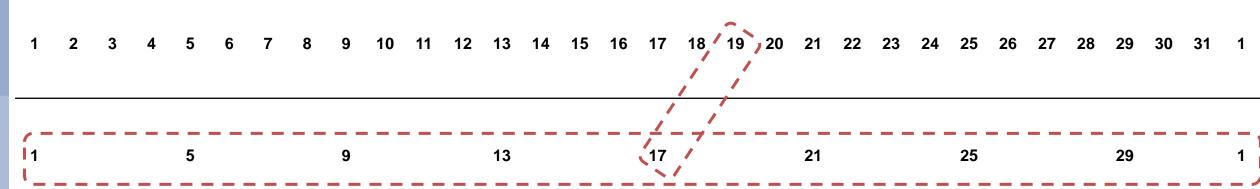


Building a model climate! – Medium range

With a wider distribution of the reforecast, the next odd day must also use a previous reforecast as the 'central' with 4 either side.

Basically, you can use the same model reforecast for 4 days in a row EXCEPT at the ends of the month...

Forecast Date (daily 'enfo')



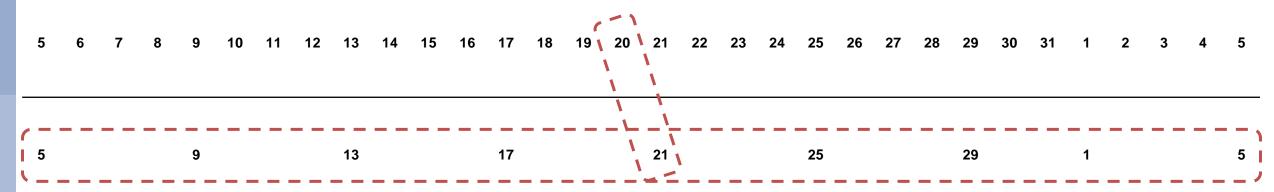


Building a model climate! - Medium Range

After a reforecast/model climate has been applied 4 times, the next reforecast becomes the 'central' position.

i.e. The 20/21/22/23 of the month will use 21, but 24/25/26/27 will move to 25.

Forecast Date (daily 'enfo')



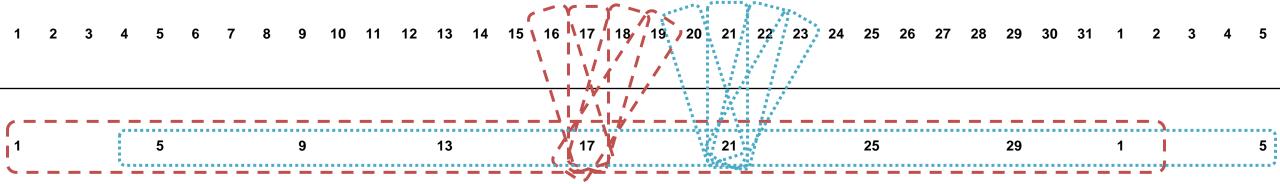


Building a model climate! - Medium Range

After a reforecast/model climate has been applied 4 times, the next reforecast becomes the 'central' position.

i.e. The 16/17/18/19 of the month will use 17, but 20/21/22/23 will move to 21.

Forecast Date (daily 'enfo')





What does this mean for me? - Dissemination

- The previous *use=Monday* and *use=Thursday* configuration has been revised, but selecting a single reforecast per week is no longer possible.
 - Technically it is, but you will only get a Monday if it's an odd day of the month!
- Now you will receive <u>all</u> reforecasts according to the following patterns:
 - Medium-range: Every four days (1/5/9/13/17/21/25/29)
 - Subseasonal (extended-range): Every other day (1/3/5/7/9/11/15/17/19/21/23/25/27/29/31)
- This means more data!



Installing the reforecast data

- To obtain the full set of reforecasts, you will need to install each day of the week with the normal use=** keyword
- The use=day-of-the-week will filter data on the day
- i.e. if use=Monday is specified and Monday happens to be the 1st of the month, you will receive data BUT if use=Monday is the 2nd of the month, you will not receive data

```
disseminate.
  class
                      = od,
  stream
                      = eefh,
                      = 0079
  expver
  domain
                      = q
                      = pf
  type
 levtype
                      = sfc,
 param
100u/100v/10fg/10u/10v/200si/200u/200v/2d/2t/asn/blh/mucape/capes/ceil/ci/
mucin/cp/dsrp/e/ewss/fdir/hcct/hwbt0/hwbt1/i10fg/kx/lblt/licd/lict/litoti/
lmld/lmlt/lshf/lsp/ltlt/mld/msl/nsss/ocu/ocv/pev/ro/rsn/sav300/sd/sf/sithi
ck/skt/slhf/slt/so/sp/sr/sro/sshf/ssr/ssrd/ssro/sst/stl1/stl2/stl3/stl4/st
r/strd/sund/swvl1/swvl2/swvl3/swvl4/t20d/tav300/tcc/tciw/tclw/tcw/tcwv/tot
alx/tp/ttr/uvb/vis/viwve/viwvn/zos/mx2t6/mn2t6/10fg6,
                      = 0000,
  time
                      = 0/to/1104/by/6,
 step
  use
monday/tuesday/wednesday/thursday/friday/saturday/sunday,
                     = 1/to/10.
  number
                      = .4/.4
 grid
```

Apply the use=day-ofthe-week for all days to ensure you receive all reforecasts applicable to that stream!

Installing the reforecast data

For weekly means or standard deviations, you also need to include the step range that is relevant for each day!

ECMWF recommends that users match the forecast step range with the reforecast step range'

If it's a Tuesday forecast, the first Monday-Sunday forecast period will be T+144 to T+312, which means the reforecast lead times to compare with need also to be T+144-312.

It's also possible to start the week on a different day!

Use=Tuesday & Step=0-168/...

will provide a weekly mean starting on a Tuesday

(remember to apply this to both your forecast and hindcast values!)

```
disseminate.
 class
                      = od
                      = eehs,
 stream
                      = 0079.
 expver
 domain
                      = q,
 type
                      = taem.
 levtvpe
                      = sfc.
 param
10u/10v/2d/2t/mn2t6/msdr/msl/mx2t6/rsn/sd/mtsfr/stl1/tcc/tprate/100u/100v/
mucape/cprate/mlsprt/sst/tciw/tclw/tcw/tcwv,
 time
                      = 00000
                      = 0-168/168-336/336-504/504-672/672-840/840-1008
 step
                      = monday.
 use
                      = .4/.4
 grid
#hindcast
disseminate,
                      = 144-312/312-480/480-648/648-816/816-984.
 step
                      = tuesday
 use
#hindcast
disseminate.
                      = 120-288/288-456/456-624/624-792/792-960.
 step
                      = wednesday
 use
disseminate,
 step
                      = 96-264/264-432/432-600/600-768/768-936/936-1104.
                      = thursday
 use
disseminate.
                      = 72-240/240-408/408-576/576-744/744-912/912-1080.
 step
 use
                      = friday
disseminate.
                      = 48-216/216-384/384-552/552-720/720-888/888-1056,
 step
                      = saturdav
 use
disseminate,
                      = 24-192/192-360/360-528/528-696/696-864/864-1032.
 step
                      = sunday
 use
```

- -

Data Access & Testing



Data Availability – as of Wednesday 14th August 2024

Model	Run	Available?	Expected date
Control ex-HRES (oper)	00/12	Yes	
Control ex-HRES (scda)	06/18	Yes	
Ensemble (enfo)	00	Yes	
Ensemble (enfo)	06/12/18	No	Week commencing 19th August
Ensemble reforecast	00	Yes	
Ensemble/wave post-processed	All times	No	End August
Wave (wave)	00/12	Yes	
Wave (scwv)	06/18	Yes	
Ensemble wave (waef)	00	Yes	
Ensemble wave (waef)	06/12/18	No	Week commencing 19th August
Subseasonal forecast (eefo)	00	Yes	
Subseasonal reforecast	00	Yes	
ecCharts / Open Charts		No	Week commencing 19th August
Open Data	All	No	Mid-September
TC3-LBC (IFS-AROME-LBCs)	All	No	Early September

Access methods – MARS Archive

- 49r1 data in MARS Archive
- Experiment version = 79 is available for all affected streams (e.g. oper, scda, enfo, waef, eefo, etc.).

On the cycle implementation date, 49r1 will be under expver 0001.

Note that expver=79 data may not be available before June 2024.

Current selection

year: 4i, 4v, ai, an, fc, me, mfb, ofb, ssd, tf

expver: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 45, 46, 47, 48, 49, 50, 51, 53, 55, 75, 58, 60, 61, 62, 63, 64, 65, 66, 67, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 5012, 5013, 5014, 5015, 8063, 9001, 9063, 9065, 9069, 9072, 9073, 9074, 9075, 9077, 9078, 9079, 9169, 9170, 9172, 9174, 9271, 9369, 9371, 9373, 9472, 9574, 9576, 9672, 9767, 9770, 9772, 9774, 9775, 9776, 9799, 9873, 9874, 9875, 9970, 9971, 9972, 9973, 9974, 9975, 9979

stream: amap, ammc, cher, cwao, dcda, dcw, edzw, eefh, eefo, eehs, efho, efho, efhs, efov, egrr, ehmm, elda, enda, enfh, enfo, enwh, esmm, ewda, ewhc, ewho, ewla, fgge, kwbc, lfpw, lwda, lwwv, maed, mawv, mfam, mfhw, mfwm, 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, wawo, waef, weeh, weehs, weov, wmfm

class: ai, at, be, c3, ce, ch, ci, co, cs, de, dk, dm, dt, e2, e4, ea, ei, el, em, en, ep, er, es, et, fi, fr, gg, gw, it, l5, la, lw, mc, me, ml, ms, nl, no, nr, o6, od, pt, pv, rm, rr, s2, se, ti, to, tr, uk, ul, ur, yp, yt



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 cy49r1 test data

Event ID	Event name	Description
4303	e_ms096	At this stage, the e-suite step 096 Control (ex 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 of the Control (ex HRES) has been generated
1636	e_ms360	At this stage, the e-suite step 360 (ENS) has been generated
4306	e_ms360ref	At this stage, the e-suite ENS reforecast products have been updated
1638	e_ms1104	At this stage, the e-suite step 1104 of the sub-seasonal range forecast has been generated
4305	e_ms1104ref	At this stage, the e-suite sub-seasonal range reforecast products have been updated

- For these events, the MSJ_EXPVER environment variable is set to 0079
 - use in MARS retrievals to specify the IFS cy49r1 test data

Options 2 and 3

 Applications should be tested with the IFS cy49r1 test data either retrieved from MARS or provided through the test dissemination



Accessing 49r1 Test Data – For users receiving data directly from ECMWF

For Member State, Gold and Silver Users:

Access your 49r1 data requirements via the test platform (TPREd):

https://products.ecmwf.int/esuite/requirements

Access your 49r1 data files via the test ECPDS (XDISS):

https://xdiss-monitor.ecmwf.int/

Access historic data via MARS using **expver 0079**

For Bronze Users:

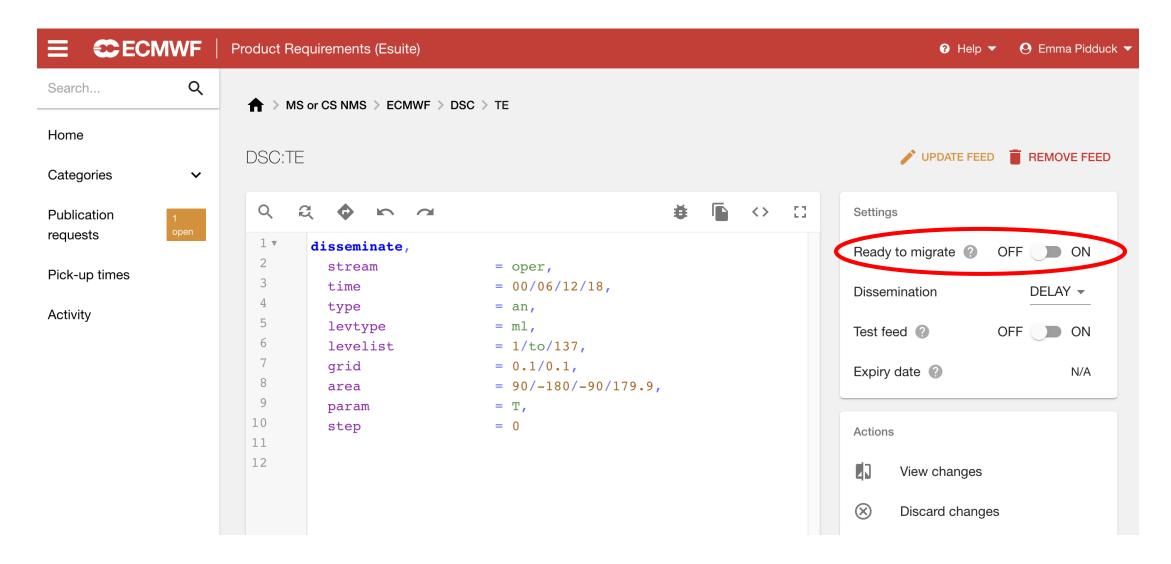
Contact the User Services Section via the Support Portal to request copies of your new data.

For Basic Users:

ECMWF Open Data will have a 49r1 test dataset available



Access methods - Test Product Requirements Editor (TPREd)





TPREd – Key Points

- TPREd has a red banner and an additional feature called 'Ready to Migrate'
- Users should configure their 49r1 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.



TPREd – Key Points 2

- Changes made in the production system must also be made in the test system.
- ECMWF will <u>not</u> be able to synchronise requirements on the day of the cycle implementation.
- Access to the TPREd and PREd will be frozen one week prior to cycle implementation for all user types.

Please test as much as you can as soon as possible to ensure your workflows are functional on implementation day.

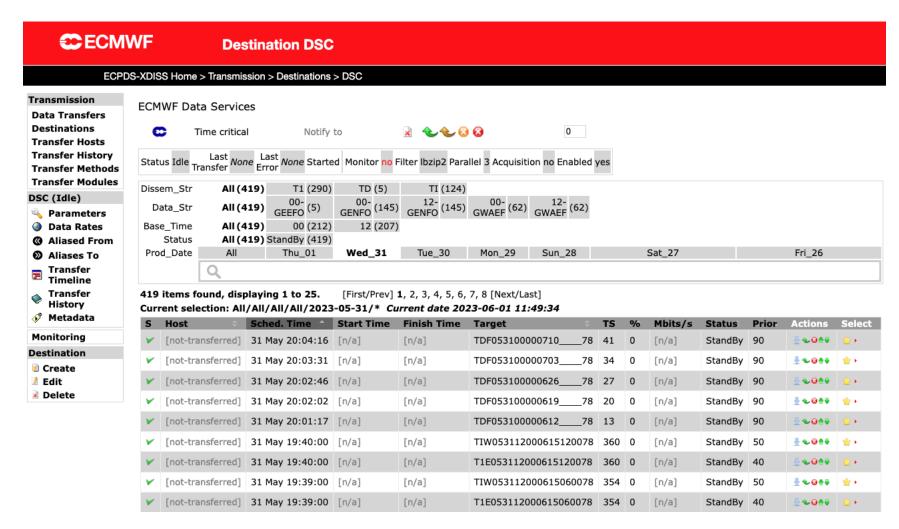


On the day of implementation, ECMWF will not make assumptions about your data requirements if you have not tested. We will ensure it is production-safe at ECMWF, but users may not have all required data if they do not test.



Access method – test ECPDS

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





Any questions?

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With contributions from many in ECMWF – thank you!

