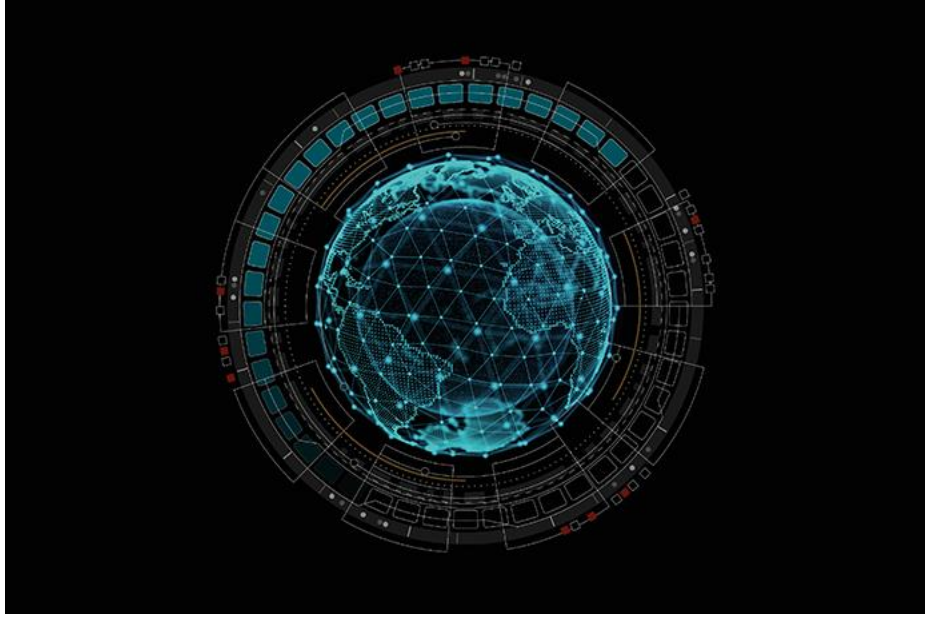


ECMWF Product Development

#UEF2024

Matthieu Chevallier, Head of Evaluation
Forecast and Services Department, ECMWF

Thanks to many colleagues for inputs

ECMWF

© ECMWF June 7, 2024

ECMWF Product Development – Outlines

Last IFS upgrade – Cycle 48r1

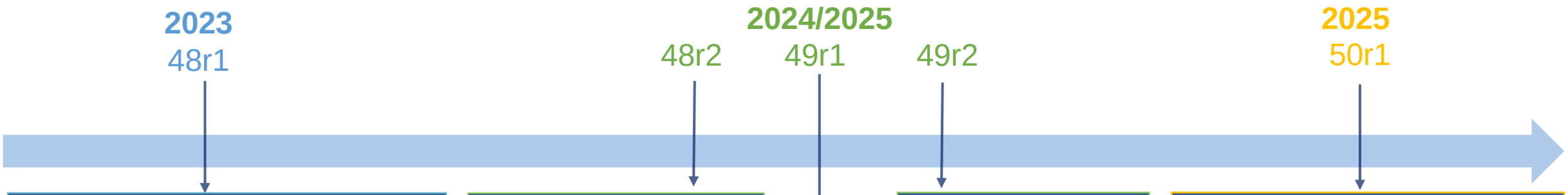
Coming IFS upgrade – Cycle 49r1

Recent new products (2023-2024)

Upcoming product developments

Current and upcoming IFS Cycles

Integrated Forecast System (IFS) upgrades



NWP: ENS resolution increase
Daily ENS-Ext ensembles
Multi-layer snow scheme
Interactive Hybrid Linear Ozone
OOPS

Improved COMPO:
stratospheric chemistry

EFAS and GloFAS: new versions at 1.5km and 5km respectively

OpenIFS new release

ORAS6 ocean reanalysis

NWP: Improved surface
Updated land fields
Higher resolution waves
Implementation of SPP
Higher resolution EDA

Improved COMPO:
prognostic stratospheric aerosol scheme

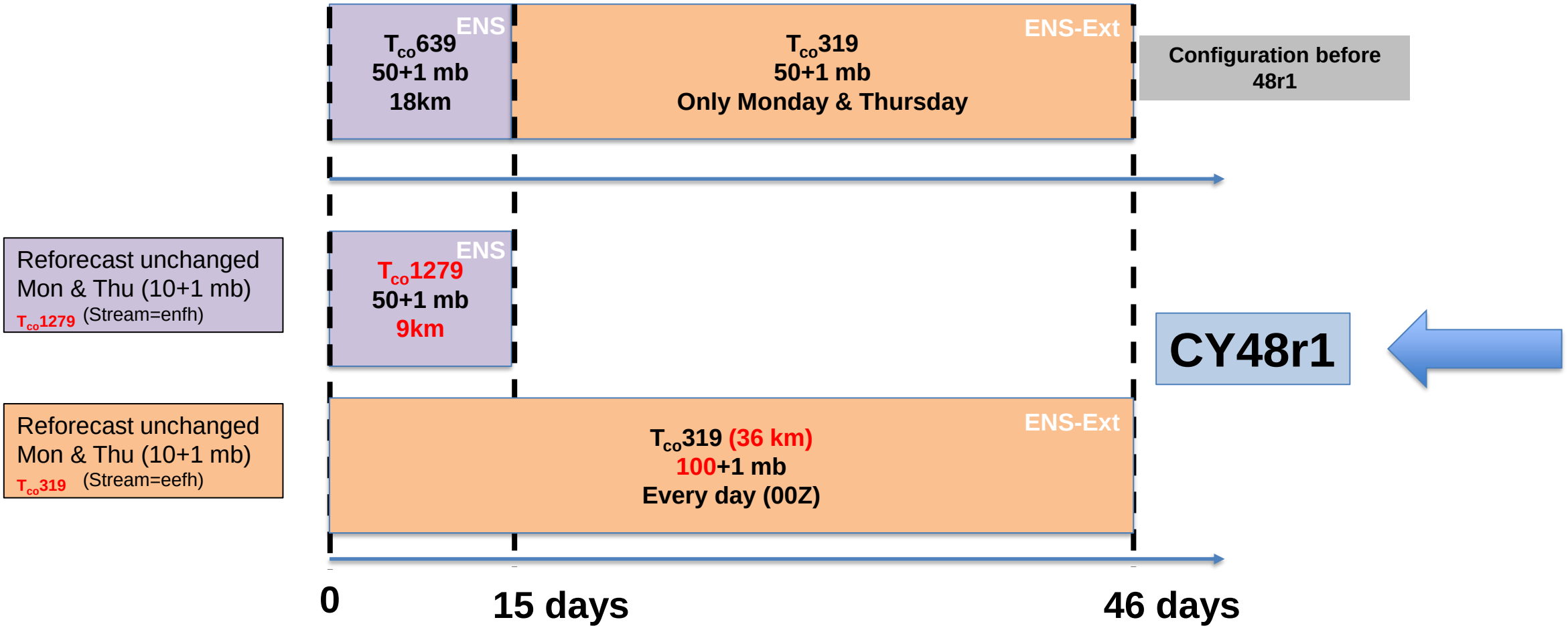
Hindcast reconfiguration (ENS and ENS-Ext)

Reanalysis :
ERA6, EAC5

Seasonal forecast:
SEAS6

NWP: New ocean and sea ice
Higher 4D-Var resolution
Outer-loop coupled DA

48r1 – key ensemble configuration changes



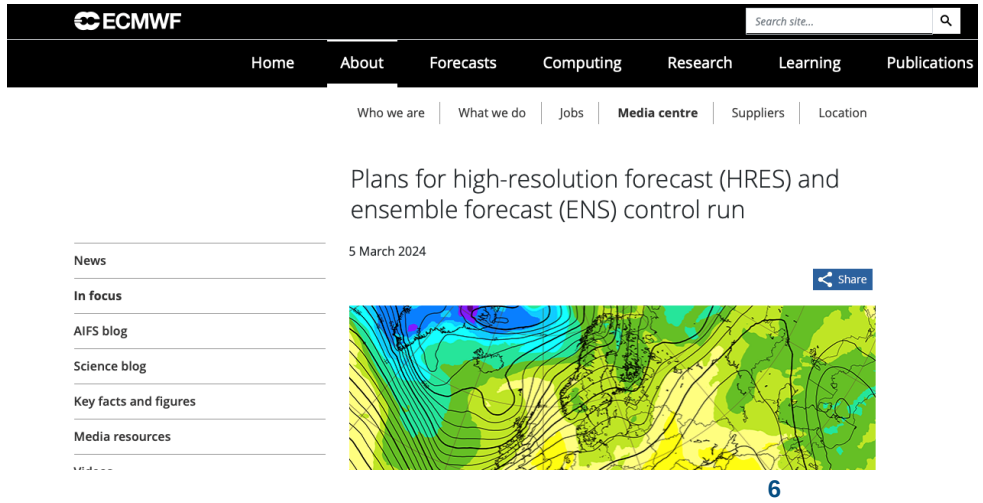
48r1 – HRES vs ENS Control ?

- **In 48r1**: ENS members and HRES have the same horizontal resolution…
  - HRES now plays a similar role to ENS “Control” run (**unperturbed**)
  - HRES and ENS Control are still 2 separate unperturbed runs (outputs are different)
  - HRES 00 and 12 UTC are 10-day long, ENS Control 00 and 12 UTC are 15-day long
  - HRES still disseminated earlier than the full ENS

- **In 49r1 (October 2024)**:
  - Both will be made computationally identical.
  - Both will run to 15 days for 00 and 12 UTC

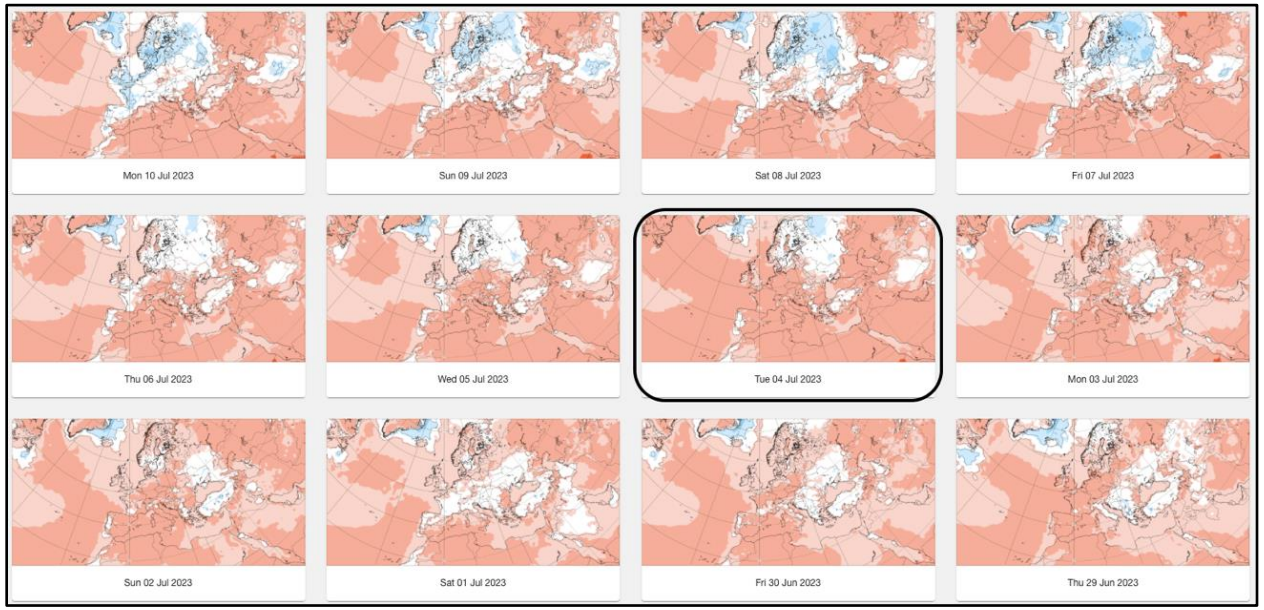
- **In 50r1 (October 2025)**:
  - Current “ENS Control” run will be stopped.
  - Data stream currently called ”HRES” will be the “Control” run.

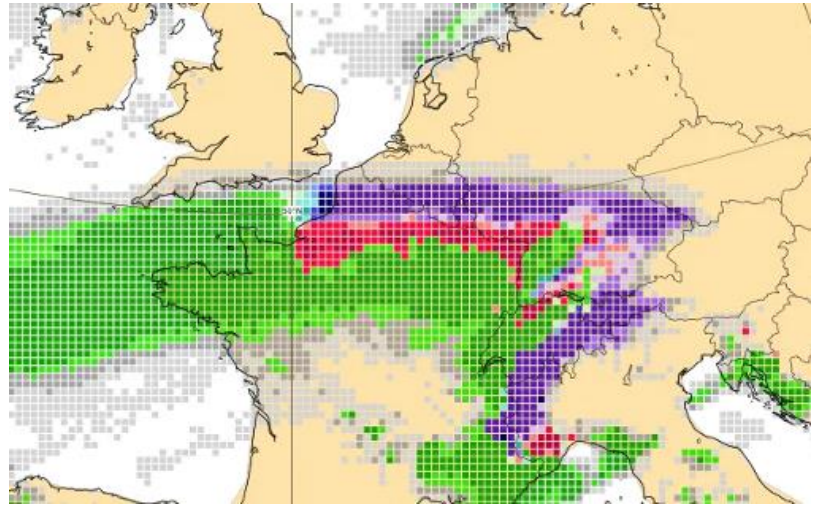
- **As a consequence, in 48r1:**
  - **Naming “HRES” is kept**
  - **“Deterministic” charts use HRES**
  - **Only HRES is plotted in 10-day meteograms**

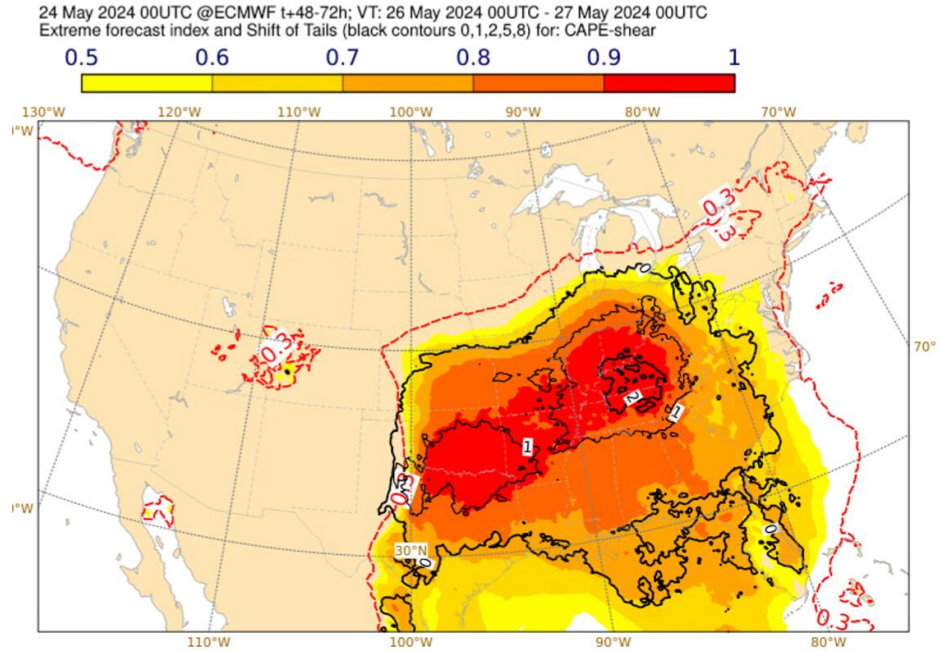


48r1 – new Parameters, new Products

- Precipitation types: freezing drizzle, most severe/frequent in last 1/3/6h
- Adjusted versions of CAPE and CAPE-shear EFI – collab with ESSL
- New meteograms
- Daily extended-range products







More on IFS performance (including 48r1 impact) in Thomas Haiden's presentation !

48r1 – precipitation type products

Rain (%) >70 50-70 <50

Sleet (%) >70 50-70 <50

Wetsnow (%) >70 50-70 <50

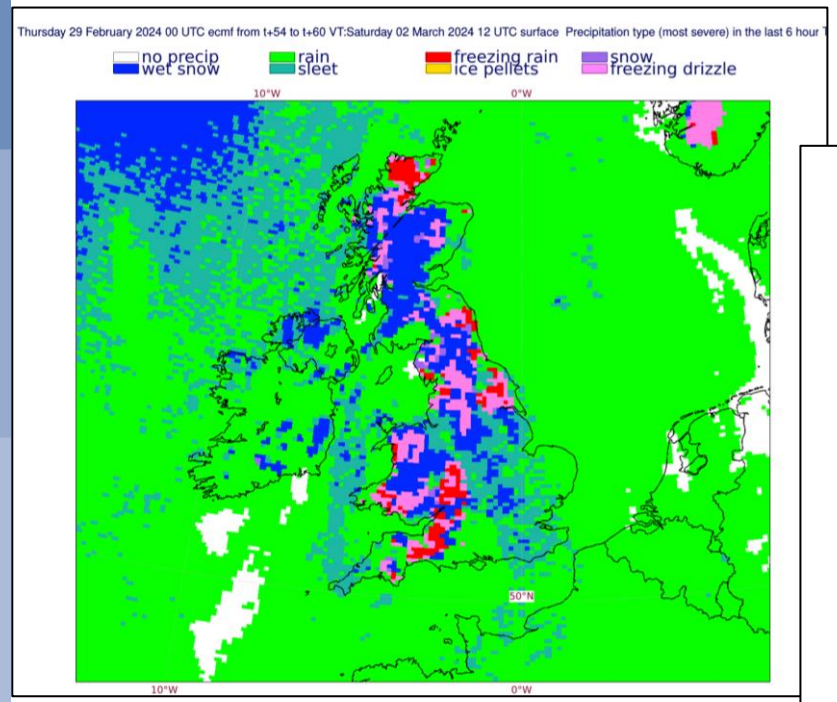
Snow (%) >70 50-70 <50

Icepellets (%) >70 50-70 <50

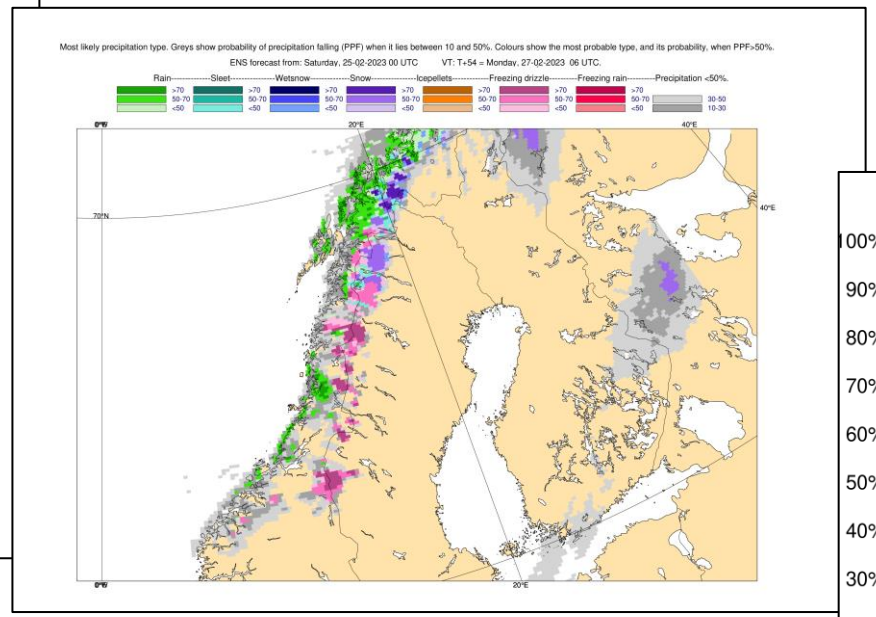
Freezing drizzle (%) >70 50-70 <50

Freezing rain (%) >70 50-70 <50

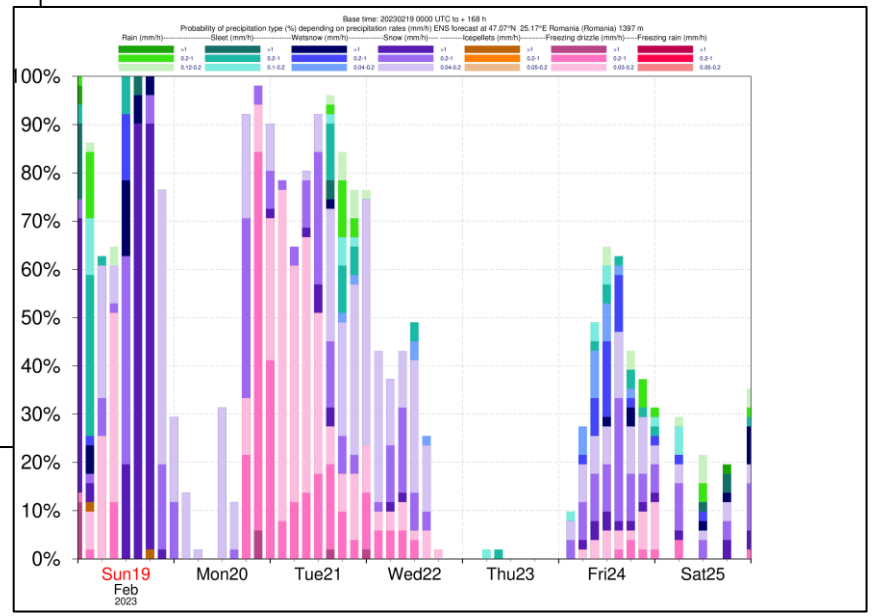
Precipitation <50% 30-50 10-30



Most severe precipitation type in the last 6h



Most probable precipitation type



Precipitation type meteograms

ECMWF

49r1 – summary

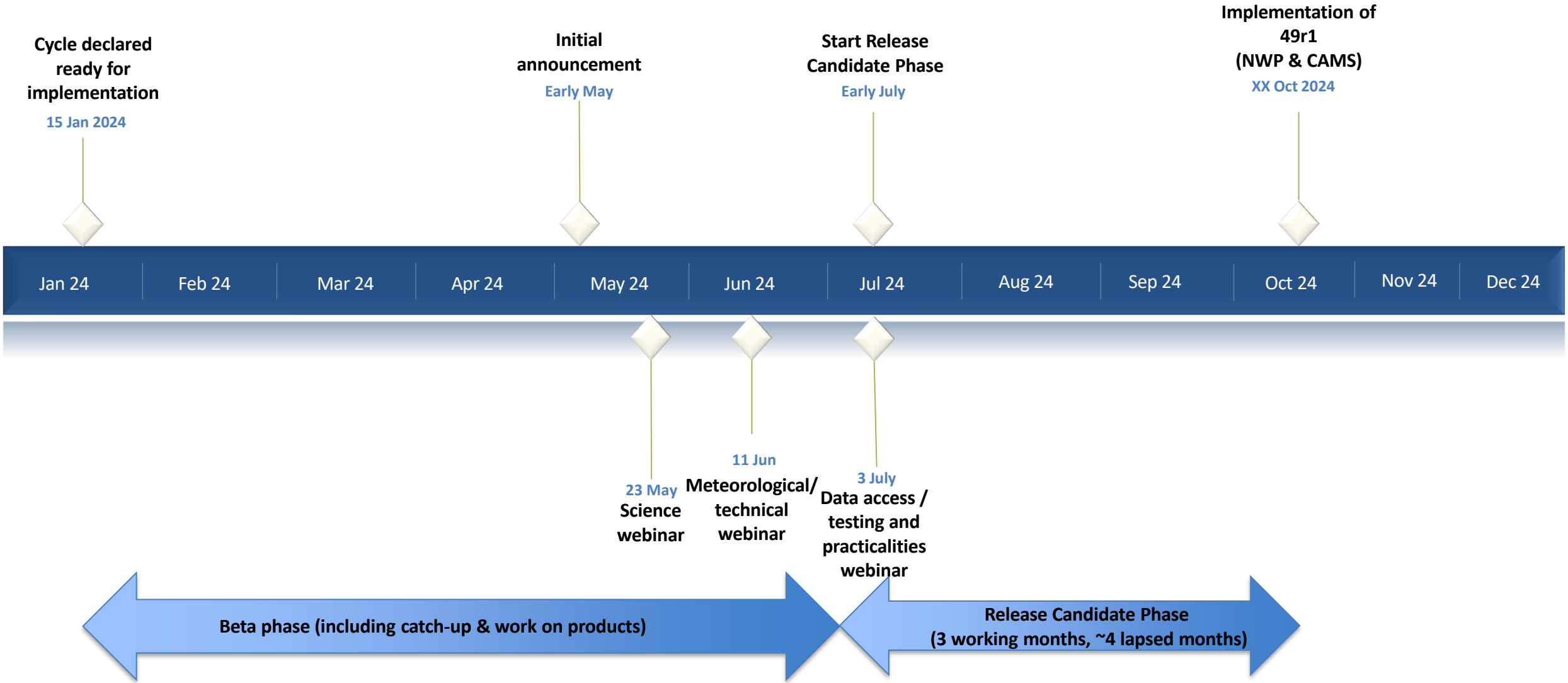
Model Changes

- Wave model and convection package
- Land-surface model updates
- Activation of the Stochastically Perturbed Parametrisations (SPP) scheme
- Physics and numerics contributions
- Atmospheric composition package

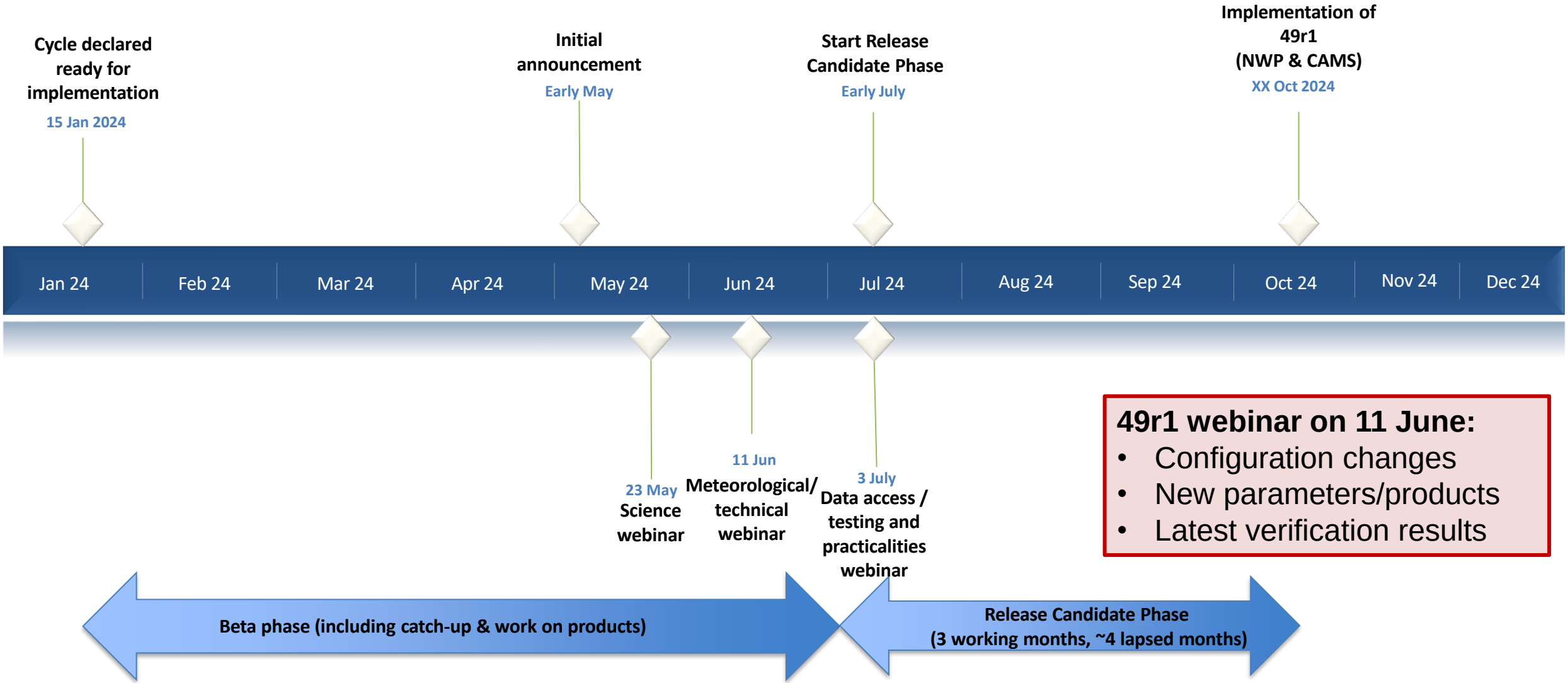
Data assimilation changes

- Microwave and RTTOV assimilation package
- Non-microwave observations package
- T2m assimilation package
- VarQC and stratospheric balance assimilation package
- Land-surface assimilation package
- Updates to EDA

49r1 – release candidate phase starting soon!



49r1 – release candidate phase starting soon!



49r1 webinar on 11 June:

- Configuration changes
- New parameters/products
- Latest verification results

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

In Cycle 48r1

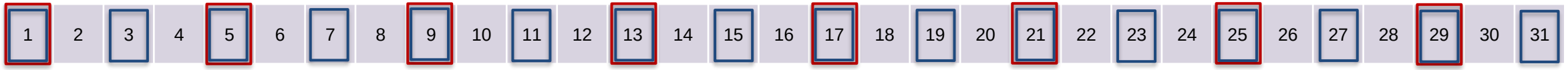
Extended-range: 10 perturbed + 1 control forecasts **every Monday and Thursday**, over past 20 years.

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

In Cycle 49r1

Extended-range: 10 perturbed + 1 control forecasts **every odd days (1,3,5,…)**, over past 20 years (excluding 29 February).

Medium-range: 10 perturbed + 1 control forecasts **every 2 odd days (1,5,9,…)**, over past 20 years (excluding 29 February).



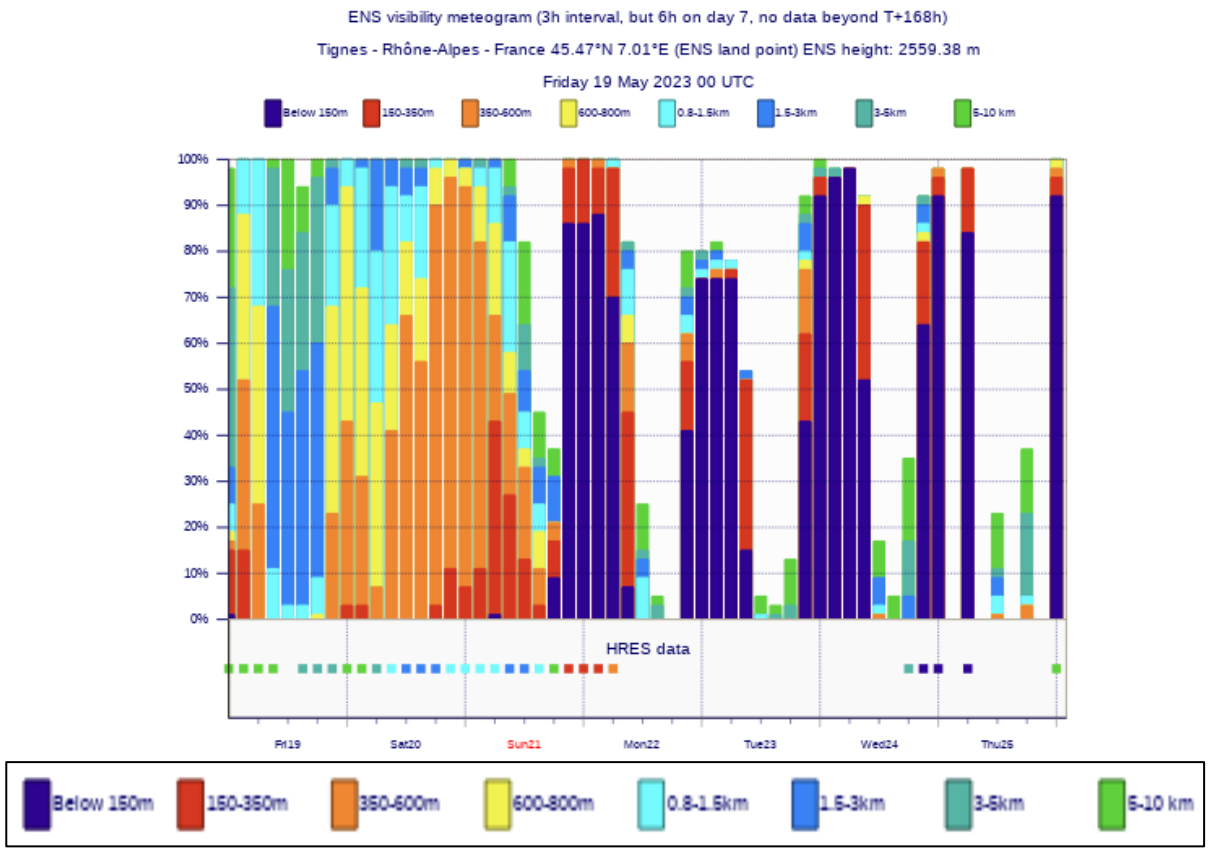
Recent product developments (2023-2024)

ECMWF

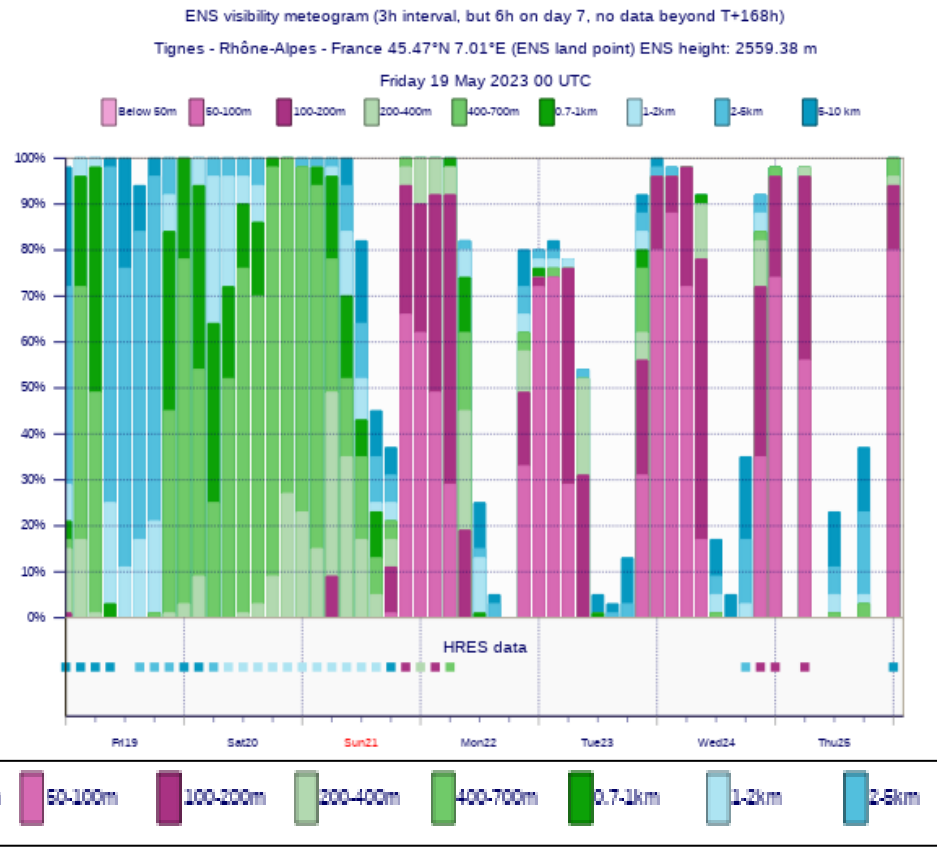
Visibility meteograms

- Operational product since 11 May 2023
- Collaboration with Member and Cooperating States (KNMI, OSMZ)

Aviation visibility range

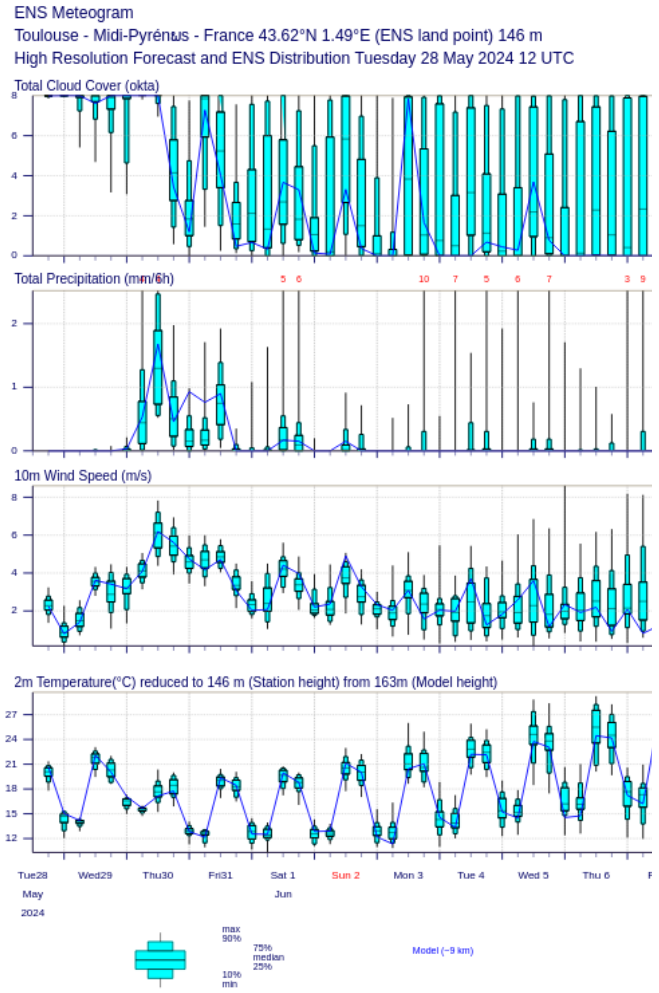


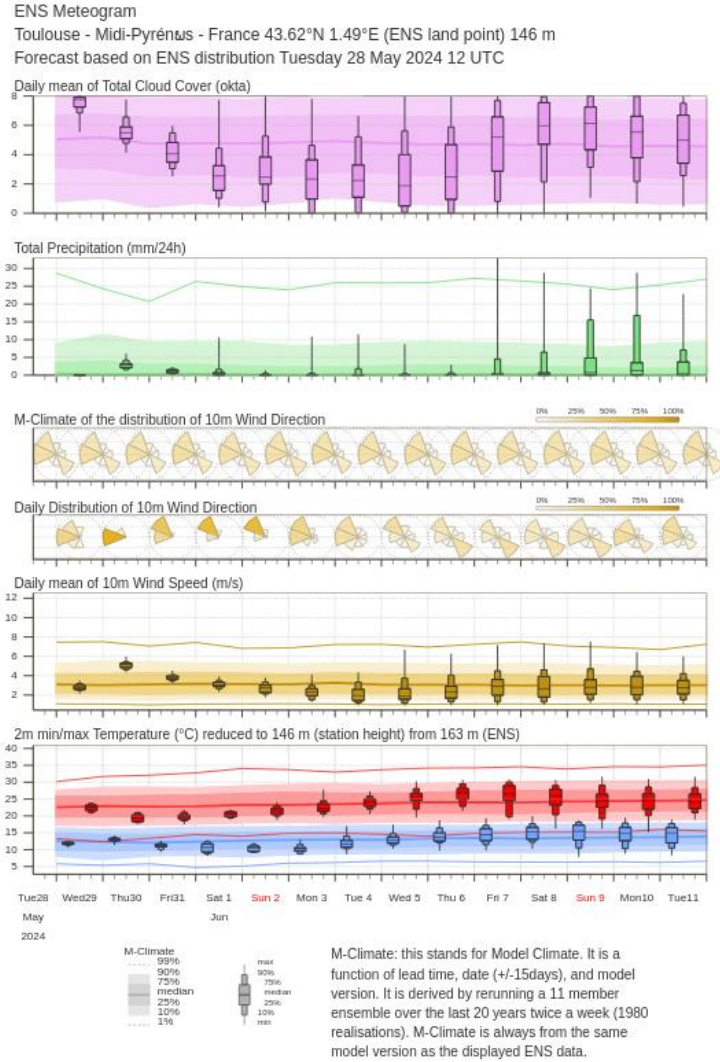
"General-purpose" visibility range



New parameters in ENS meteograms

- Collaboration with Member and Cooperating States (DWD)

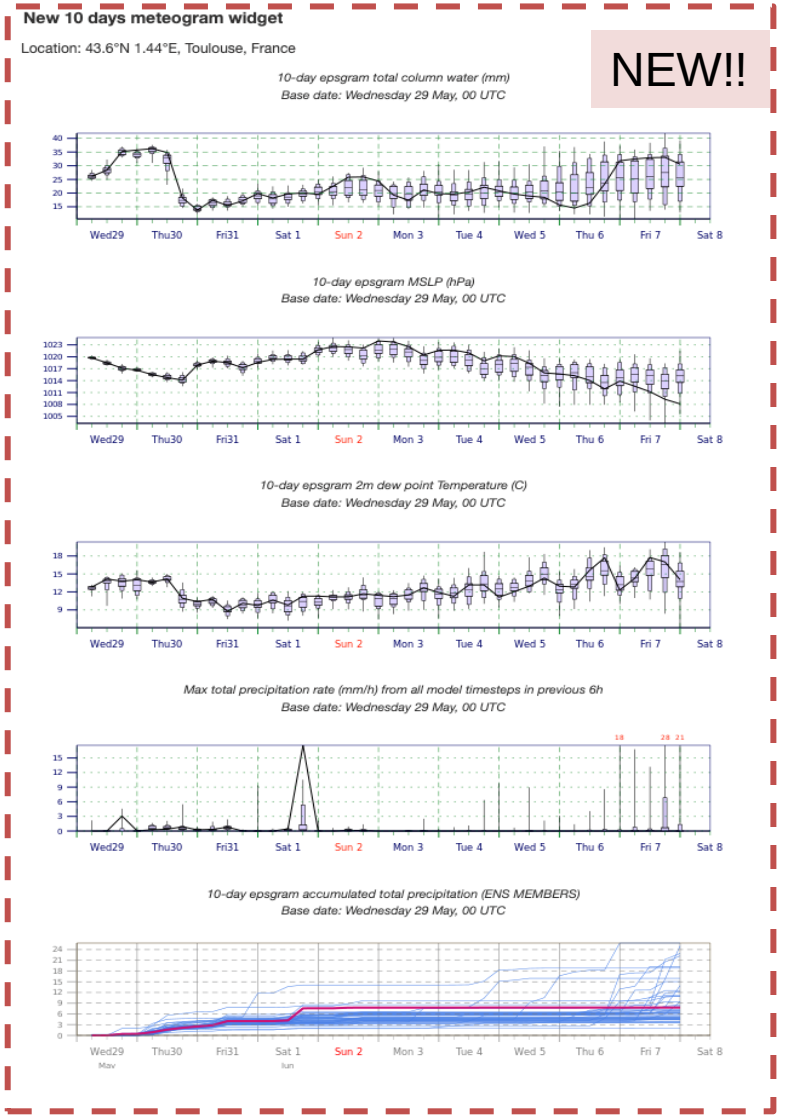




M-Climate: this stands for Model Climate. It is a function of lead time, date (+/-15days), and model version. It is derived by rerunning a 11 member ensemble over the last 20 years twice a week (1980 realisations). M-Climate is always from the same model version as the displayed ENS data.

New 10 days meteogram widget

NEW!!



Cihan Sahin's talk (Thu pm)

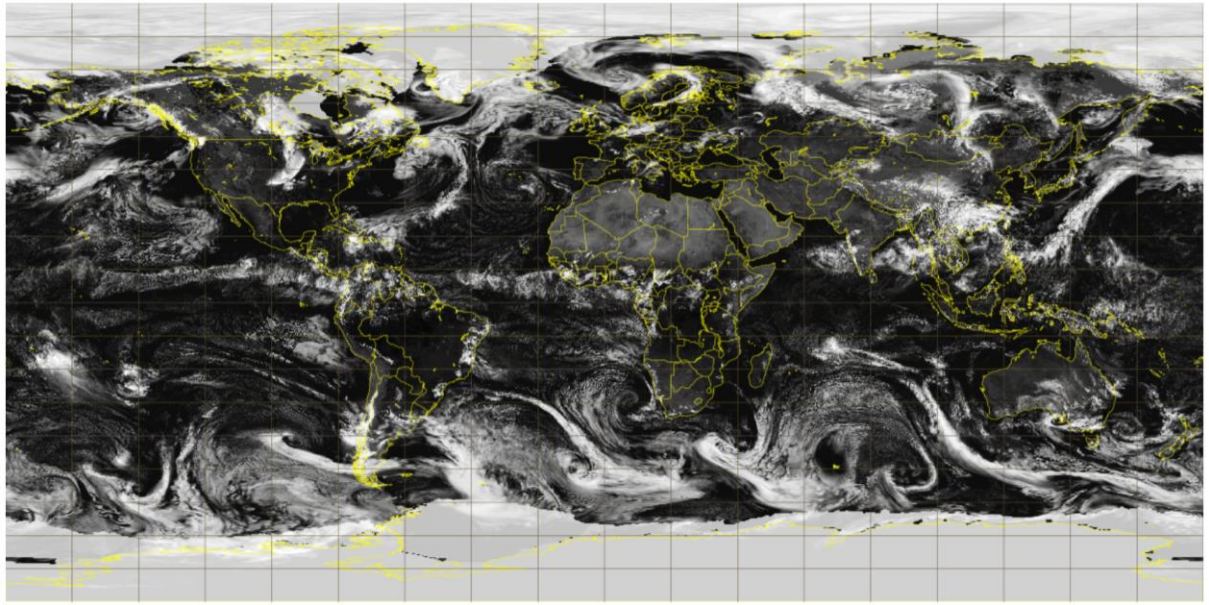
Simulated (satellite) image

- Upward flux of radiation as would be detected by a weather satellite
- Derived from model temperatures and cloud layers
- Cloud-related fields in a format familiar to forecasters

NEW!!

Visible channels

Base time: Tue 28 May 2024 12 UTC Valid time: Wed 05 Jun 2024 06 UTC (+186h) Area : Global Channel : Visible reflectance at 0.635 microns

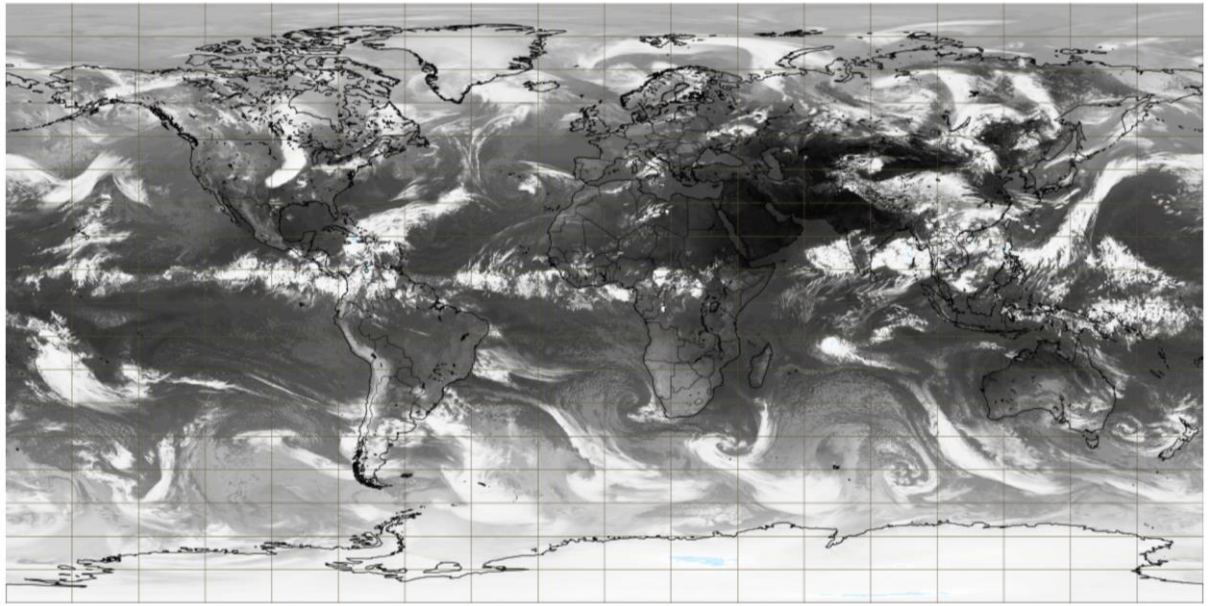


Simulated image: Visible reflectance at 0.635 microns (reflectivity)

0 10 22.5 35 47.5 60 72.5 85 100

Infra-red channels

Base time: Tue 28 May 2024 12 UTC Valid time: Wed 05 Jun 2024 06 UTC (+186h) Area : Global



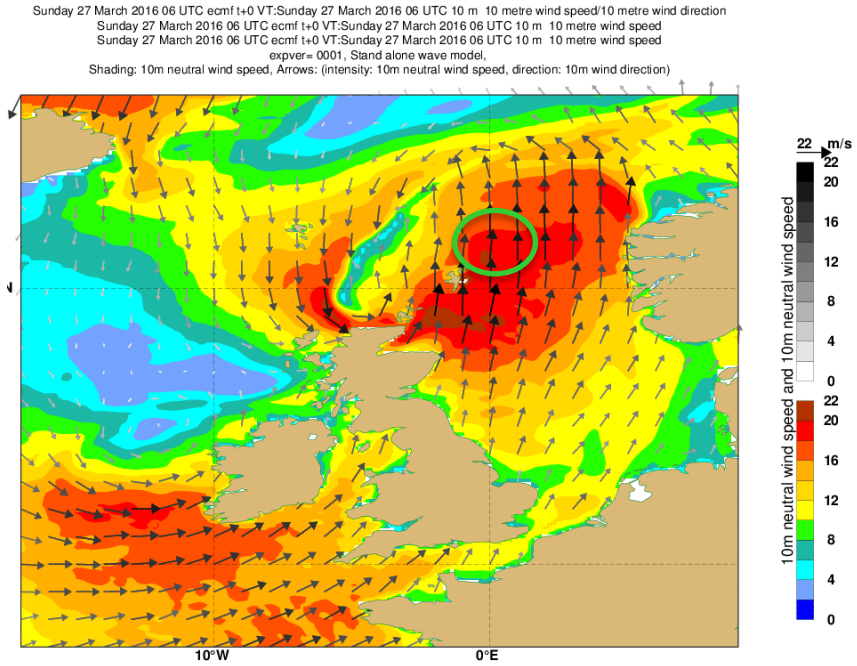
Simulated image: Infrared (IR) channel (C)

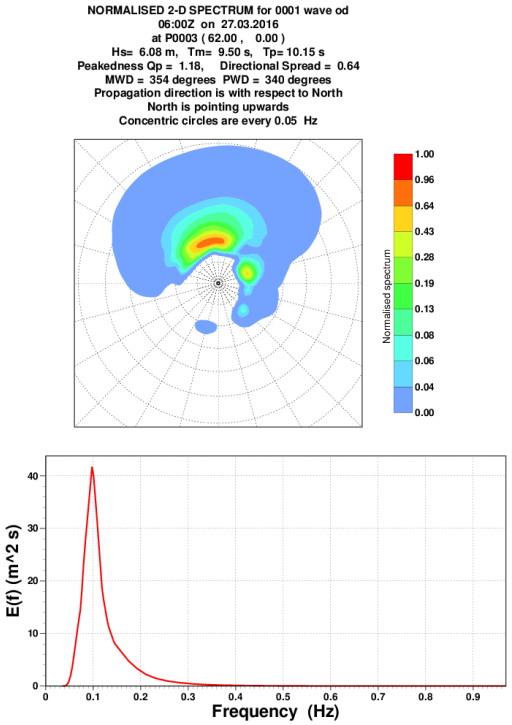
-120 -84 -66 -48 -30 -12 5 23 41 69

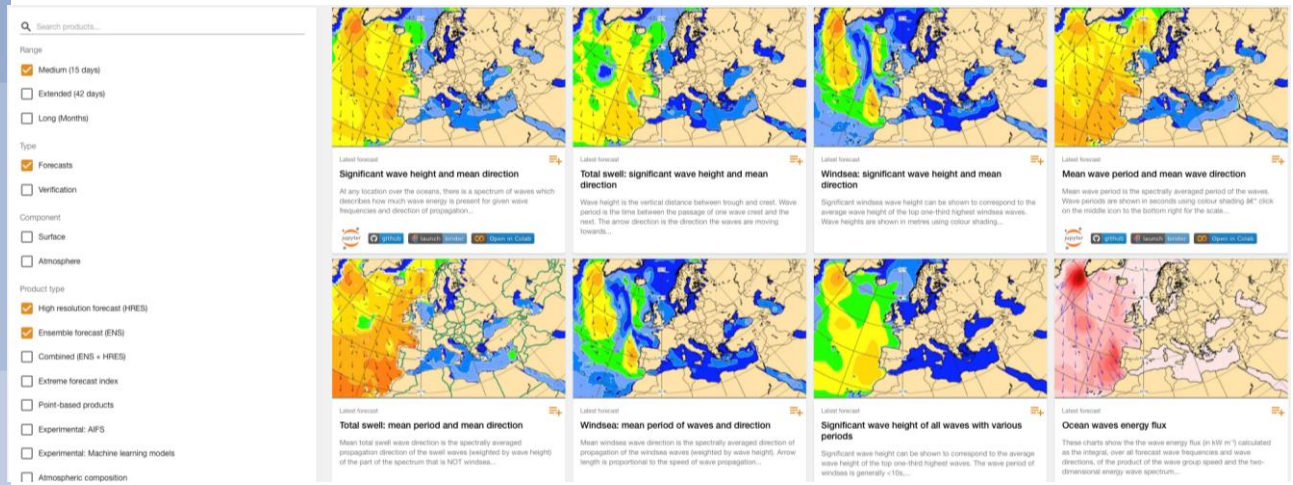
Cristina Lupu's talk (Speakers' Corner)

Wave products

- 2D wave spectra routinely output
- Significant wave height
- Peak period
- Mean period(s) from weighted integration of the 2D spectrum
- Integrated mean direction
- …







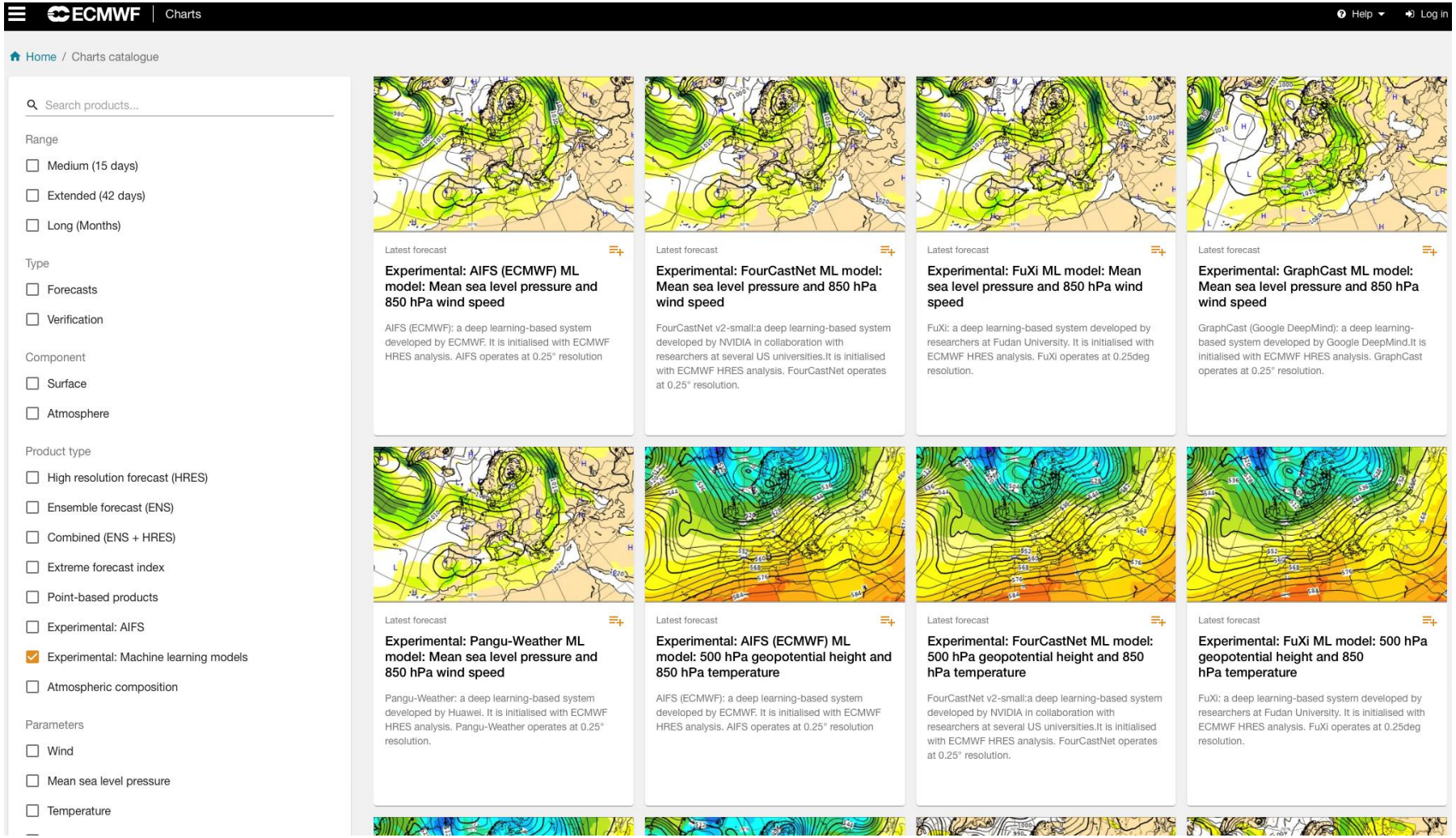
Wave model related changes in Cycle 49r1

- ecWAM on same Tco grid as atmosphere.
- Number of frequencies in wave spectra output reduced from 36 to 29 frequencies.
- Modified wind input parameterisation.
- Sea state dependent heat and moisture fluxes.
- Hourly wave data assimilation instead of 6-h.
- New wave parameters output

ECMWF

#IFS49r1 #newfcsystem @ECMWF

Data-driven experimental forecasts available on OpenCharts



More on AI@ECMWF on Thursday am!

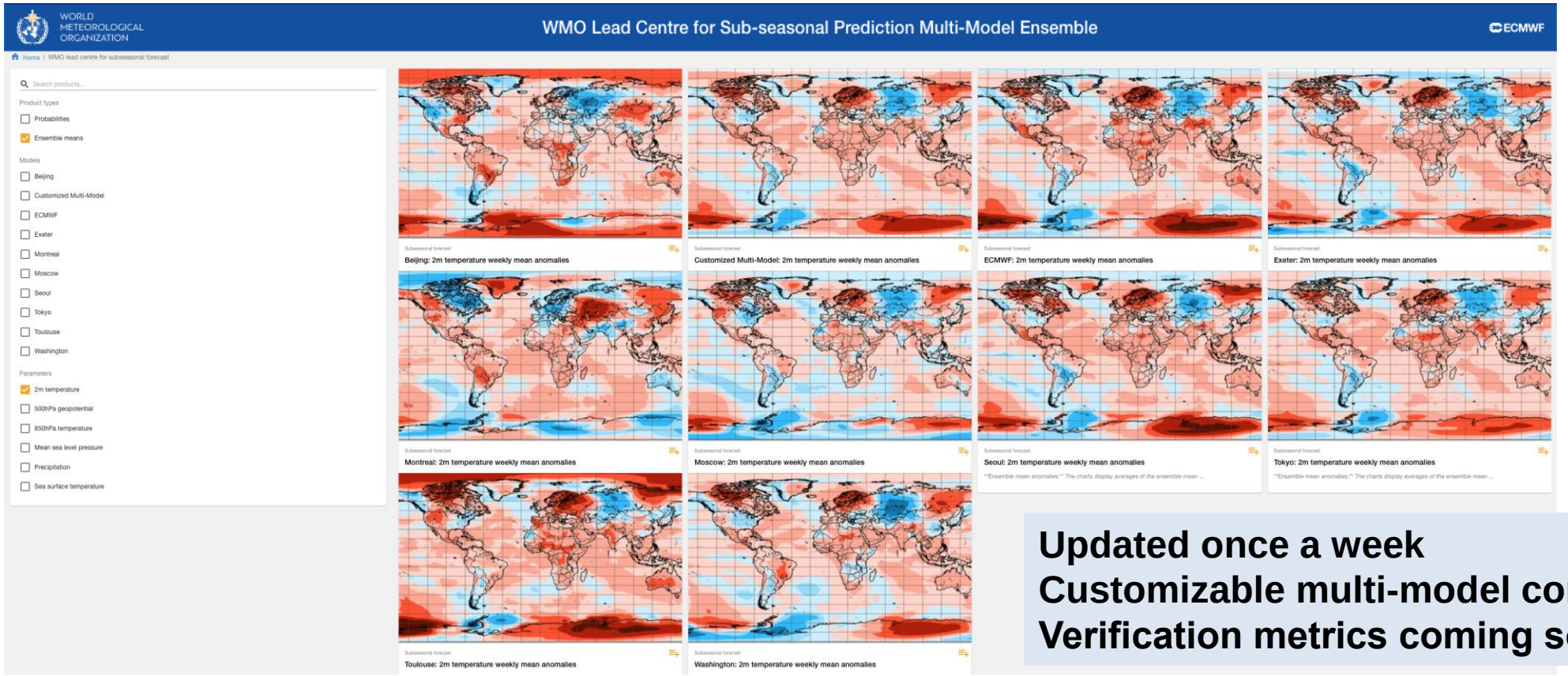
A new observation dashboard

- **A quick near-real time access to the configuration and health status of the observations used and monitored at ECMWF**
- System designed to serve expert and non-expert users
  - Based on ECMWF use of the data in IFS DA.
  - Highlight automatically flagged anomalies (availability and quality)
  - Detailed description of the obs system configuration (what is used and what is monitored only)
- Quick access to detailed timeseries (from the alarm system and on-demand observation monitoring system)
- Automatically update with new observations (after few days) and delete of obsolete data (after period of non-reporting).
- Future updated will allow anomalies from other sources to be included (e.g. EUMETSAT UNS system, WMO incidents management systems, etc).

https://obsstatus.ecmwf.int/

Subseasonal forecasts – WMO Lead Centre

- **ECMWF designated Lead Centre for Sub-seasonal Predictions Multi-Model Ensemble (LC-SSPMME) in WMO WIPPS.**
- Built on the legacy of the WWRP/WCRP S2S project and relies on S2S archive infrastructure.
  - Near-real-time forecasts from ECMWF and 8 centres contributing to S2S database.

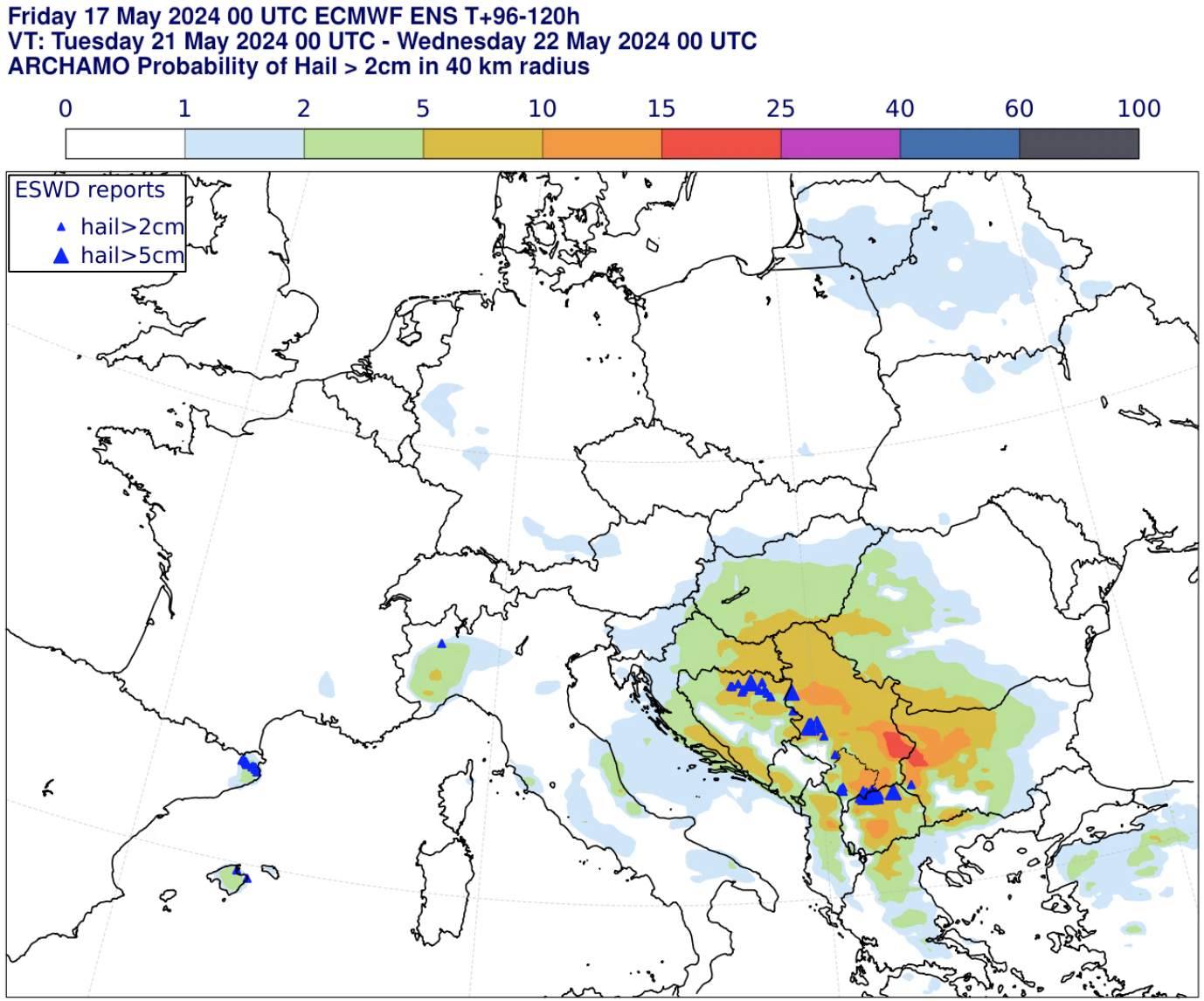


Updated once a week
Customizable multi-model combination!
Verification metrics coming soon…

Upcoming developments

- New variables constantly being added to ecCharts/OpenCharts — **Cihan Sahin's talk (Thursday pm)**
- Cyclone Database Product updates (2024) — **Tim Hewson (Speakers' Corner)**
- 6h and 24h Point Rainfall forecast (ecPoint) (2024)
- EFI with new "M-Climate" (reforecast reconfiguration – 49r1) (2024)
- Named tropical cyclone products into ecCharts (e.g. Strike Probabilities) (2024)
- Extended Range forecast plumes (2024), and other XR product options — **Tim Hewson (Speakers' Corner)**
- Convective hazards (hail, wind gusts) – collaboration with ESSL (2024/25)
- More products from Machine Learning forecast models (esp AIFS) (2024-…) — **AI session (Thursday am)**
- Blending outputs of different ensemble runs (lagged and dual-resolution 9km/36km over day 0-15) (2024-…). — **Nigel Roberts (Speakers' Corner)**
- Many developments in environmental forecasts and services (Copernicus) — **Stijn Vermoote's talk (Wed pm)**
- Upgrade of ECMWF seasonal forecast system – SEAS6 (2025)

Upcoming developments – Convective hazards probabilistic products

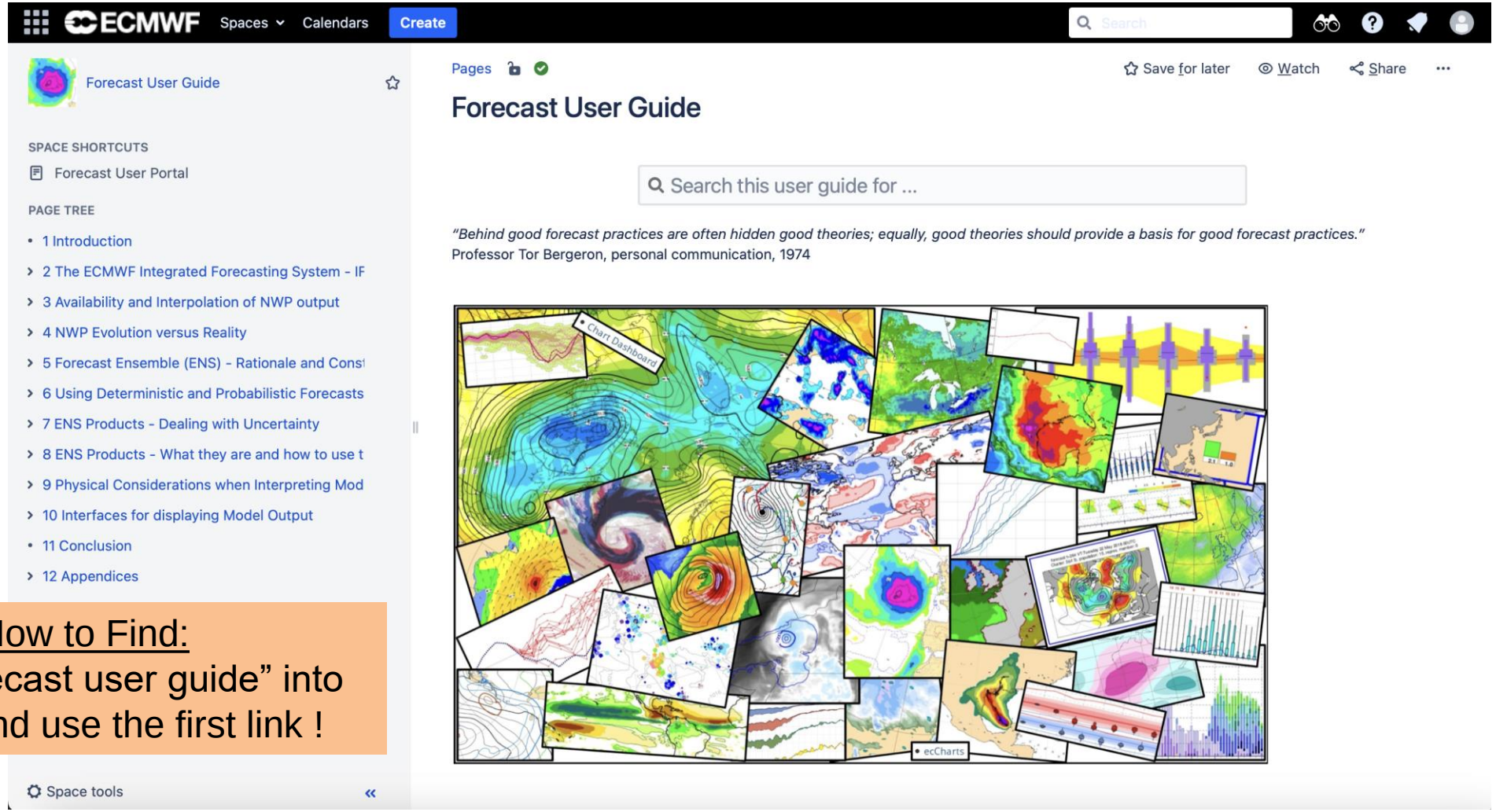


- Collaboration project with ESSL
- Additive Regression Convective Hazard Models (AR-CHaMo) – ESSL's statistical model for forecasting convective hazards trained with ERA5, ESWD reports and ATDnet lightning data
- Predictors derived from ECMWF's ENS used to run AR-CHaMo models
- Resolution: O640 (~18 km)
- Testing during ESSL's testbed 2024

- Probability of:
  - Hail > 2cm
  - Hail > 5 cm
  - Severe convective wind gusts

User guide to ECMWF forecast products

https://confluence.ecmwf.int/display/FUG/Forecast+User+Guide



How to Find:
Type: "forecast user guide" into google and use the first link !

Thank you

#UEF2024
#IFS49r1 #newfcsystem @ECMWF