

Update from ECMWF

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4th RIMES Ministers Conference

Wednesday 7th May 2025



ECMWF Overview

ECMWF's role is to address the critical and most difficult research problems in medium-range NWP that no one country could tackle on its own.

- Provision of Numerical Weather Prediction products from medium- to long-range.
- Provision of services to support and enable Member & Co-operating States in their day-to-day operations and activities.
- Provision of support to WMO activities including training and access to products.

Member States	Co-operating States
 Austria	 Bulgaria
 Belgium	 Czech Republic
 Croatia	 Georgia
 Denmark	 Hungary
 Estonia	 Israel
 Finland	 Latvia
 France	 Lithuania
 Germany	 Montenegro
 Greece	 Morocco
 Iceland	 North Macedonia
 Ireland	 Romania
 Italy	 Slovak Republic
 Luxembourg	
 The Netherlands	
 Norway	
 Portugal	
 Serbia	
 Slovenia	
 Spain	
 Sweden	
 Switzerland	
 Türkiye	
 United Kingdom	

ECMWF Overview

Intergovernmental Organisation Established in 1975

- 23 Member States | 12 Co-operating States
- 500+ staff

24/7 Operational Service

- Operational Numerical Weather Prediction
4x forecasts / day
- Supporting National Weather Services, Research
Institutes & Businesses globally

Other Key Activities

- Experiments to continuously improve our models
- Entrusted Entity of Copernicus Climate Change Service
(C3S) & Copernicus Atmosphere Monitoring Service
(CAMS)
- Computational Centre for CEMS Flood & CEMS Fire
- Entrusted Entity for Destination Earth

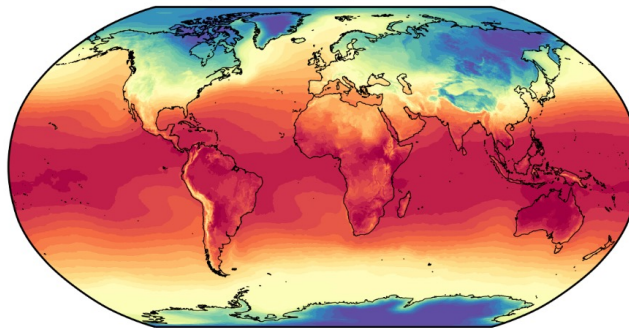


Overview of Products, Open Data & How to Access

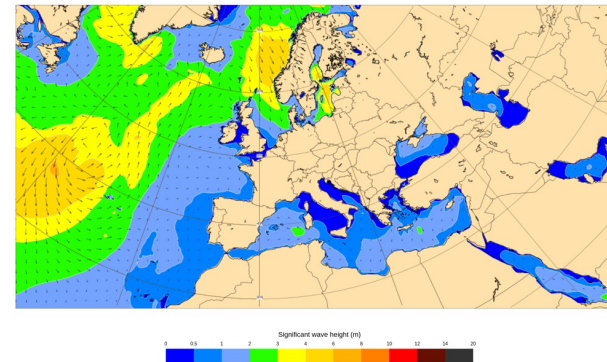


Global data provision across multiple timescales

ERA5 monthly mean
2m temperature
– Jan 2016



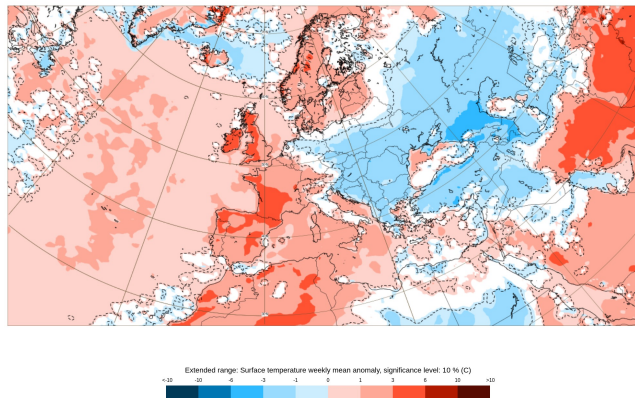
Reanalysis – 1940-now – ~31km



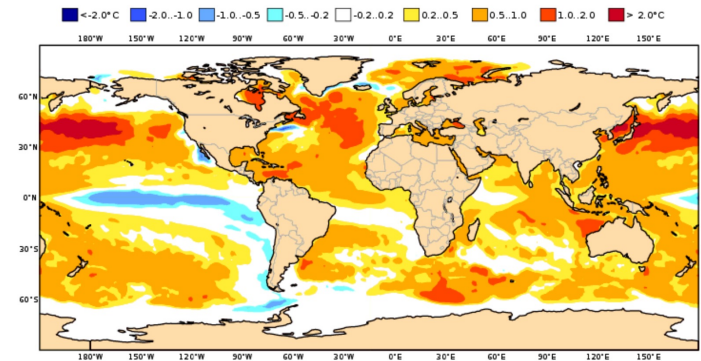
Significant Wave
Height (m)
– 04 Nov 2024

Medium-range – 15 days - 9km

2m temperature
anomaly
– 04-11 Nov
2024




Sub-seasonal – 46 days - 36km






Mean SST
anomaly
– Nov 2024

Seasonal Forecast – 7 months - 36km

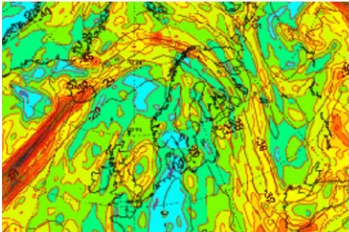
Where to find information on ECMWF forecasts and data



Search site...   Help  Becky Hemingway ▾

HomeAboutForecastsComputingResearchLearningPublications

ChartsDatasetsQuality of our forecastsAbout our forecastsAccess to forecasts




Charts


Our Integrated Forecasting System (IFS) provides forecasts and associated verification at different resolutions and for multiple time ranges. The verification provides essential feedback on the [quality of the forecasting system](#).

Medium range

Extended range

Long range

Quick access: 




Datasets


Real-time and archive forecasts, analyses, climate re-analyses, reforecasts and multi-model datasets.

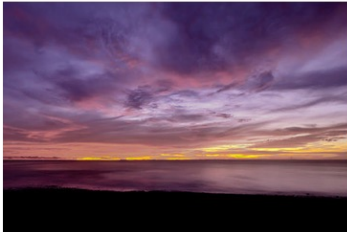
Real-time datasets

Archive datasets

Open data

Quick access: 

Public Datasets 



Monitoring of the observing system

We continually monitor the quality and availability of the different components of the global observing system used at ECMWF.

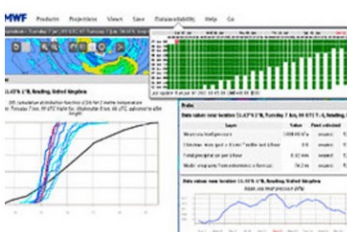
Availability

Satellite data monitoring

Conventional data monitoring

Ocean observation monitoring

Automatic data checking



The Integrated Forecasting System

Key characteristics of the Integrated Forecasting System (IFS), documentation on specific areas, and description of our forecasts.

Medium range overview

Extended range overview

Long range overview

Changes in the IFS

IFS documentation

Open Data at ECMWF



Free and open charts including
meteograms (Open Charts)



Free and open data available on
ECMWF Data Portal and in Microsoft
Azure, Google & Amazon AWS



Contents of the ECMWF real-time catalogue
provided with an open licence (CC-BY-4) for
data at 0.4 degrees and coarser

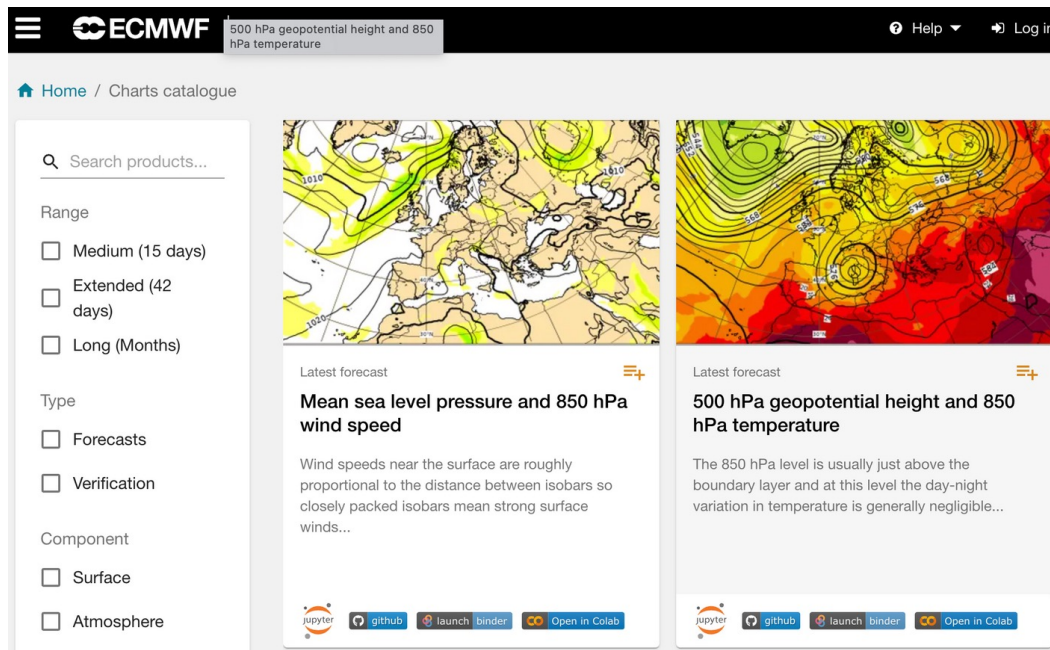


Reduced fees for some
licence types

From October 2025: full
catalogue **at all resolutions**
provided with CC-BY-4 licence



Open Data Availability – OpenCharts



- Publicly available under CC-BY-4 licence
- Originally released October 2020
- Continual updates with new products and improved features
- Predefined static maps with time sliders
- Can interact with some of the maps to get more information e.g. Meteograms
- Content comes from ecCharts

Access them here!
<https://charts.ecmwf.int>



Open Data Availability – GRIB Products

<https://www.ecmwf.int/en/forecasts/datasets/open-data>

High-resolution products:

Steps:

- For times 00z & 12z: 0 to 144 by 3, 150 to 240 by 6.
- For times 06z & 18z: 0 to 90 by 3.

Single and Pressure Levels (hPa): 1000, 925, 850, 700, 600, 500, 400, 300, 250, 200, 150, 100, 50

Parameters: as described below

Short name	Long name	ID	Level
10u	10 metre U wind component	165	Single
10v	10 metre V wind component	166	Single
100u	100 metre U wind component	228246	Single
100v	100 metre V wind component	228247	Single

Also available via AWS,
Microsoft Azure and
Google Cloud!

Access them here!



What is available to WMO Members



OpenCharts



ecCharts



“SOFF” dataset - approved subset of the full catalogue available to all WMO Members



NMHS Licence for access to the complete catalogue with applicable service charges



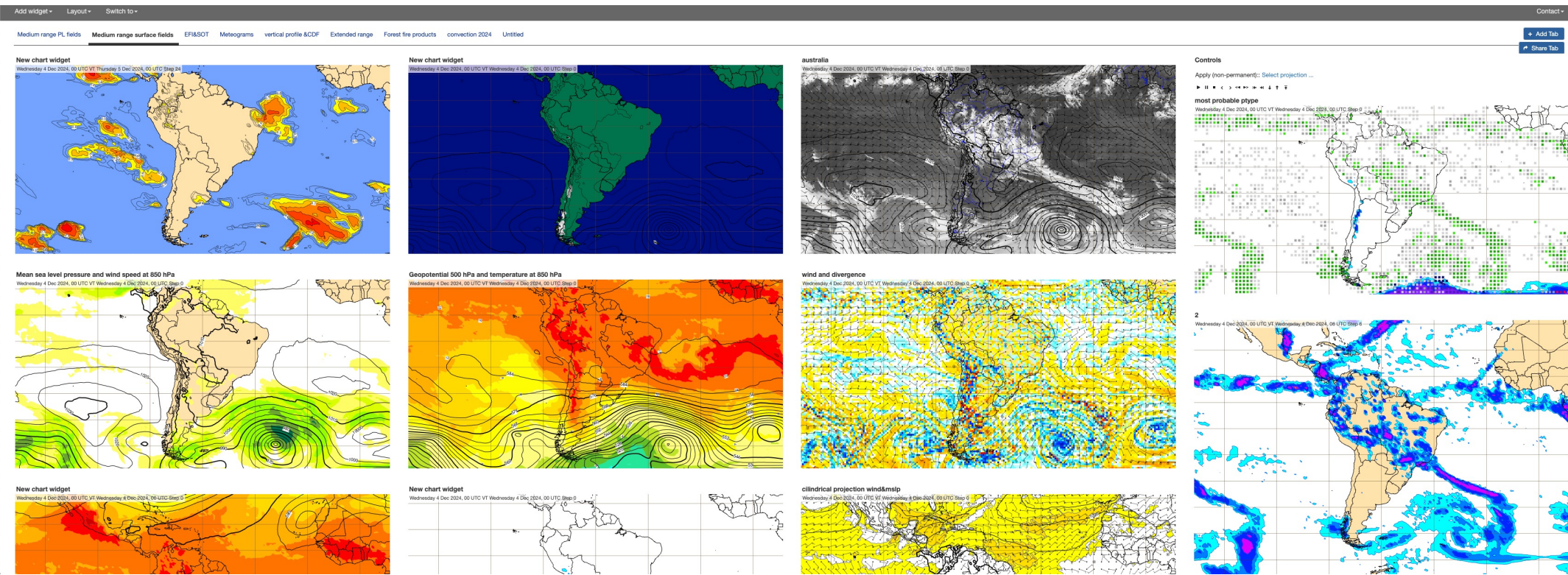
<https://charts.ecmwf.int/wmo/>



EUROPEAN CENTRE FOR MEDIUM-RANGE WEATHER FORECASTS



ecCharts - dashboard



SOFF Dataset



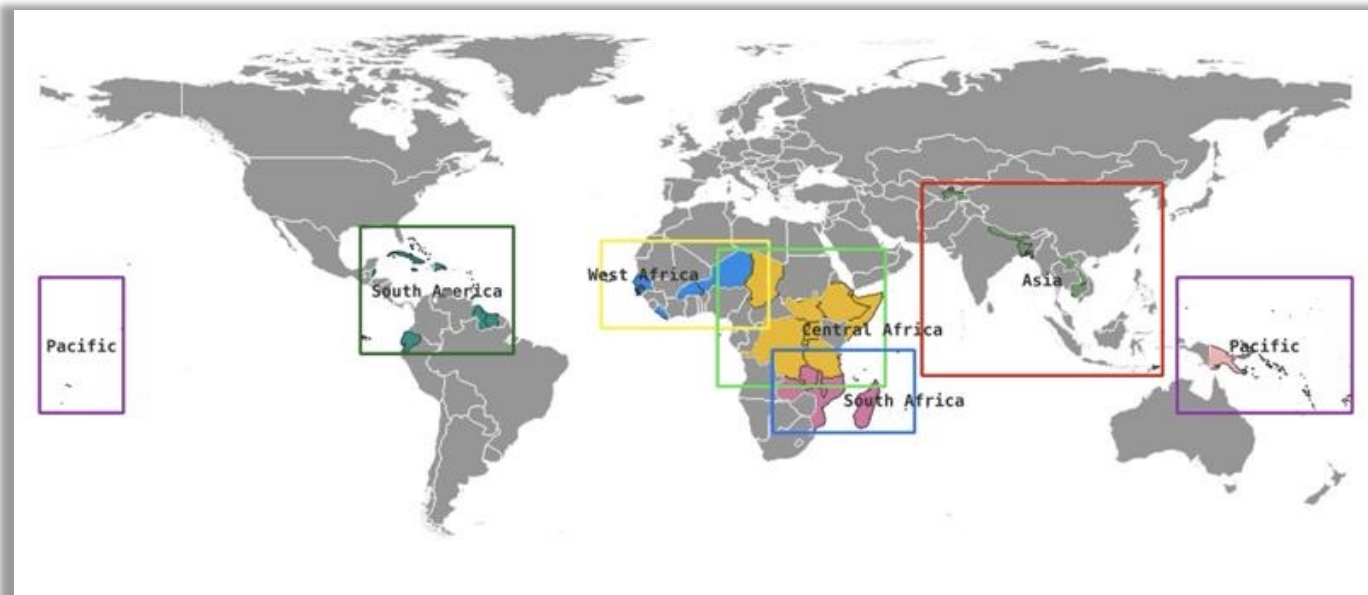
“SOFF” data distribution: 60 Countries



Consistent subset of variables for different regions; Data routinely pushed to dedicated folders on ECMWF FTP pull server



Extend to all WMO NMHSs by 2027; “self-service” with documentation and training materials



Co-operation RIMES/ECMWF

ECMWF → RIMES

- ~30 GB daily at various resolutions (max 0.2 degrees), deterministic and ensemble forecasts, from medium-range to seasonal
- Agreement in force until October 2025

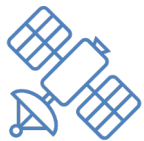
RIMES → ECMWF

- Access to historical observations via DataEx for assimilation into models
- For various reasons (metadata, data characteristics) it has not been possible to schedule these observations for assimilation into the next ECMWF reanalysis ERA6 product
- Daily data could still be useful for distribution via the Copernicus Global land surface dataset but current policy for access by ECMWF does not allow re-distribution

EC DG INTPA Africa-EU Space Partnership Space for Early Warning in Africa (SEWA)



Objective: contribute to sustainable development, a green transition and digitalization in Africa through an enhanced EU-Africa Space Partnership



Develop space-based services and applications/tools to strengthen Early Warning Systems of hazardous weather and climate-related events (ECMWF– EUMETSAT – AUC)



Activities include:

- Regional pilots on Impact-based Forecasts and warning tools for hazardous weather and climate events
- Training and engagement
- Access to infrastructure, data products and support



EUROPEAN CENTRE FOR MEDIUM-RANGE WEATHER FORECASTS



Machine Learning Progress



A short history of data-driven weather forecasting

February 2022 – First competitive medium-range systems

- Keisler – GraphNN, competitive with GFS (USA)
- NVIDIA – FourCastNet Fourier+ , 0.25°, $O(10^4)$ faster & more energy efficient than IFS

December 2022

- Deepmind – GraphCast

GraphNN
0.25° Many parameters with comparable skill to IFS.

November 2022

- Huawei – PanguWeather

Vision Transformer
0.25° “More accurate tropical cyclone tracks” than the IFS.

January-June 2023

- Microsoft – ClimaX
- China academia/Shanghai Met – FengWu
- Alibaba – SwinRDM
- NVIDIA – SFNO
- ...

December 2023

- Deepmind – GenCast

Probabilistic forecast (ensemble) – 0.25°
“Outperforming the leading operational ensemble forecast” (aka ECMWF)

June 2024

- Microsoft – Aurora

Higher resolution – 0.1°
Atmospheric composition

2018 – Concept explored (ECMWF and others)...

Early 2023
Prototype AIFS developments begin

October 2023
ECMWF – AIFS experimental forecasts live

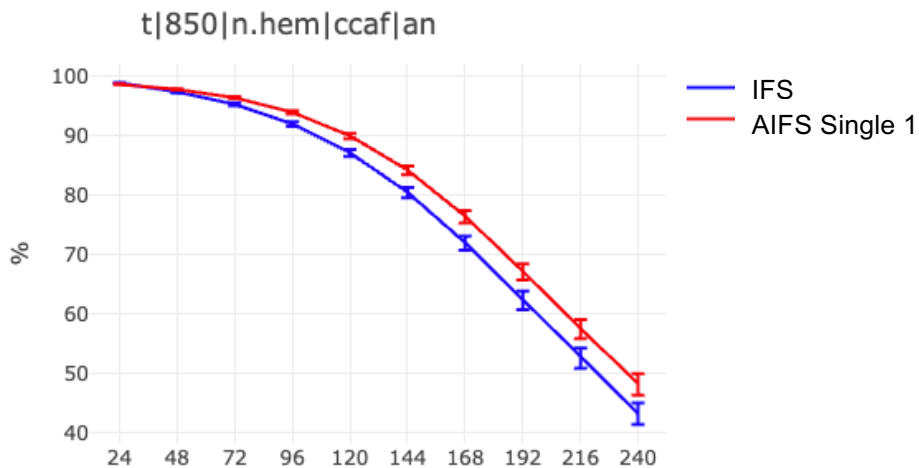
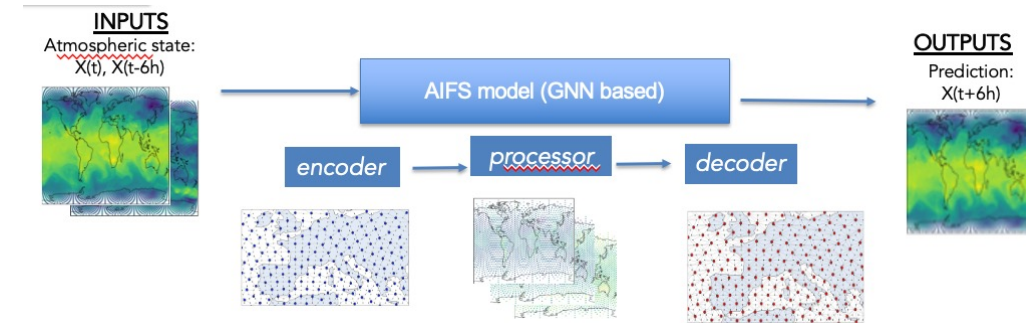
July 2024...
ECMWF – First AIFS ENS experimental

Feb 2025: ECMWF – AIFS Single 1 operational

AIFS Single vs IFS

Lang et al 2024a

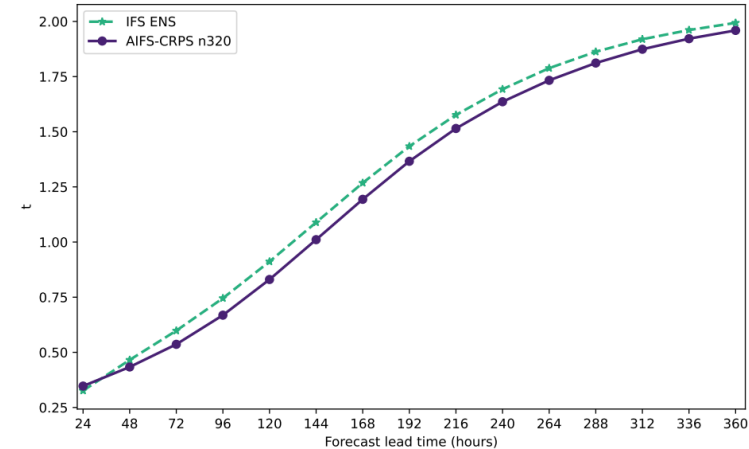
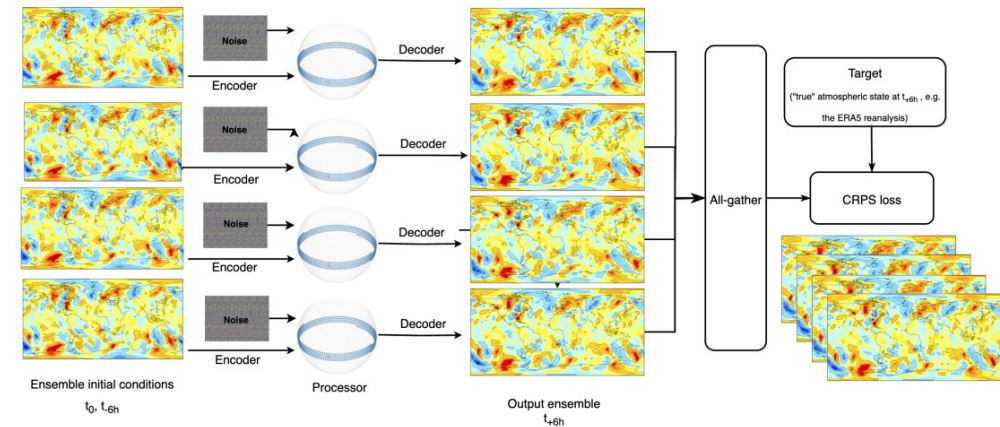
Operational system from February 2025



AIFS ENS CRPS vs IFS ENS

Lang et al 2024b

Operational system later this year



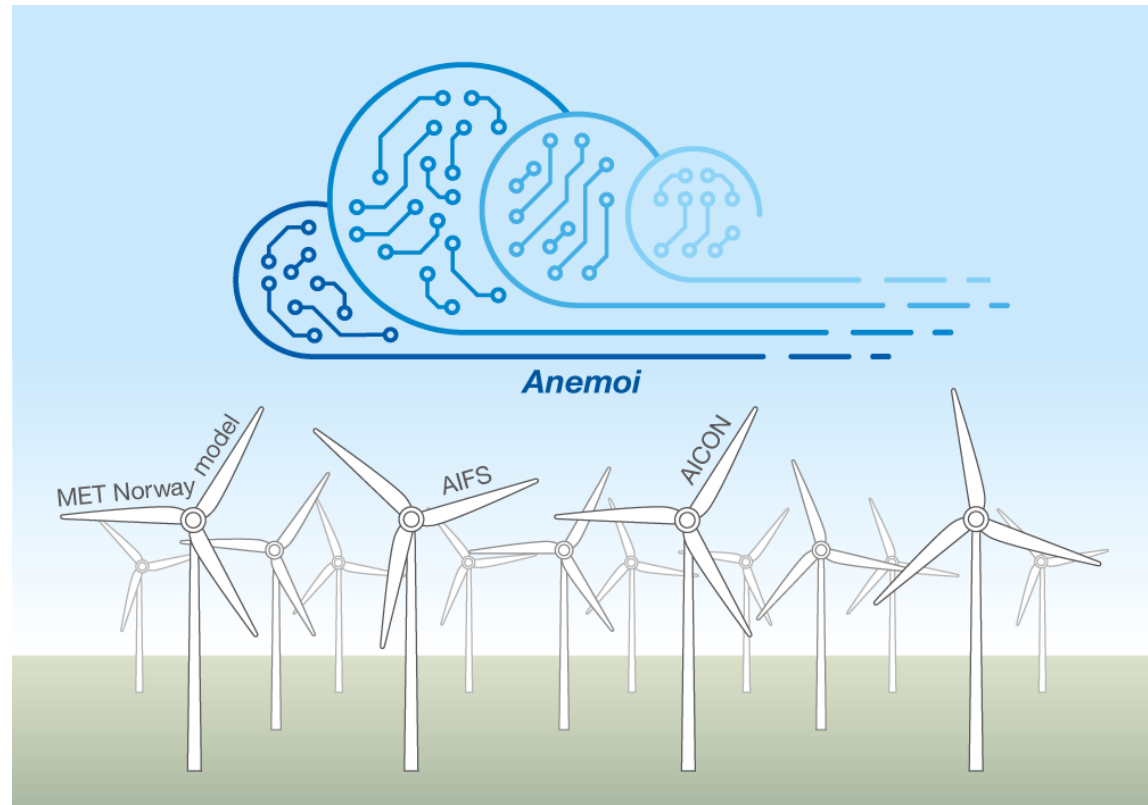
Anemoi

Set of tools, shared/co-developed **across Europe, and beyond**, for building data driven forecasting systems.

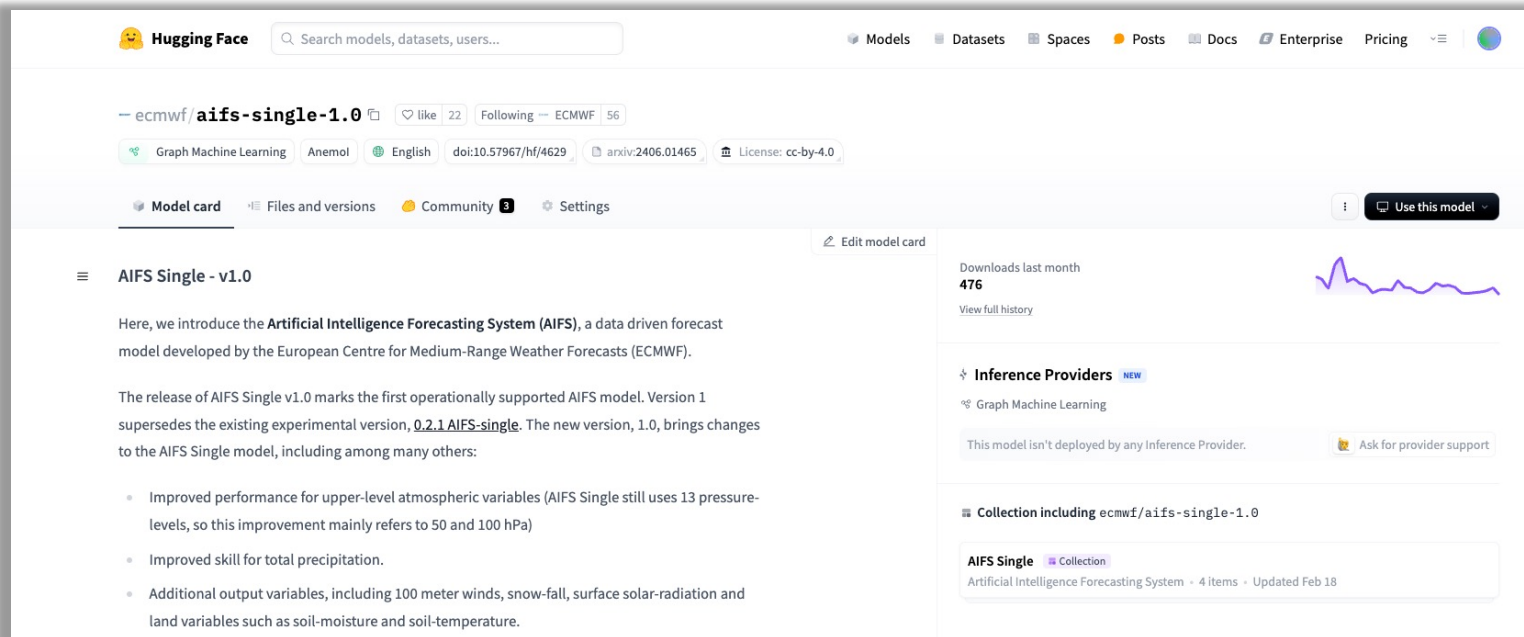
Users can bring their data and pick a suitable architecture and training method. More advanced users can add new architectures and training methods.

AIFS is one possible output from Anemoi

Anemoi is open source, with already > 10 meteorological centres using/exploring it



Running AIFS yourself interactively



- AIFS Single 1 on Hugging Face – an open platform for sharing ML models.
- Includes interactive notebook on how to run from ECMWF open data, can be adapted for other sources.

<https://huggingface.co/ecmwf/aifs-single-1.0>

Thank you!



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