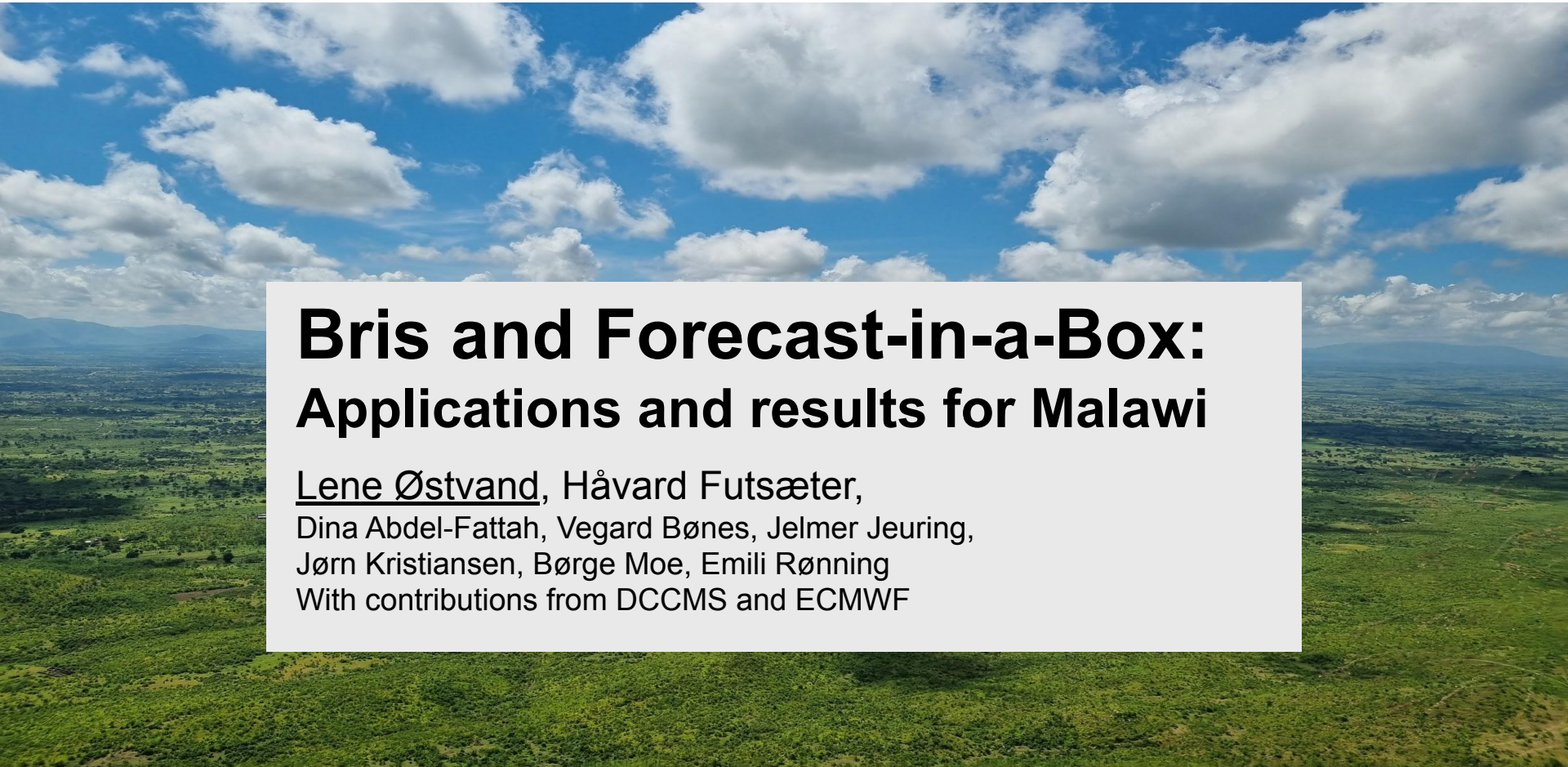

Bris and Forecast-in-a-Box:
Applications and results for Malawi

Lene Østvand, Håvard Futsæter,
Dina Abdel-Fattah, Vegard Bønes, Jelmer Jeuring,
Jørn Kristiansen, Børge Moe, Emili Rønning
With contributions from DCCMS and ECMWF

Main goal:

Deploy and evaluate AI weather prediction in Malawi, and explore how AI can strengthen early warning capabilities.

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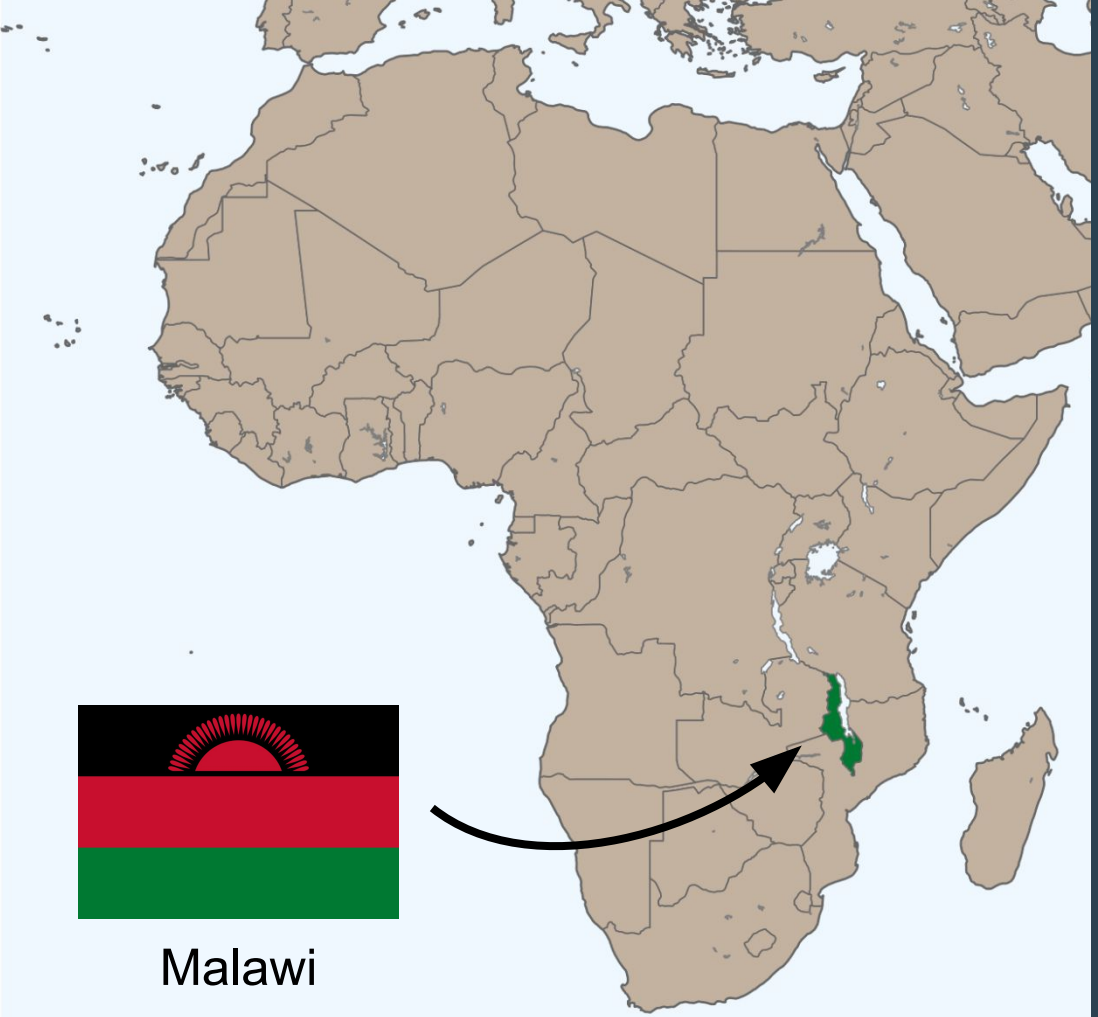

Malawi

Malawi is a landlocked country in South-East Africa.

Severe events typically include

- Heavy rain
- Floods
- Thunder storms
- Mwera winds over Lake Malawi
- Dry spells
- Heat waves
- Cold waves
- Tropical storms and cyclones

How do we work?

Peer-to-peer: physical workshops, video meetings, chat groups, GitHub.

Interdisciplinary: IT developers, meteorologists and researchers with background in physics, statistics and social sciences.

Oslo August 2025

Including visit from the WMO President

Photo: Muhannad Al Badri

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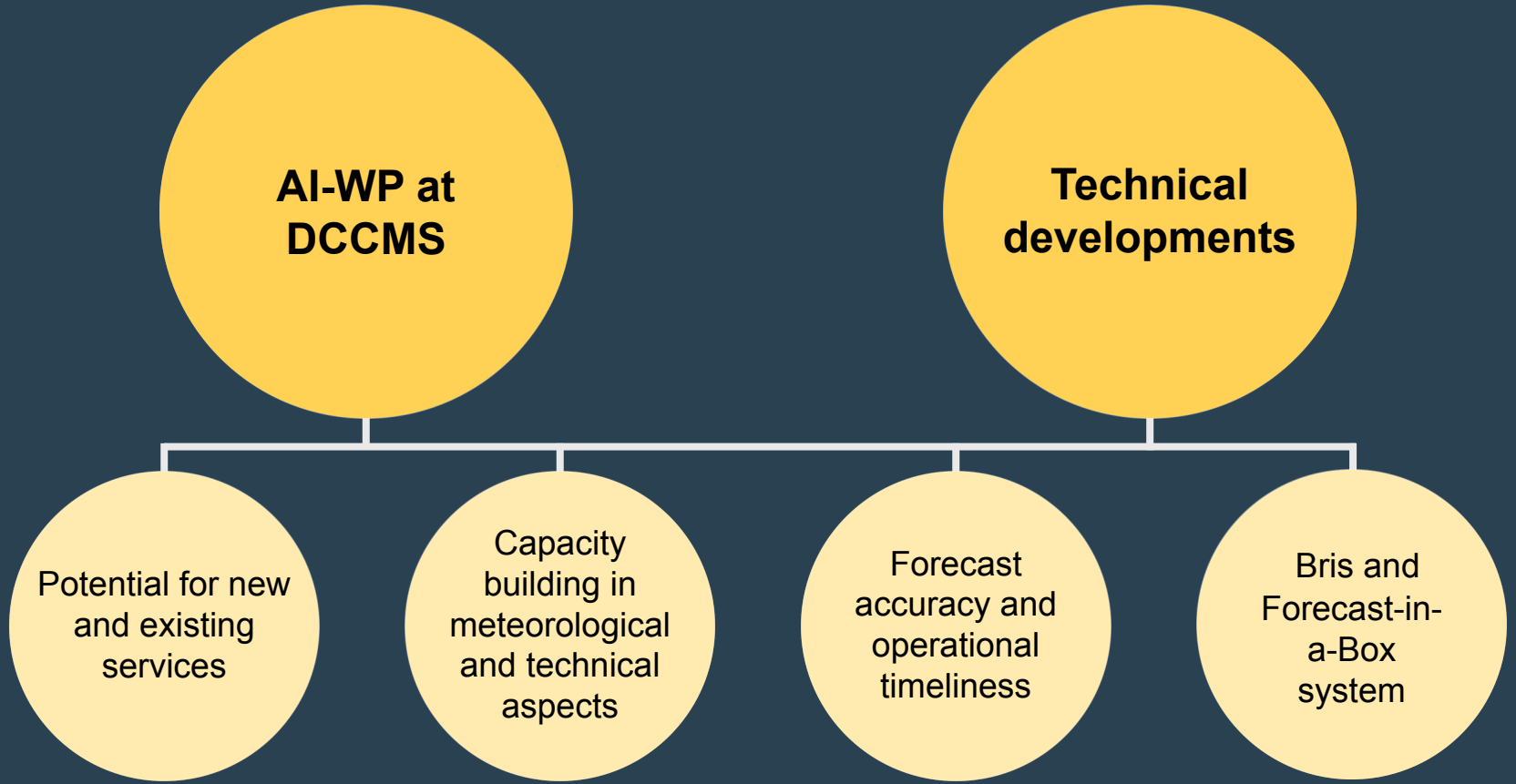

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Bris for Norway

- Based on the global AIFS from ECMWF.
- Uses Anemoi, a common framework for AI modelling by ECMWF and European countries
- Global + regional
- Clouds, precipitation, temperature, winds, etc
- Running daily since November 2024

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anemoi

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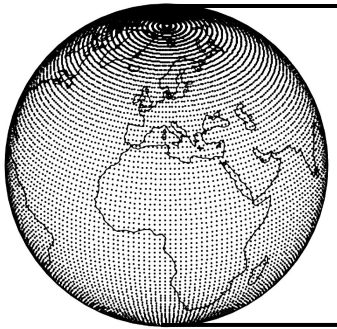
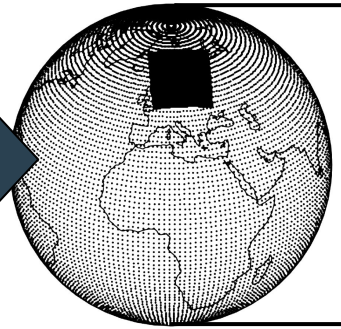
Bris is trained in stages



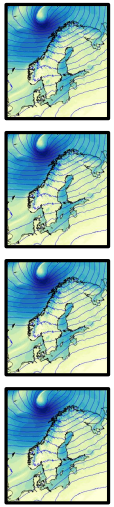
Global pre-training
43 years of ERA5
540,000 grid points

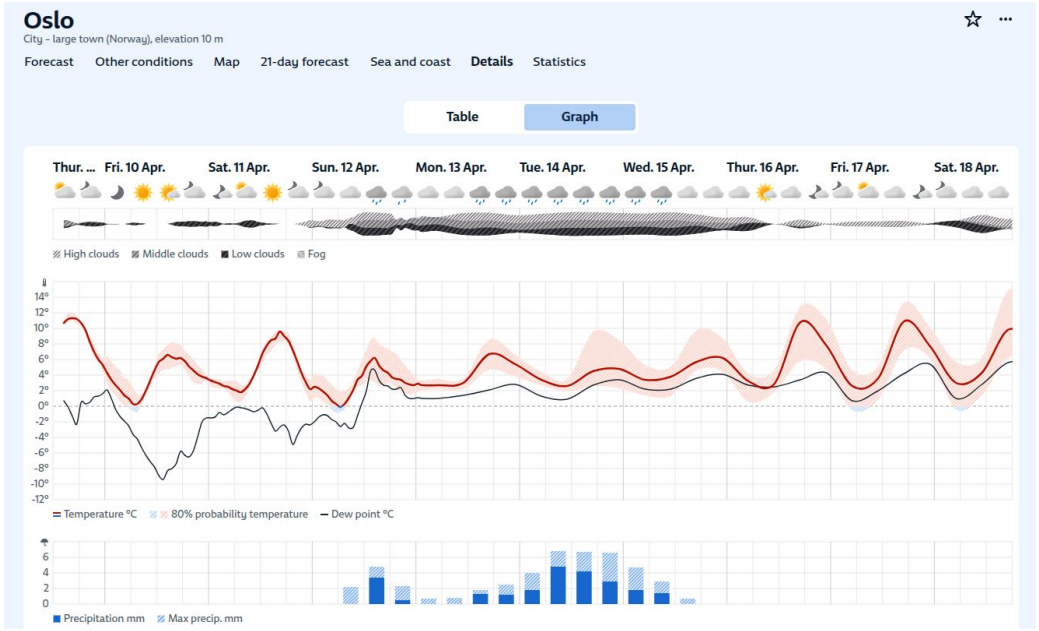


Stretched-grid fine-tuning
3.5 years of MEPS/IFS
1,300,000 grid points

Bris has evolved from deterministic to probabilistic forecasts

Members





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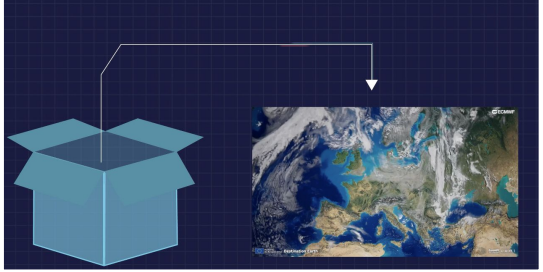
Forecast-in-a-Box



What's in the Box?

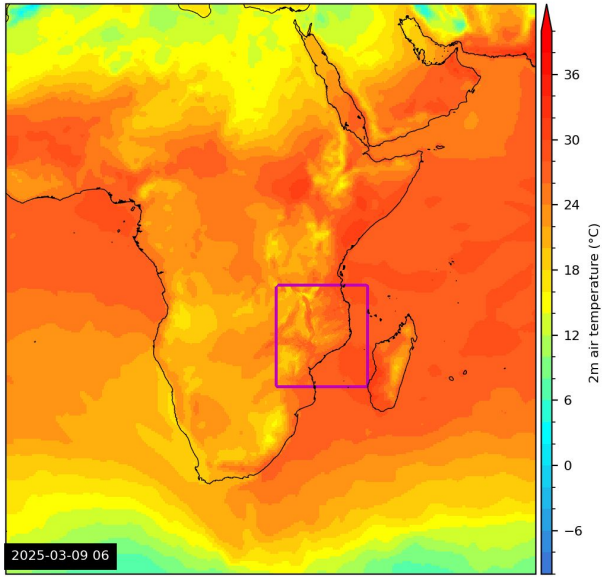
- Prepare initial conditions
- Run the model
- Create user products
- Visualise

Key Features

- Deploy anywhere
- Easy to run
- Choose your own model
- Tailor your products

Bris for Malawi

- Run AI-WP model Bris using Forecast-in-a-Box.
- Modify Bris to run for the Malawi domain.
- Downscale global data as input data to Bris.
- Runs on a wide range of infrastructure configurations.
- Prototype deployed at DCCMS.



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Producing a 10 day forecast with Bris-Malawi

On MET Norway cloud infrastructure

- Run on 1 NVIDIA H200 GPU (70G MIG instance)
  → Run time: 2 minutes

On consumer hardware

- Mac Studio (Apple M4 Max, 128GB memory)
  → Run time: 19 minutes
- NVIDIA DGX Spark (128GB memory)
  → Run time: 8 minutes

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Forecast-in-a-Box/Bris at DCCMS Malawi

- Running since February 2026.
- Running ensemble version of Bris for Malawi with one member.
- DCCMS forecasters have started to give feedback on the system.

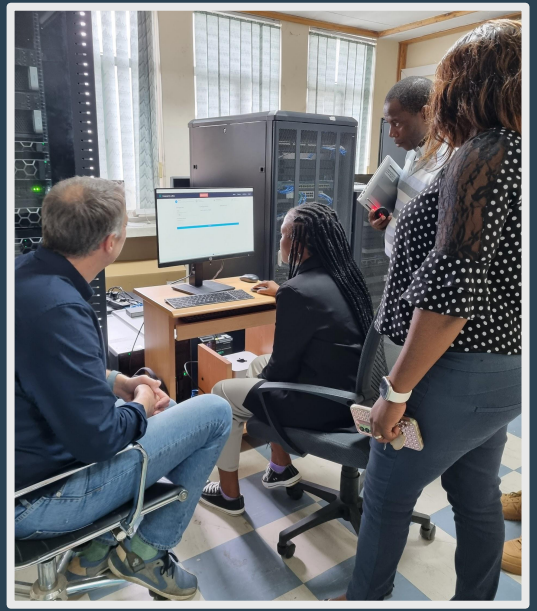
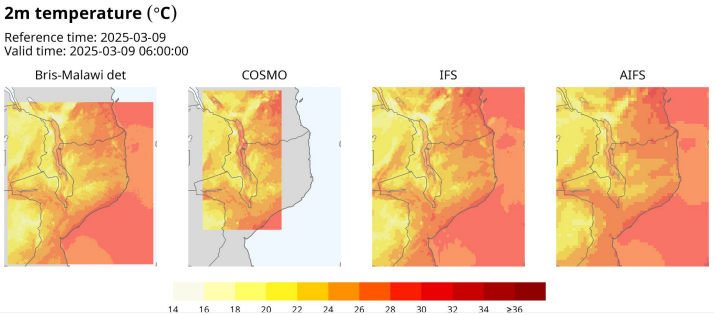
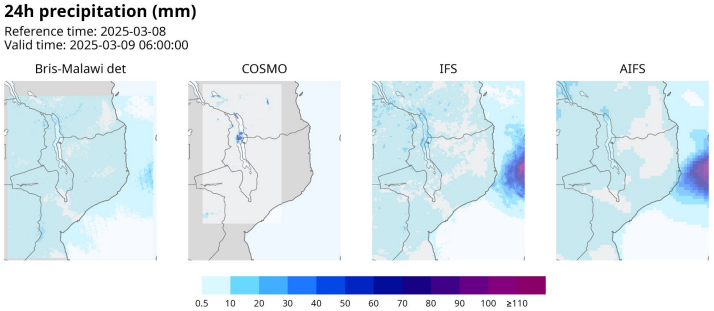


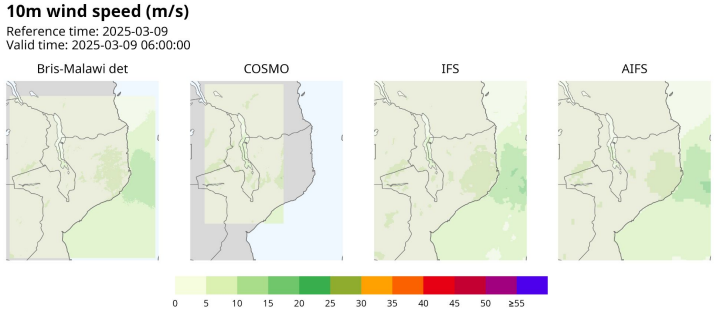
Photo: Lene Østvand

Case study: Cyclone Jude March 2025





Incoming Cyclone Jude on March 9, 2025.



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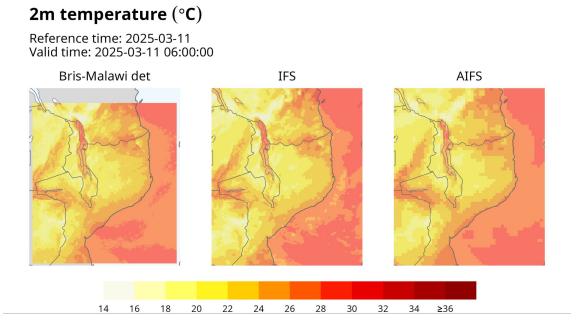
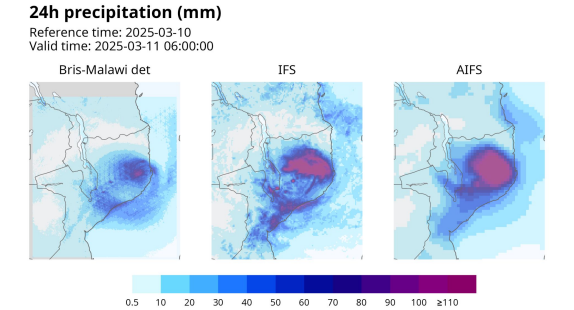
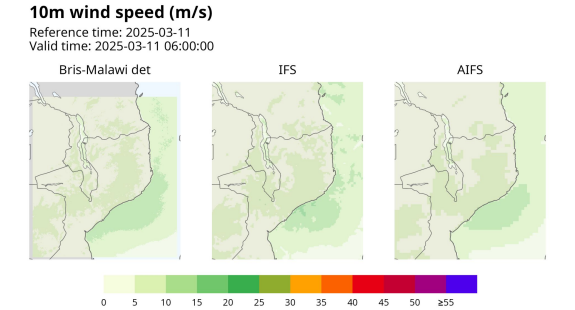
Case study: Cyclone Jude March 2025





Cyclone Jude hit southern Malawi on March 11. DCCMS suffered a power shortage and were not able to run COSMO.



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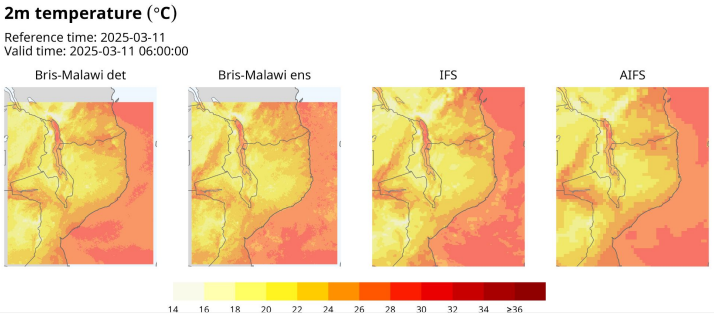
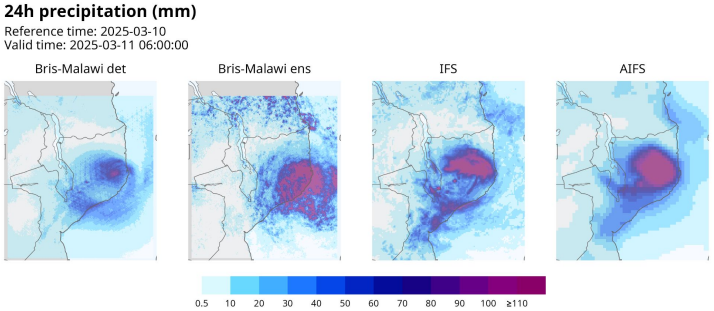
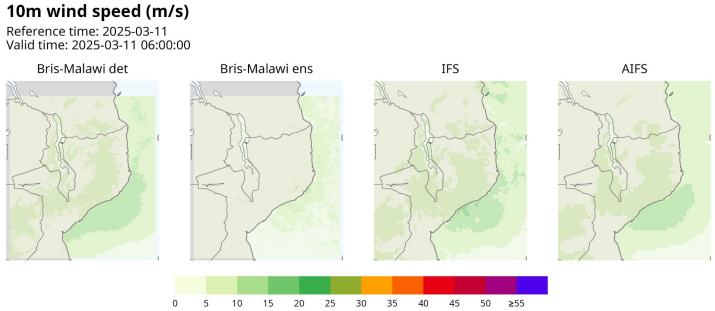
Case study: Cyclone Jude March 2025





Ensemble version of Bris-Malawi seem to better capture precipitation.



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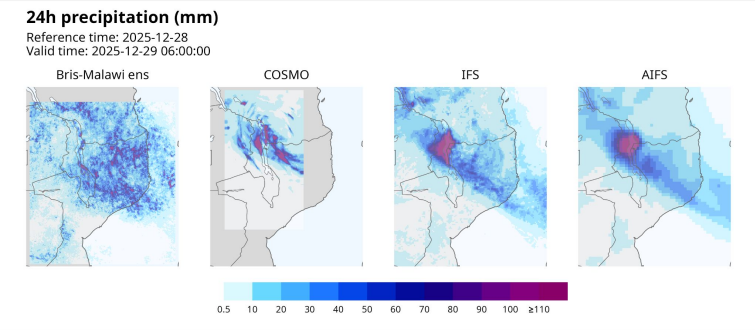
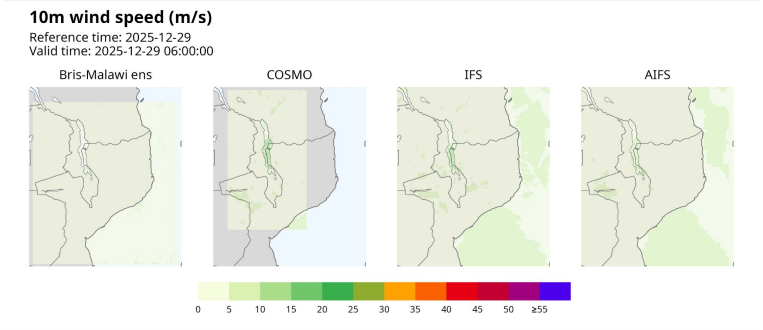
Case study: Heavy rainfall December 2025





Precipitation from Bris-Malawi ens seems to be too much spatially spread.
Wind speeds may be too low.

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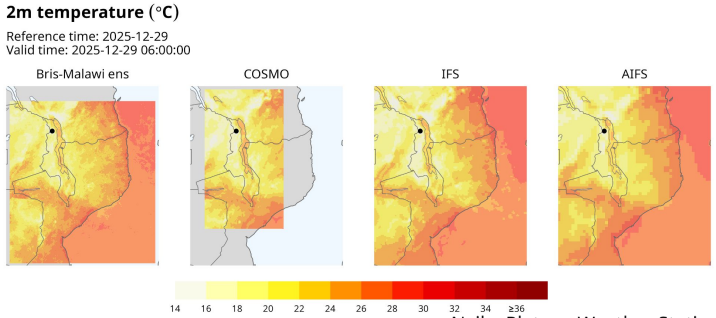
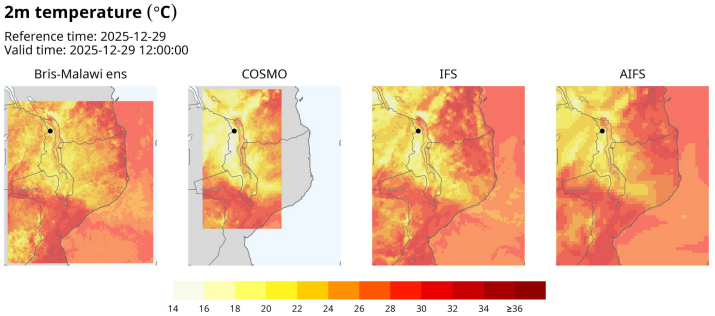
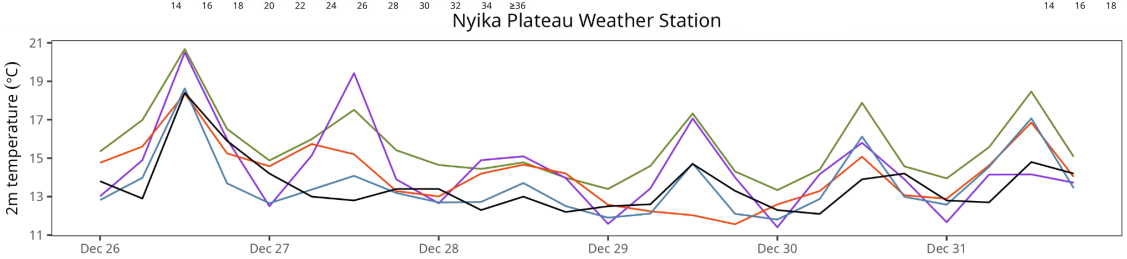
Case study: Heavy rainfall December 2025







Bris-Malawi ens do not forecast temperature as well as initially thought.

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DCCMS's priorities to make forecasts fit-for-purpose

Photo: African Mountain Research Foundation

Strengthen the observation value chain from instrument maintenance to data management and dissemination.

Develop tools to link forecasts to impacts, and ensuring they are properly received and understood by users.

Photo: Redd Barna/Save the Children

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Systematic Observations Financing Facility (SOFF)

SOFF Malawi recently entered the investment phase.
MET Norway and the Icelandic Met Office are peer advisor.

Launch of SOFF investment phase and field trip to Ngabu, Malawi February 2026. Photo: WMO/SOFF

SOFF Systematic Observations Financing Facility | UNDP | Norwegian Meteorological Institute | Icelandic Met Office | Ministry of Natural Resources and Climate Change, Department of Climate Change and Meteorological Services | World Meteorological Organization

Lessons learned

- Forecast-in-a-Box makes AI weather prediction easily accessible.
- Bris forecasts show promising results, but needs improvements, especially for extreme events. More systematic evaluation is needed.
- Feedback and assessments from DCCMS are important for current and future developments.
- Collaborative effort on data is needed for future iterations.

Next steps for the Malawi project

- Feedback on Forecast-in-a-Box/Bris system by DCCMS forecasters to developers.
- Continued capacity building, including synergies with SOFF to improve the observations network and data management.
- Improved routines for evaluating Bris-Malawi.
- Refinement of Bris-Malawi with local data.
- Work on probabilistic forecast products.