

New Extratropical Cyclone products related to "Front Density"

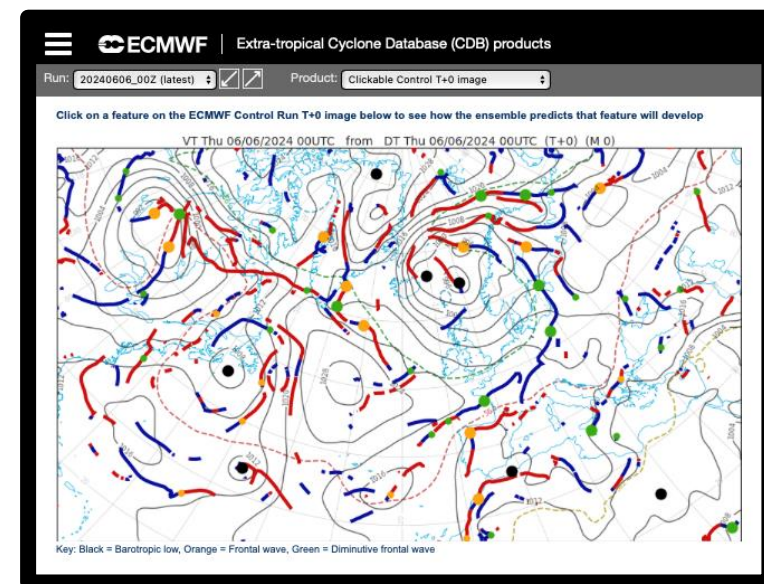
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Thanks to Caroline Jones and Helen Titley at the Met Office

Thanks to Paul Dando at ECMWF



Cyclone Database Product Updates

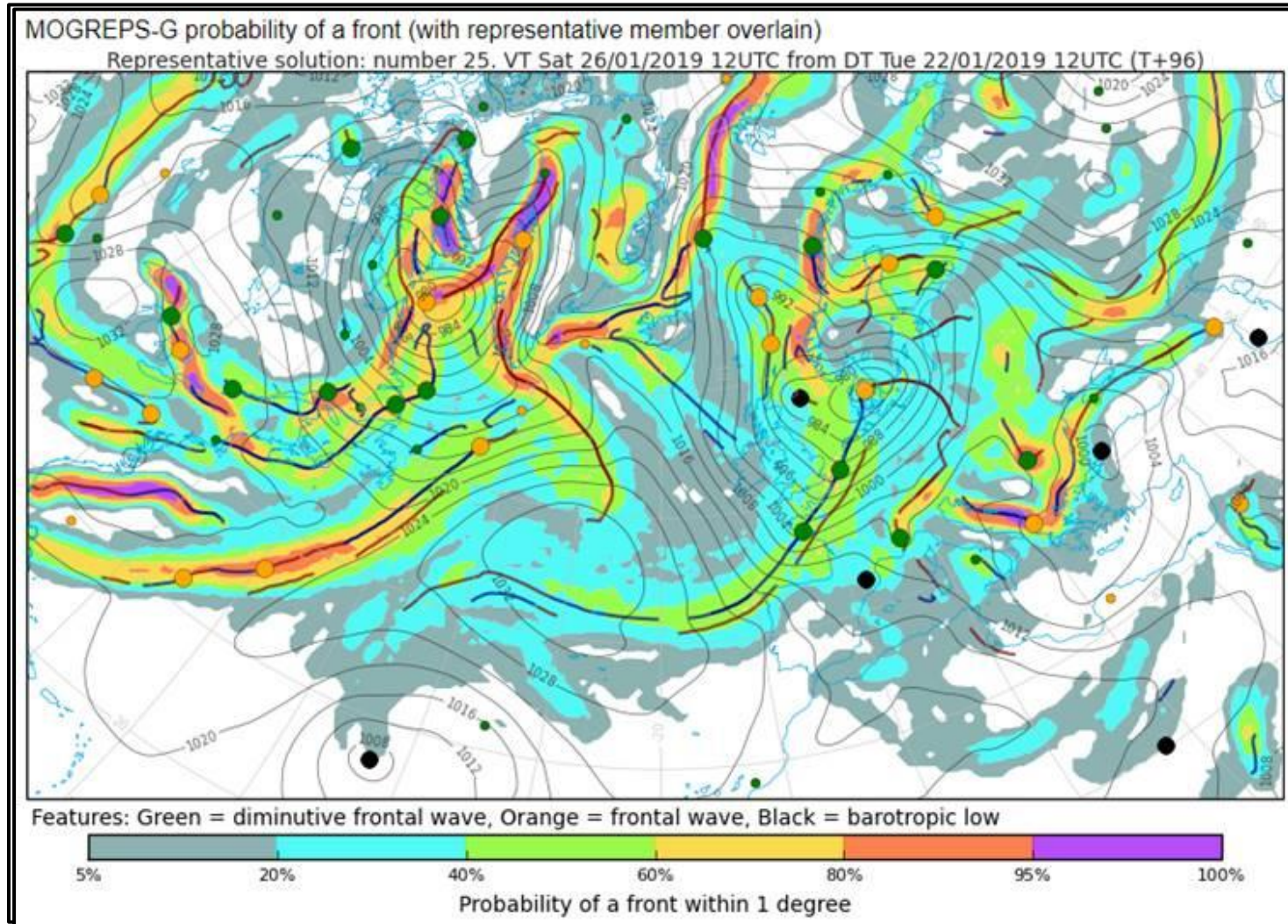
- In collaboration with the Met Office (where output applied to MOGREPS global ensemble)
- New products:
 - Front probabilities (with HRES or Control overlaid)
 - Front probabilities (with **most representative member** overlaid)
 - Confidence index based on density of fronts (graphs)
 - HRES versus ENS consensus (graphs)
 - Rank of HRES against other ENS members (graphs)
- Hopefully going live this summer (internal web version already working)
- To follow at some point:
 - A change in time step from 12 hours to 6 hours
- Example products follow...

Most Representative member

- Often in forecasting it is helpful to know how well a ‘deterministic’ run represents the picture portrayed by the ensemble
- This is particularly true for severe weather events, which in the extratropics often relate to cyclones and frontal zones
- If HRES is a bit of an outlier then forecasters may ask “which run better represents the ensemble as a whole?” (to provide the basis for warnings, media communication, etc.)
- There are various ways of selecting a “representative member”
- These new cyclone database products do this in a way that relates directly to adverse / extreme weather – by using objective fronts, and in fact “ensemble front density”, as a basis
- The Met Office algorithm finds, at each time step, the **member whose fronts “overlay” best with the front density plots**
 - At shorter leads – up to day 5 say – this is often, but not always, HRES (or the Control)
 - At longer leads other runs tend to become more representative of the ensemble
- One downside of selecting different runs at each time step can be a lack of continuity, but for severe event focus this is not such a big issue
- Other spin-off graph-style products show (i) how representative HRES is, (ii) a new front-density-based spread metric, ...

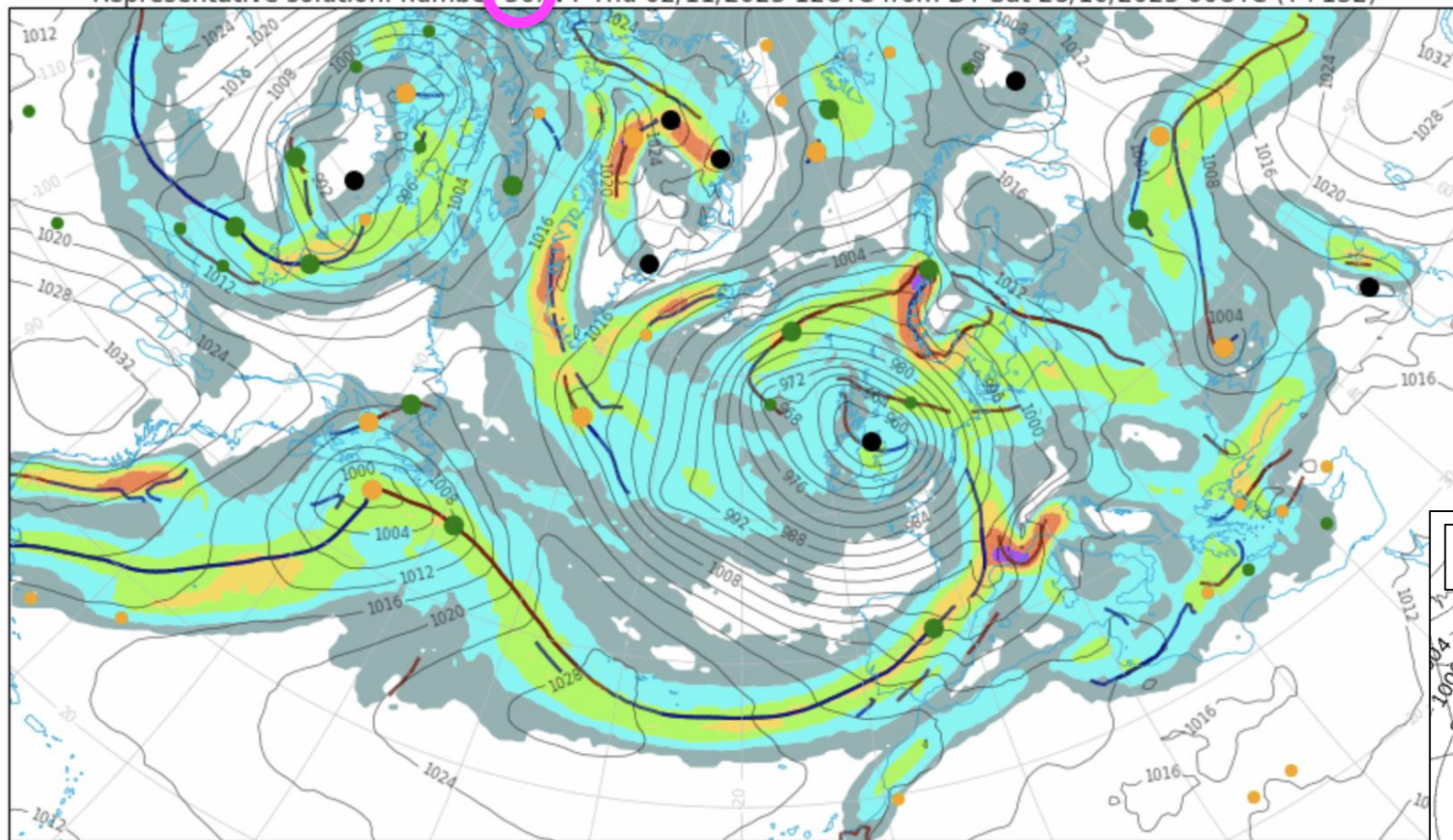
“Front density” and “Most representative member”

From the **Met Office** global ensemble:



ECMWF ENS probability of a front (with representative member overlay)

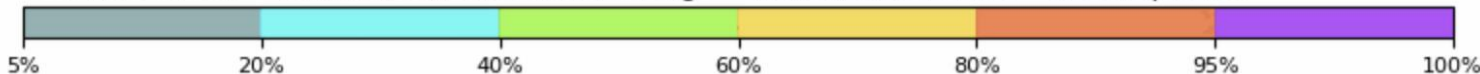
Representative solution: number 36. VT Thu 02/11/2023 12UTC from DT Sat 28/10/2023 00UTC (T+132)



T+132 **ECMWF** forecast example for cyclone Ciaran near the UK (Nov 2023)

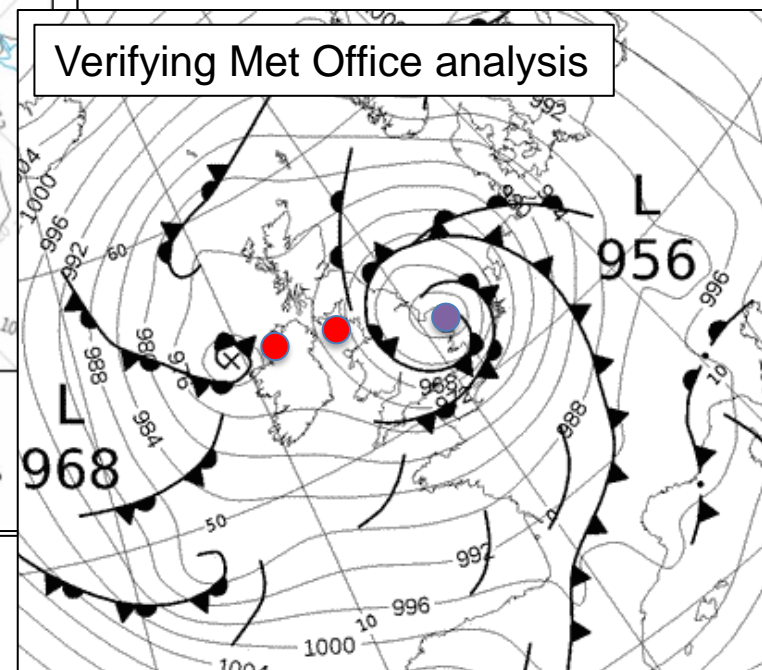
(mentioned in Linus' talk this morning)

Features: Green = diminutive frontal wave, Orange = frontal wave, Black = barotropic low



Probability of a front within 1 degree

Verifying Met Office analysis

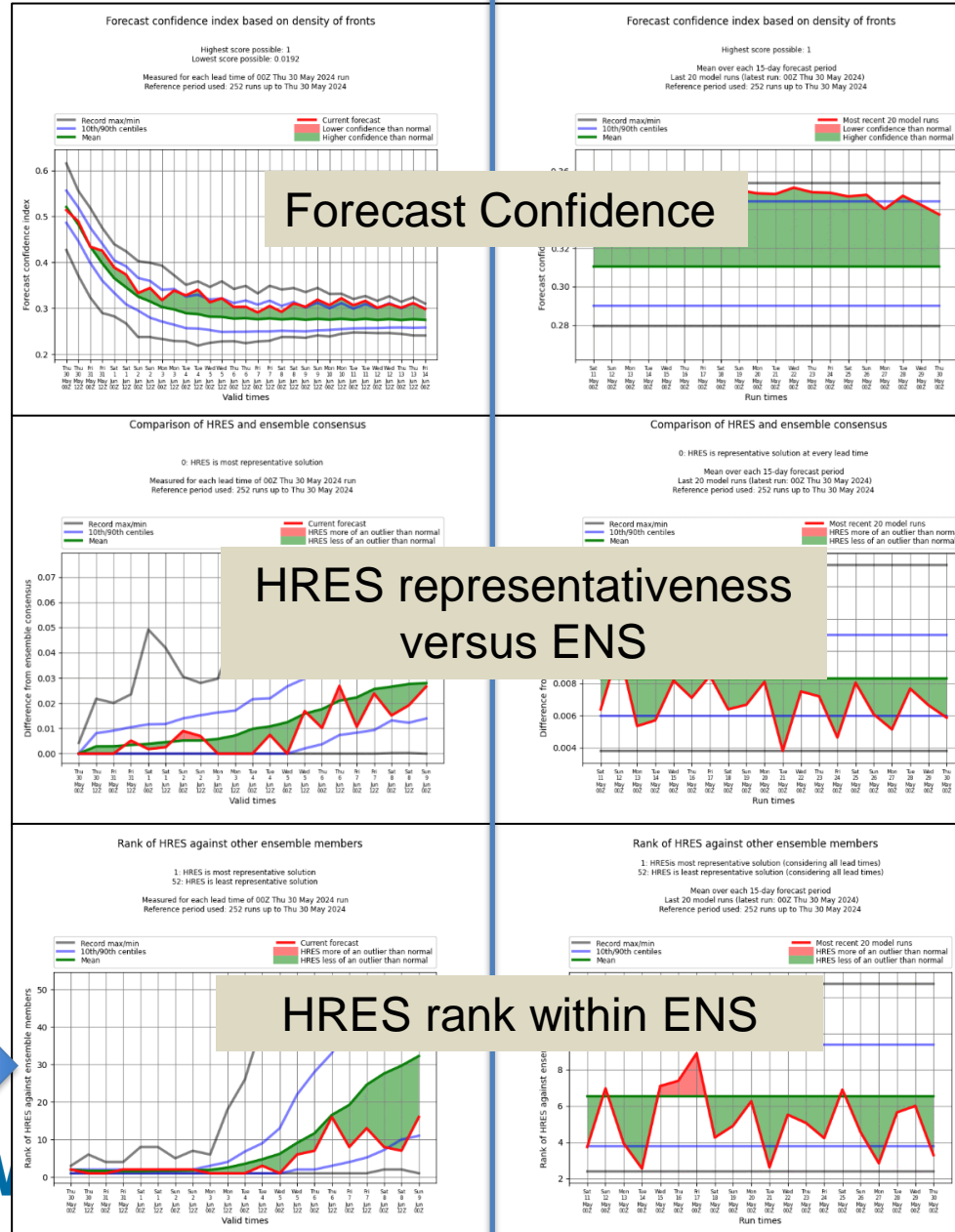


Graph Options

(beneath animations
– scroll down)

Current Forecast (D1-15)

Last 20 forecasts (averages for D1-15)



6 panels:

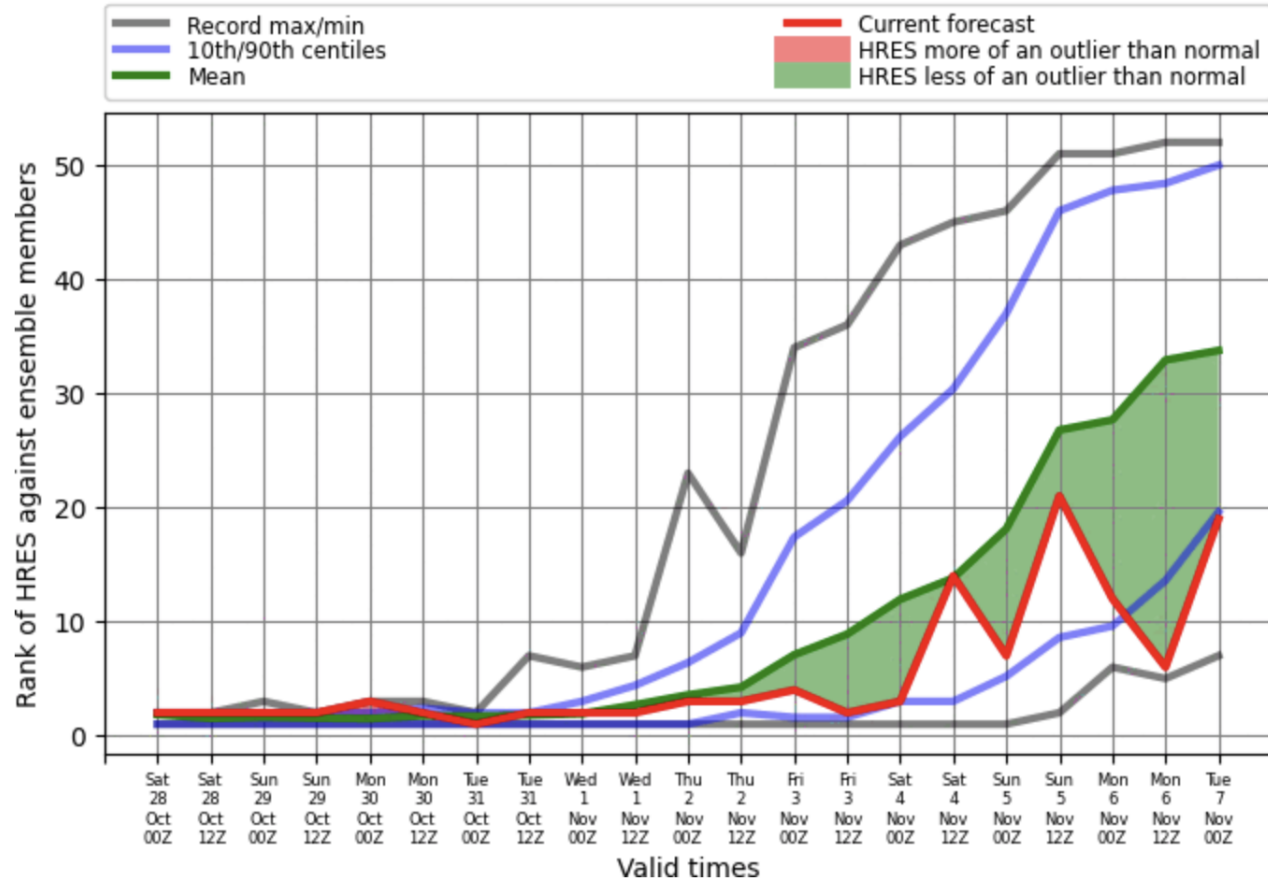
Current forecast in left column
(VT on x-axis)

Recent behaviour in right column
(DT on x-axis)

Rank of HRES against other ensemble members

1: HRES is most representative solution
52: HRES is least representative solution

Measured for each lead time of 00Z Sat 28 Oct 2023 run
Based on 37 runs up to Sat 28 Oct 2023



“Utility of HRES” as a mid-range solution

=> Weighting for HRES ?
(subjective)

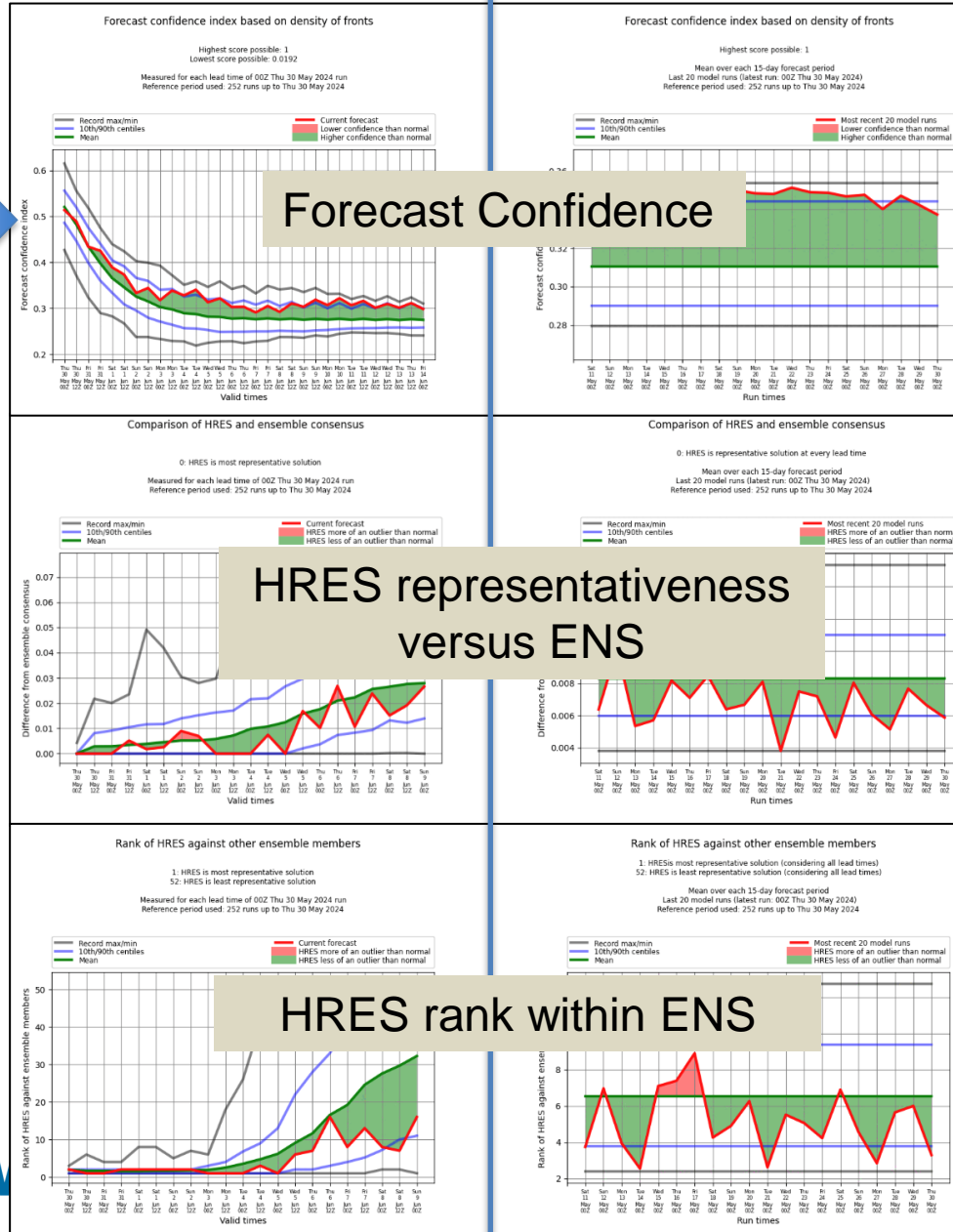
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Current Forecast (D1-15)

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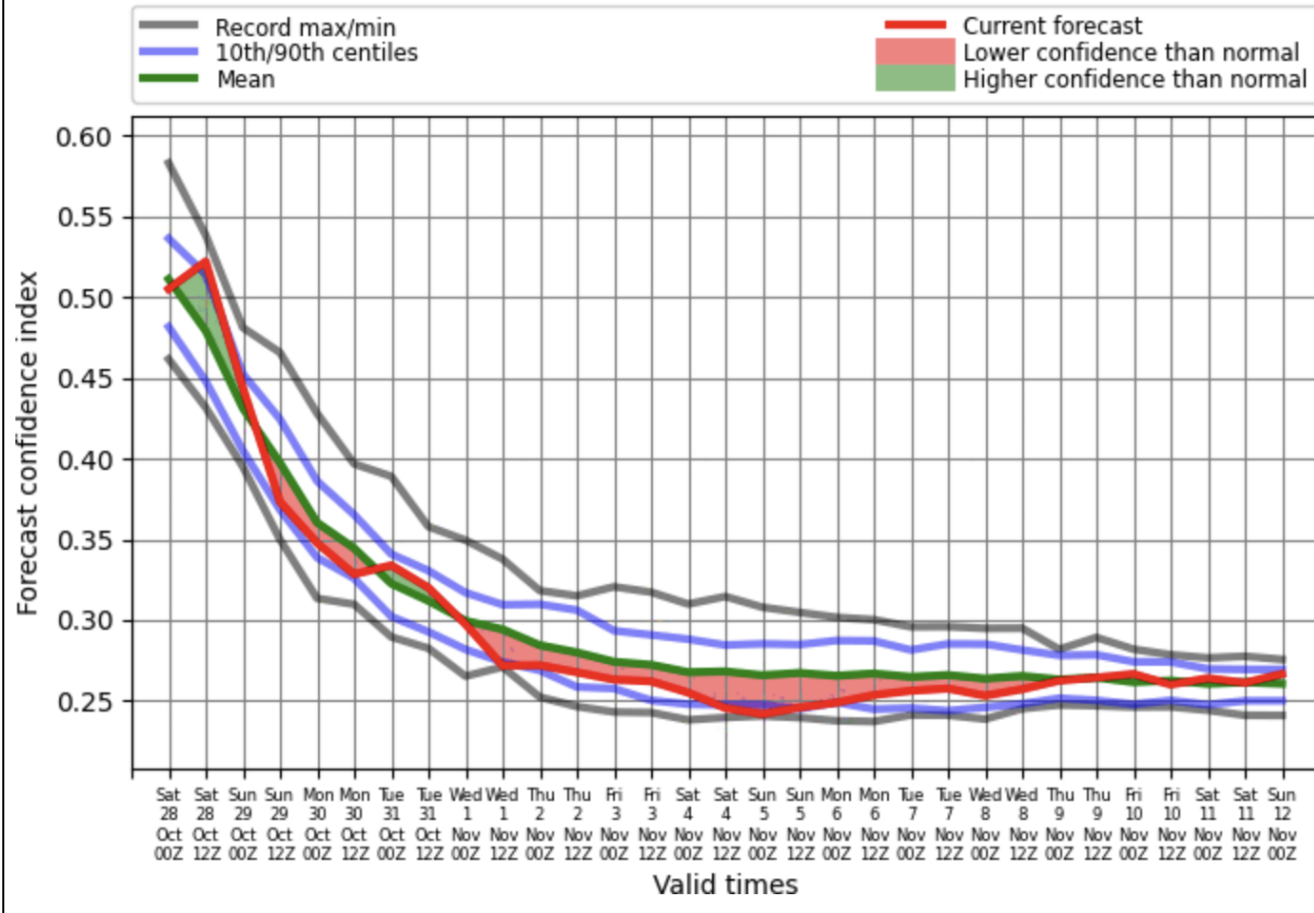
Current forecast in left column (VT on x-axis)

Recent behaviour in right column (DT on x-axis)

Forecast confidence index based on density of fronts

Highest score possible: 1
 Lowest score possible: 0.0192

Measured for each lead time of 00Z Sat 28 Oct 2023 run
 Based on 37 runs up to Sat 28 Oct 2023

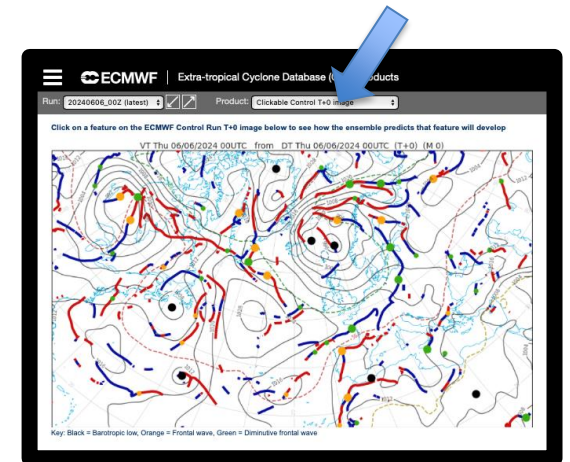


A “synoptic scale feature” spread metric (inverted)

Summary

- Via a long-standing collaboration with the Met Office, ECMWF is almost ready to go live with a new set of front-density-related products (in ECMWF's CDB web interface)
- Forecasters should find these a helpful and complementary addition to pre-existing cyclone database products
- They can help users to further disentangle the complex range of solutions portrayed by the ENS, using (synoptic) features that form a key part of the “language of forecasters”
- As always feedback is welcome 😊

Thanks for listening!



<https://sites.ecmwf.int/charts/cdb/>