Predictive skill of atmospheric rivers in the Iberian Peninsula

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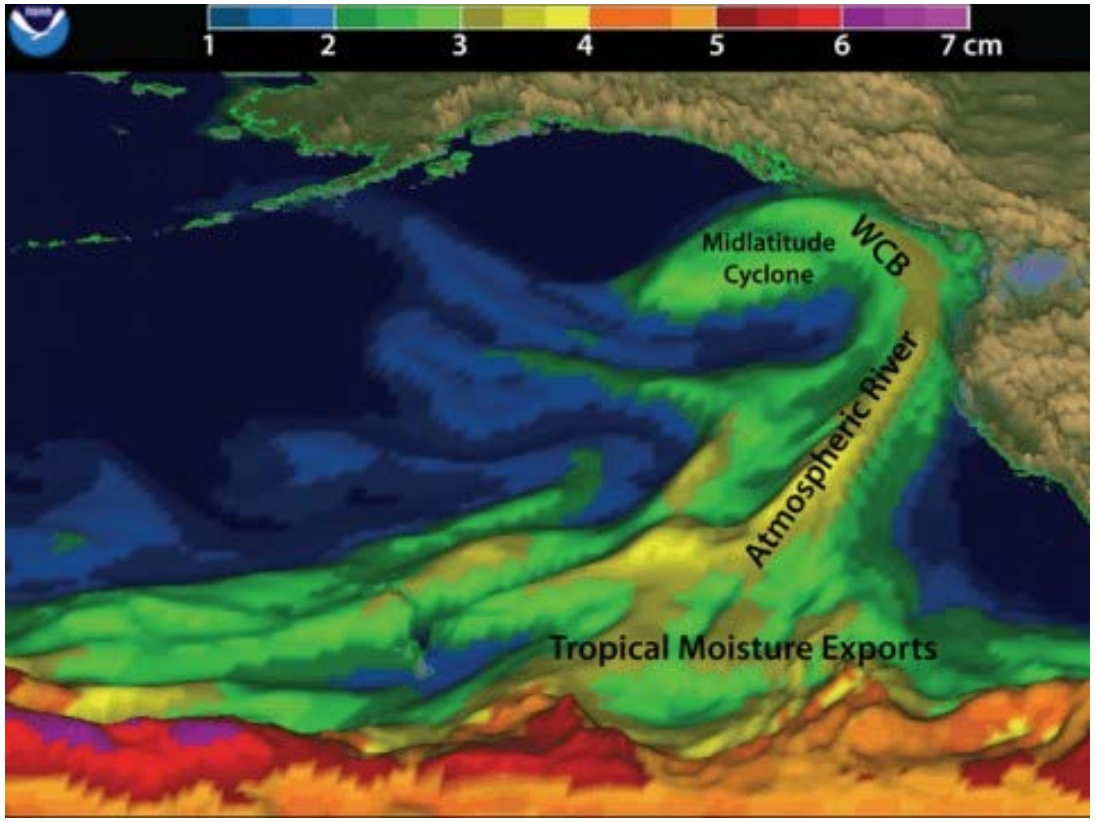
Motivation

- Heavy precipitation and floods along the west coast of Europe are largely caused by intense water vapor transport within the ARs

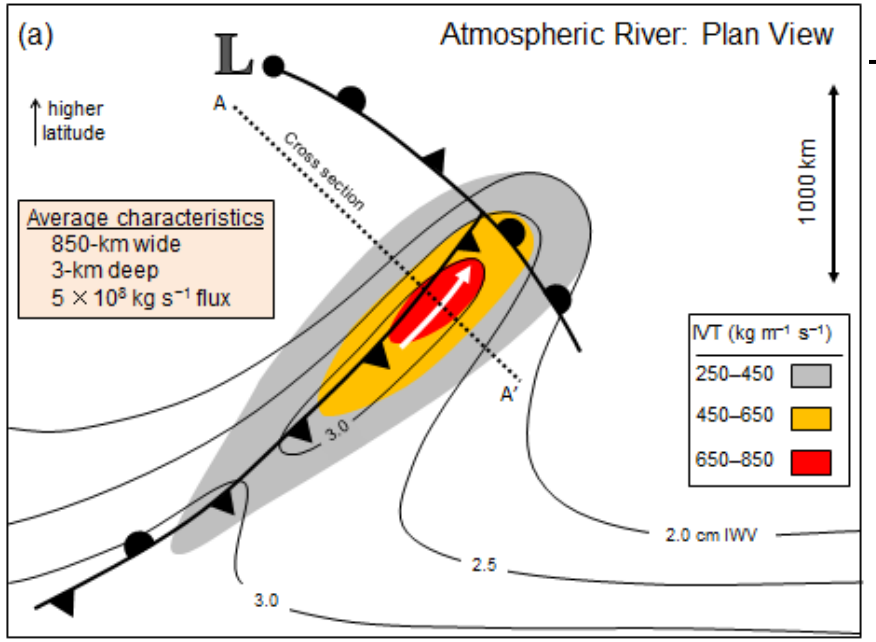
- Early awareness of extreme precipitation, can provide the time necessary to make adequate event preparations.

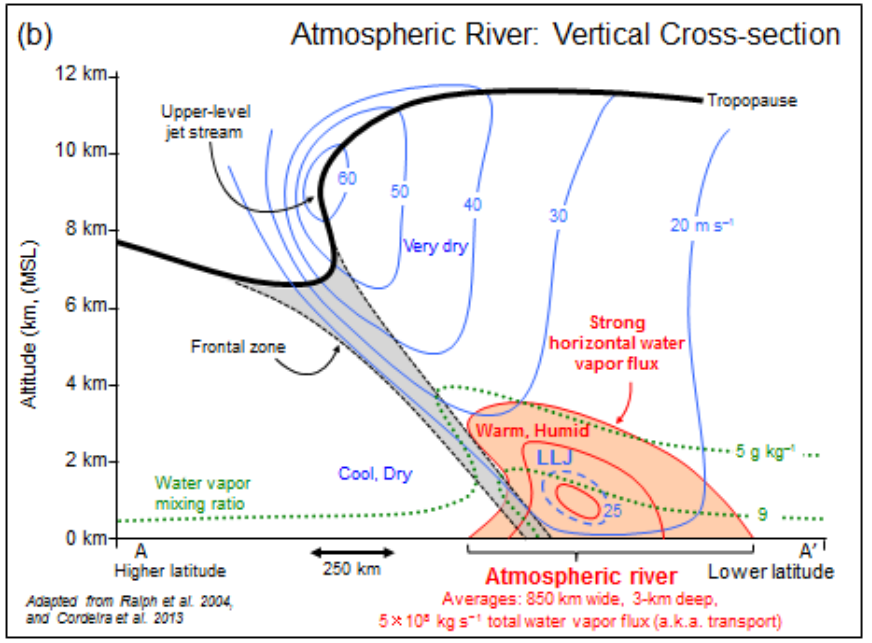
Atmospheric Rivers



A long (~2000km), narrow (~850km), and transient corridor of strong horizontal water vapor transport that is typically associated with a low-level jet stream ahead of the cold front of an extratropical cyclone. The water vapor in atmospheric rivers is supplied by tropical and/or extratropical moisture sources. Atmospheric rivers frequently lead to heavy precipitation where they are forced upward—for example, by mountains or by ascent in the warm conveyor belt.

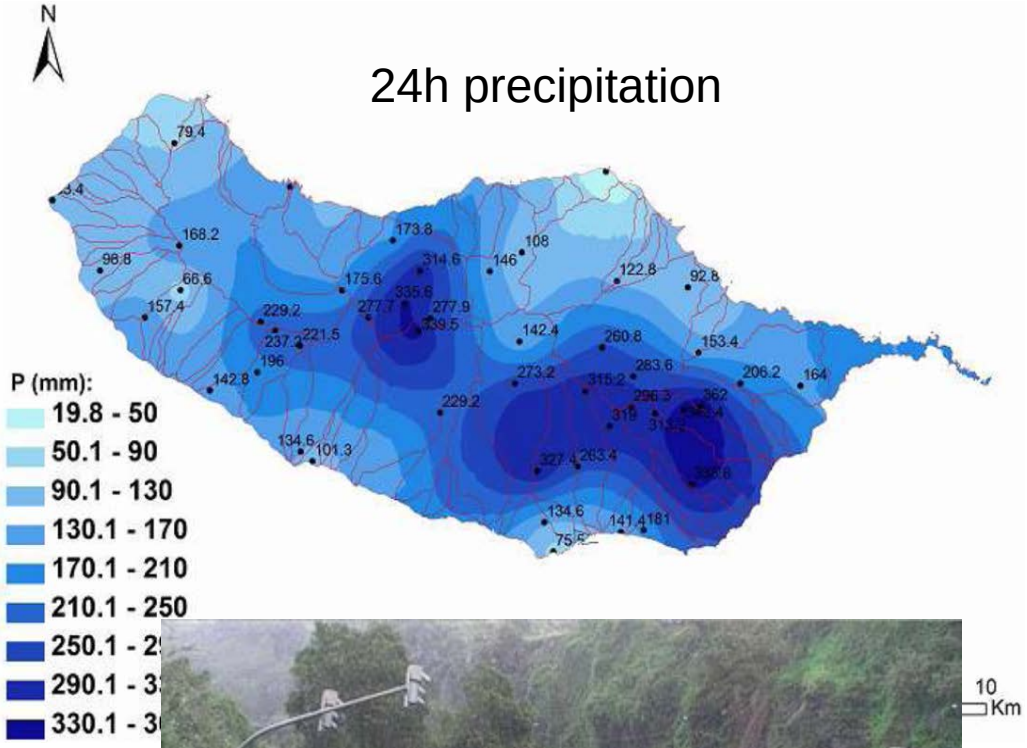
AMS, Glossary

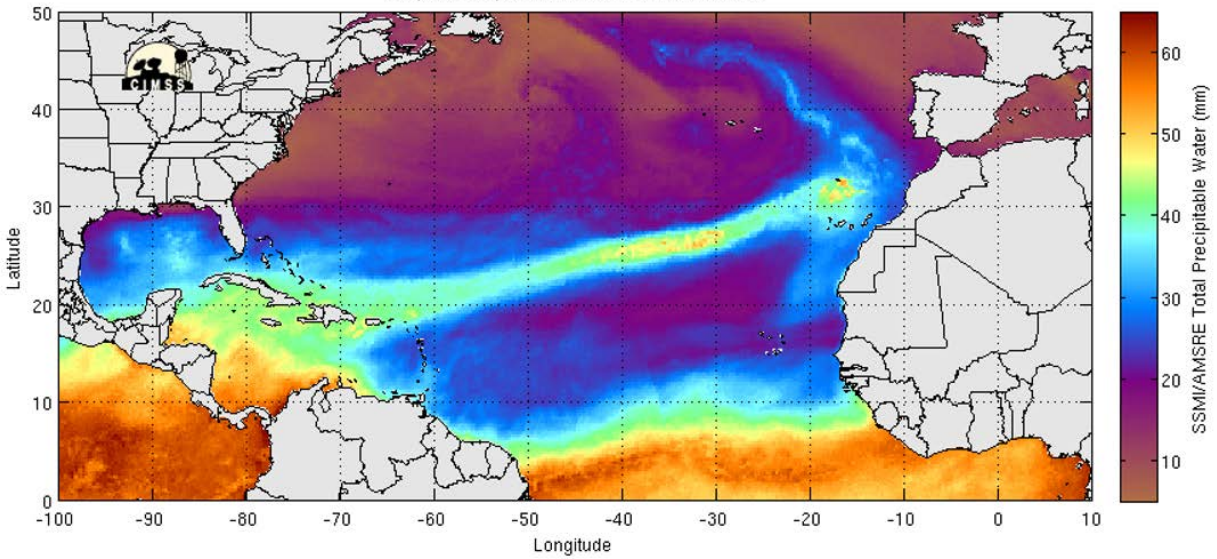




Motivation

Flash Flood Event in Madeira 20 February 2010



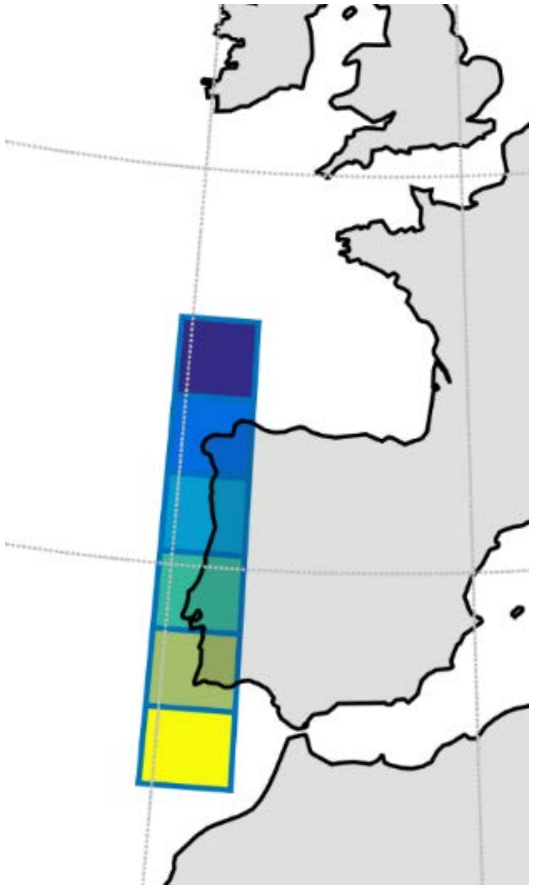


Dataset & Methods

Only interested in potential ARs events:

- **Days with mean IVT value inside box > 450 kg/m/s;**

Iberian Peninsula



(200 events)

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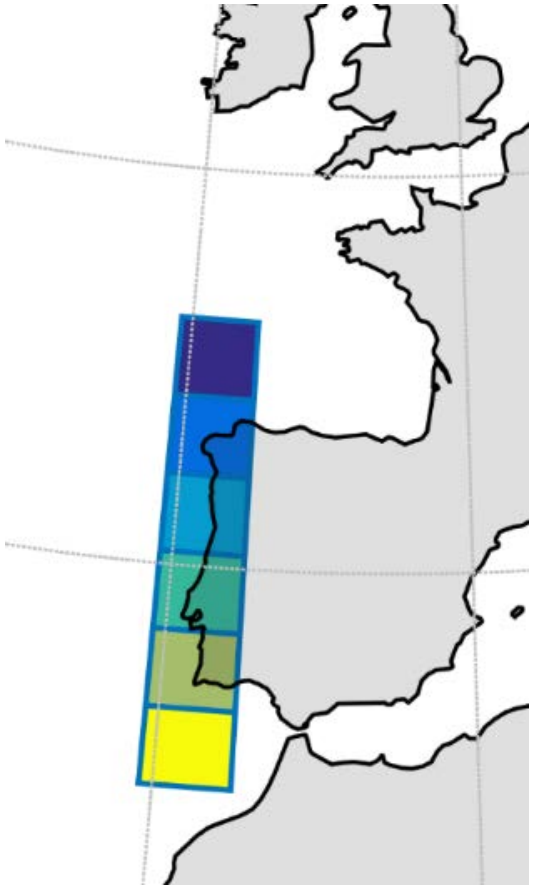
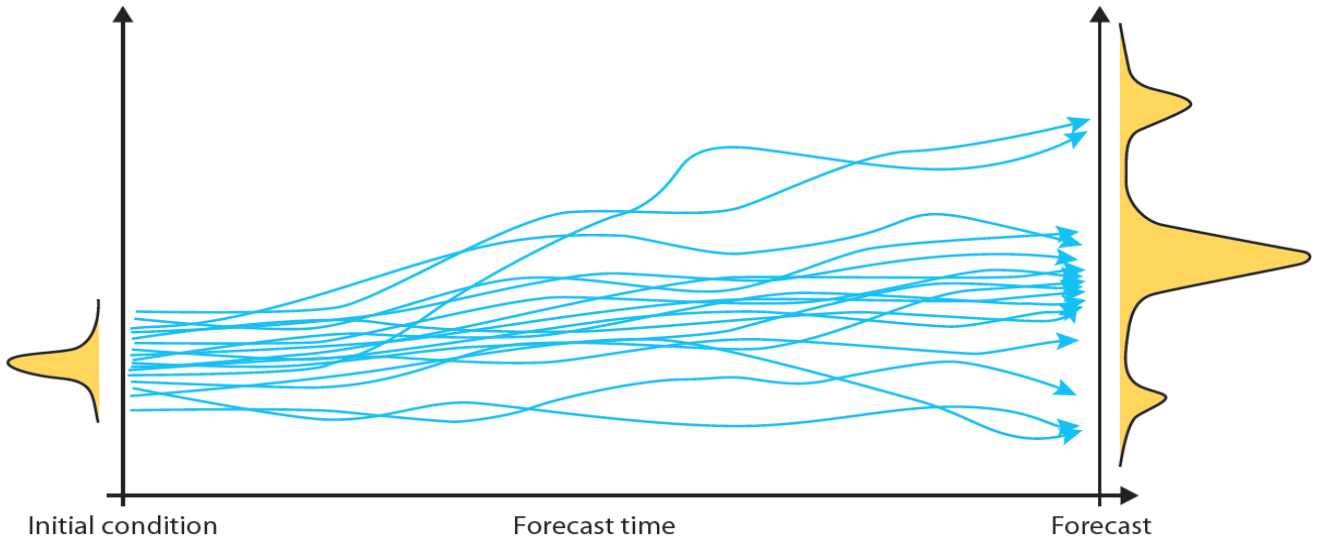
Iberian Peninsula



(200 events)

The operational and 50 perturbed ensemble members (out to forecast day 15) from the ECMWF ensemble prediction system, were retrieved for the 00UTC and 12UTC initialization for:

- Four extended winter seasons (October to March) of **2012/2013, 2013/2014, 2014/2015 and 2015/2016;**
- **IVT (intensity and direction);**
- Horizontal resolution of 0.25º x 0.25º



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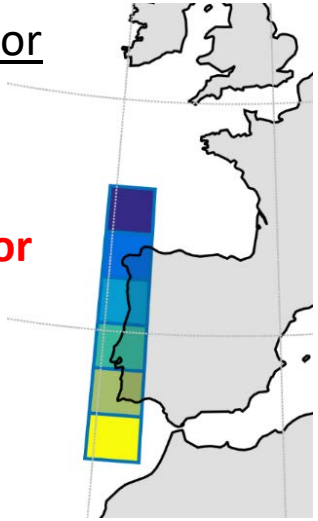
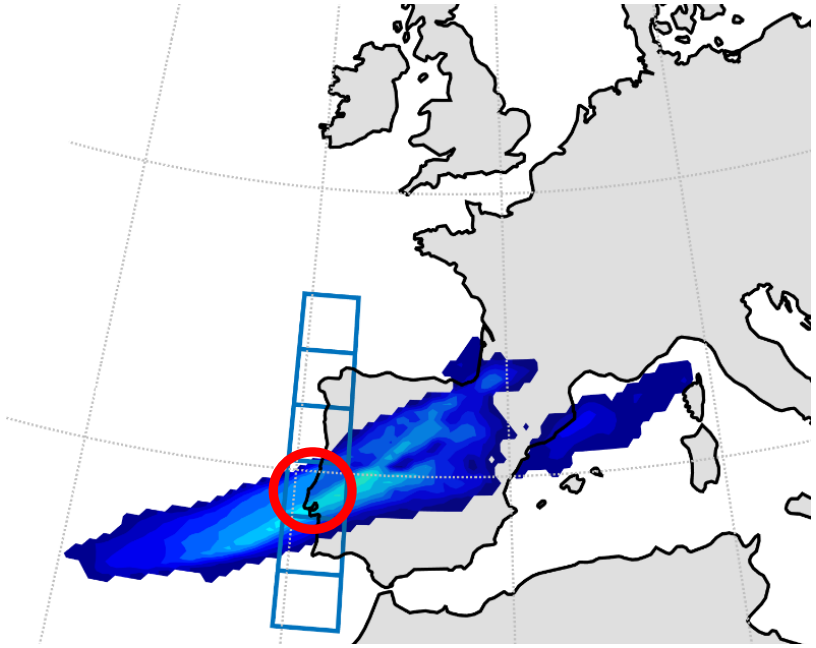
Dataset & Methods

For the days with mean IVT value inside a box **> 450 kg/m/s,** we compared the analysis for AR events (at 00 UTC or 12 UTC) against the forecasts made in previous days (-24h, -48h,...-336h) using the following metrics:

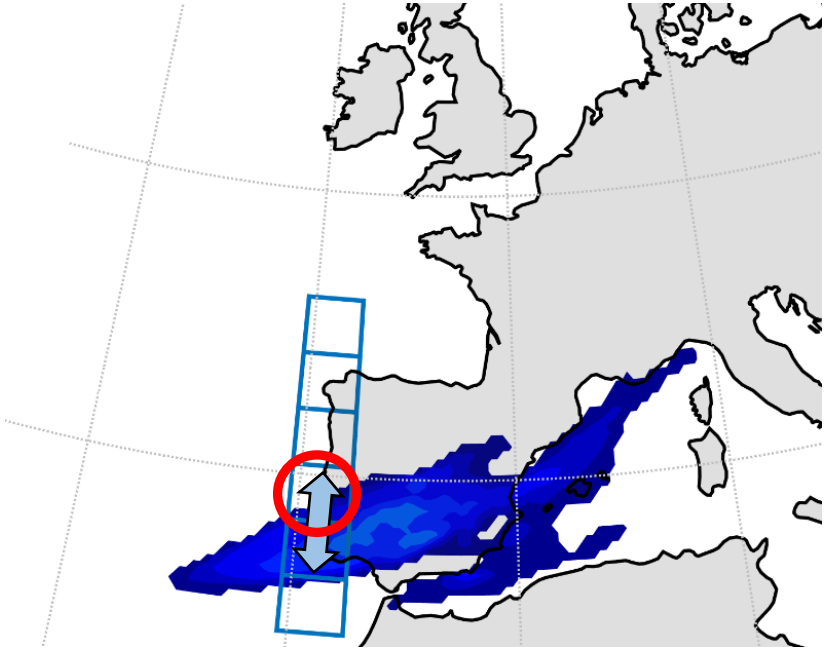
- **the location (latitude) of the *observed/predicted* AR axis (maximum IVT) – Landfall distance**
- **the intensity (mean IVT in the box) at the latitude of *observed/ should have been predicted* – Landfall IVT Error**

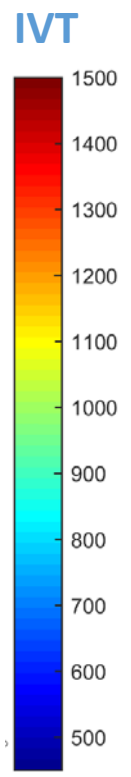


Analysis
11-Jan-2016 00UTC



Forecast (day –5)
6-Jan-2016 00UTC +120h





Example for 11-Jan-2016

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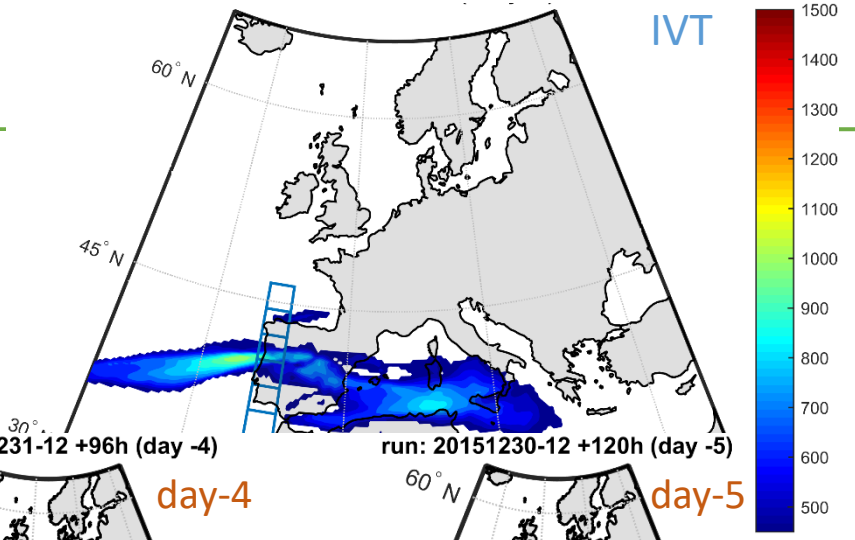
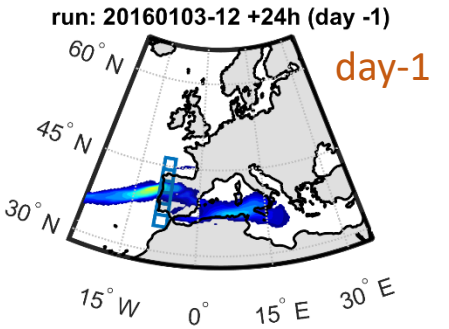
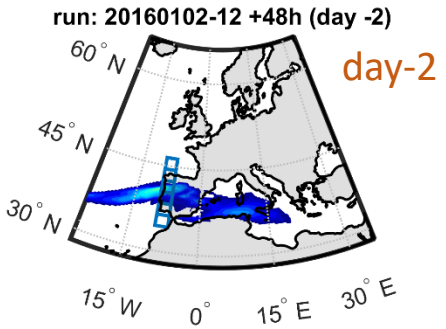
Example

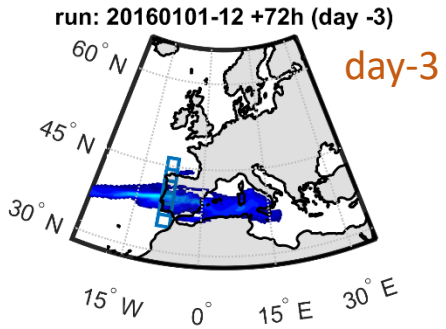
04 Jan-2016 12UTC - Analysis

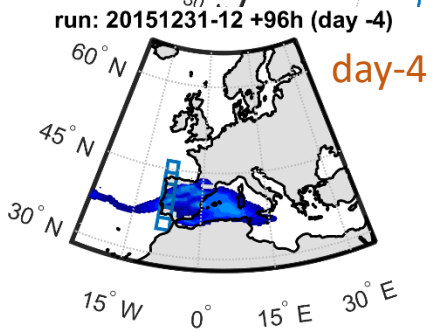


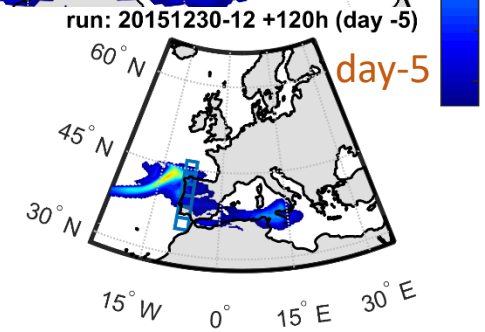
Evolution of the Operational RUN Forecast

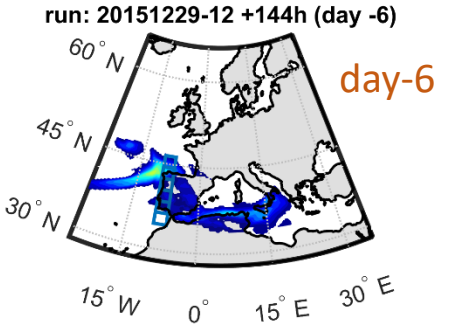


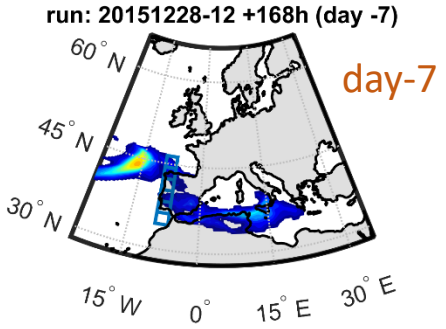


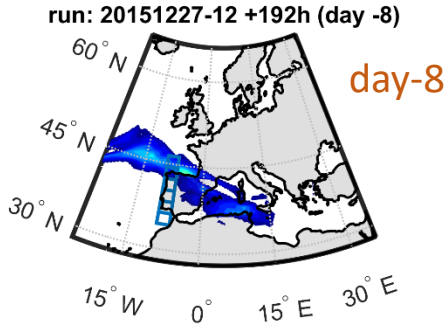


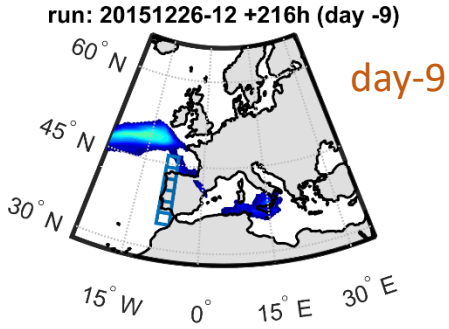


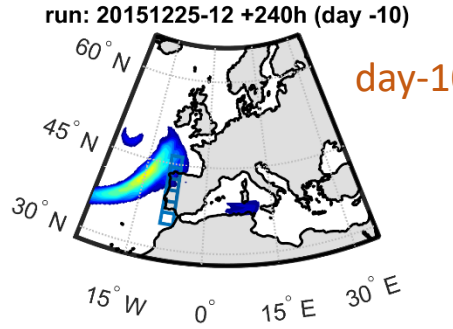


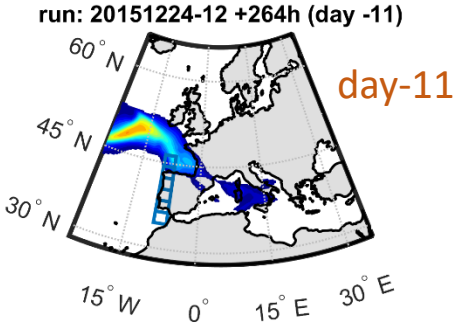


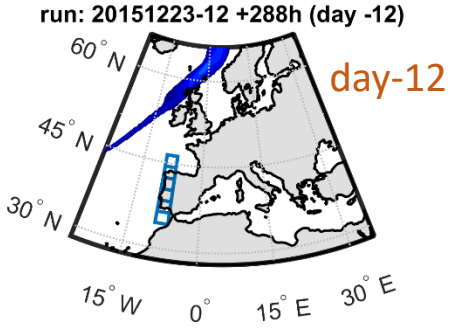


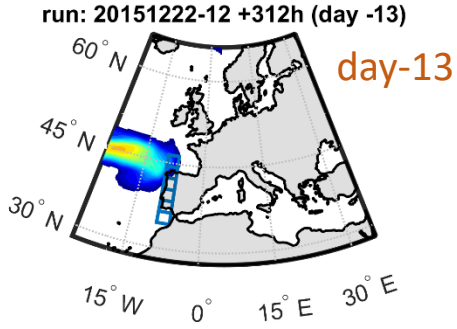


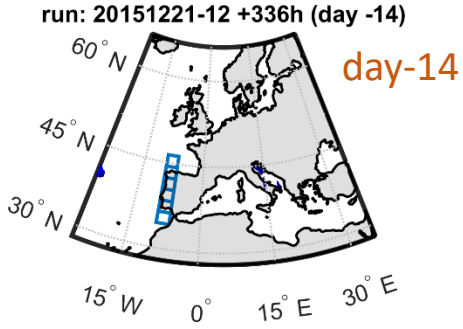












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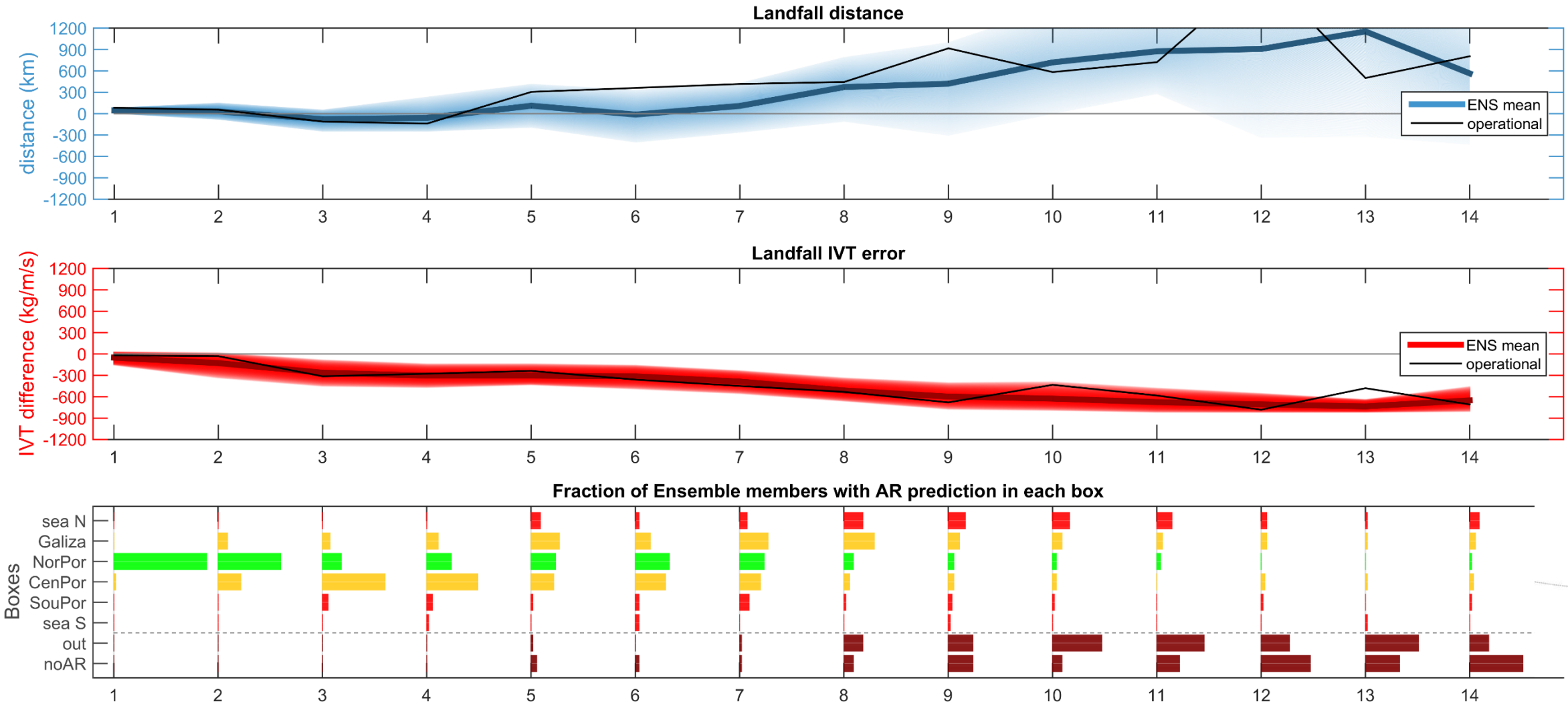
04 Jan-2016 12UTC – Ensemble Forecast



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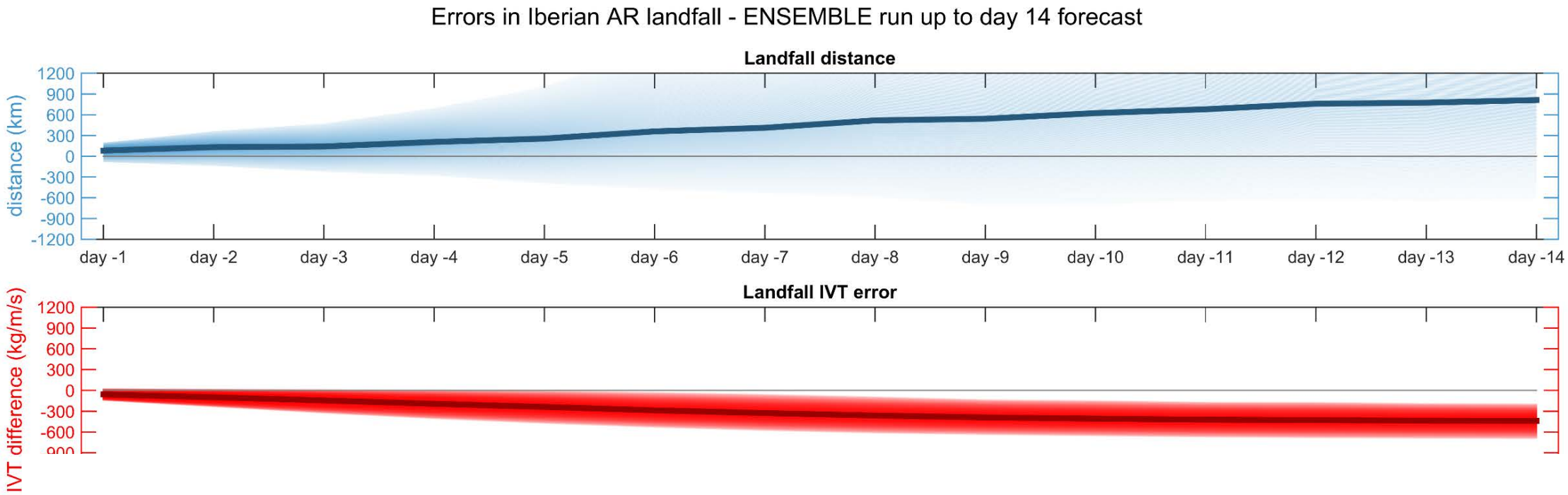
ARs Predictability Iberian Peninsula

Mean of all operational forecasts (200 events)



ENSEMBLE FORECAST – 200 cases x 50 Members

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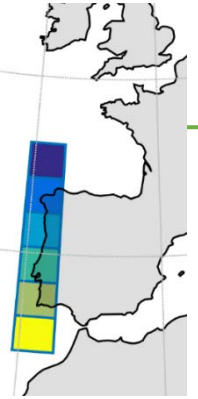
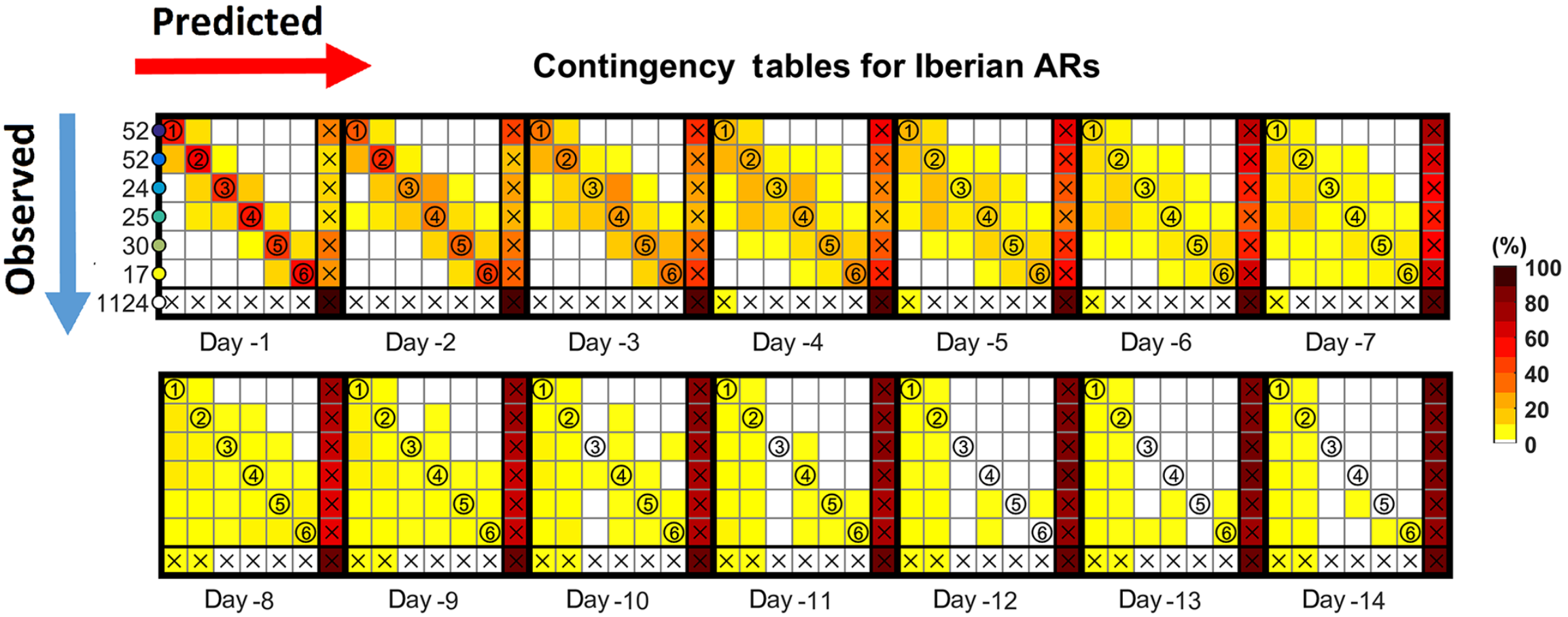


All operational forecasts (200 events)



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Final Remarks

- It seems that there is some predictability on the characteristics of the ARs affecting the Iberian Peninsula
- The **location** and **intensity** of the **AR landfall** position, are well predicted until forecast day 5 and lower when going to longer forecast periods;
- At longer forecast times detail is lost regarding the **specific latitude** of the landfall, but there is still good predictability for potential ARs occurring in the Iberian Peninsula;
- ARs tend to be forecasted further north than observations in Iberia as forecast times increase;
- Mean IVT values tend to be underestimated for longer range forecasts;
- The use of the ensemble forecast, along with knowledge of systematic errors/biases, will be useful for the probabilistic forecast of the location and intensity of the ARs;

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Acknowledgments

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