Towards the first "eddy-resolving" climate prediction system: The 2015 subpolar "Cold Blob" and European summer heat waves

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Workshop on
"Multi-annual to decadal Climate Predictability in the North Atlantic-Arctic Sector "
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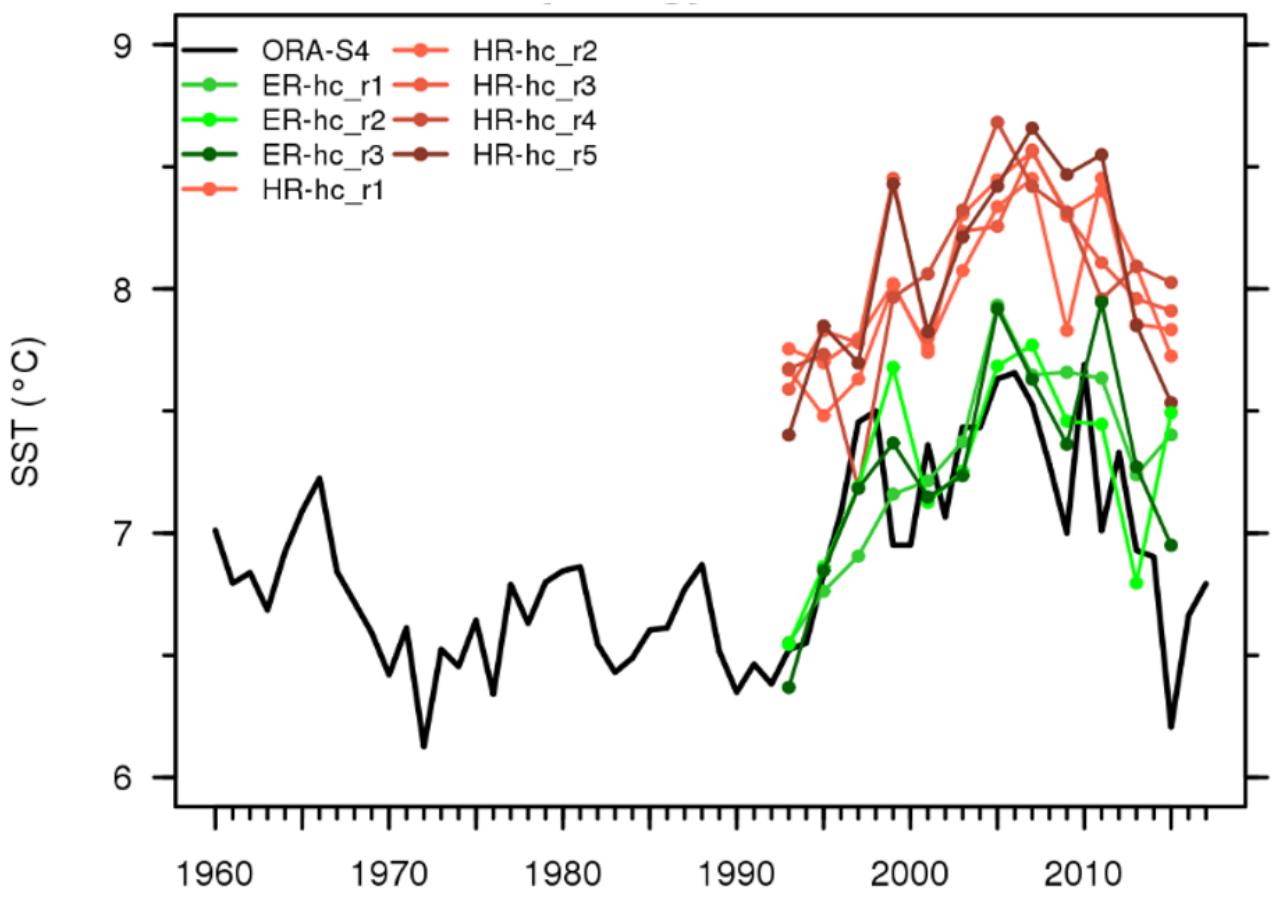
MPI-ESM-ER "eddy-resolving" climate prediction system

- Ocean component: tripolar grid with 0.1° nominal resolution, 40 z-levels Atmosphere component: spectral grid T127 (1°), 95 hybrid levels (high top)
- 3 ensemble members initialized in Nov every 2nd year between 1992 and 2012 (2 years long), ensemble generation by 1 day lag initialization
- 10 ensemble members initialized in Nov 2014 (2 years long) and Nov 2013 (3 years long)
- Initialisation of 3D oceanic T and S anomalies (ORAS4), sea ice cover anomalies (National Snow and Ice Data Center), full-field atmospheric state (ERA40, ERA-Interim)
- Bias correction of prediction experiments based on ensemble mean 1992 to 2012 hindcasts

Predicted North Atlantic Subpolar Gyre SST – lead time 1 year



CMIP6 (Eddy-Permitting)

Eddy-Resolving

Observations

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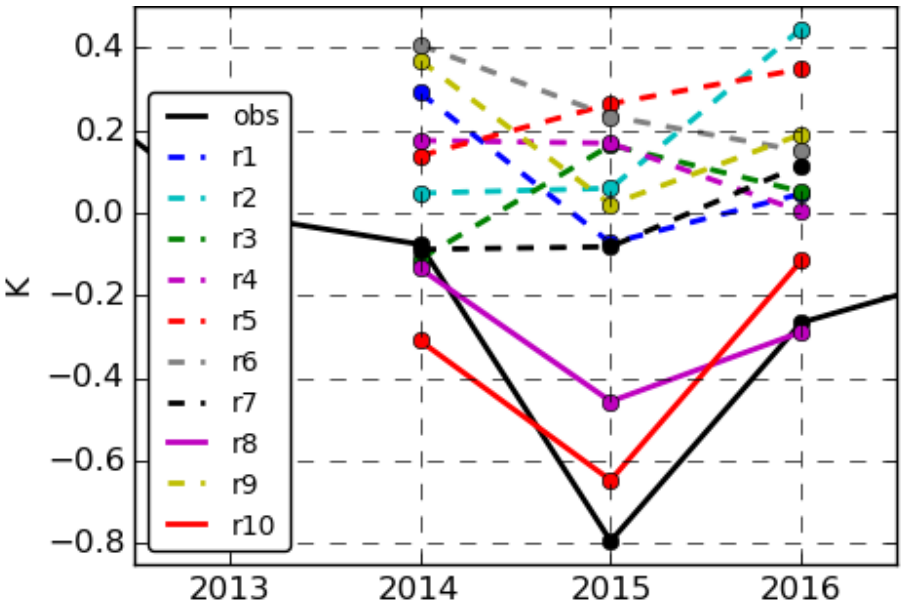
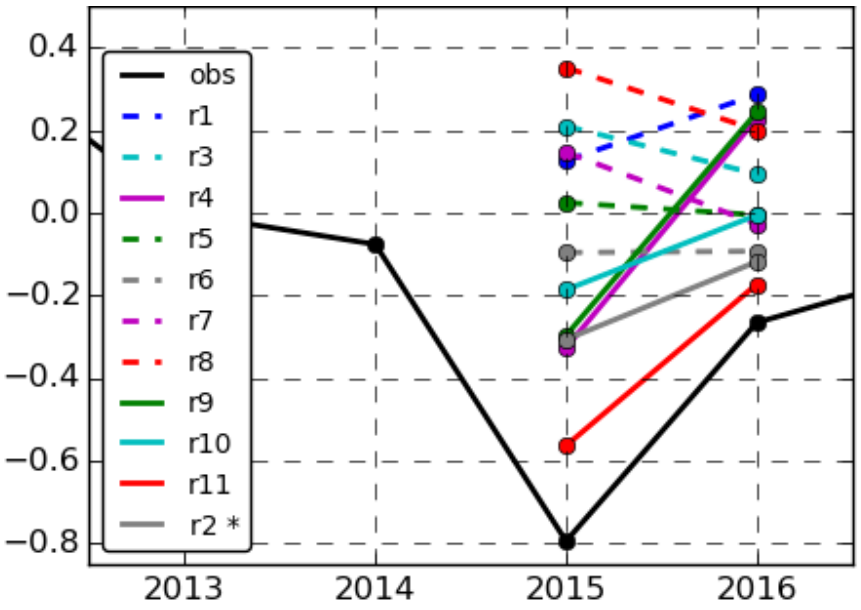
2015 Subpolar "Cold Blob" in "eddy-resolving" prediction experiments

Ensemble Initialized in Nov 2013



Ensemble Initialized in Nov 2014



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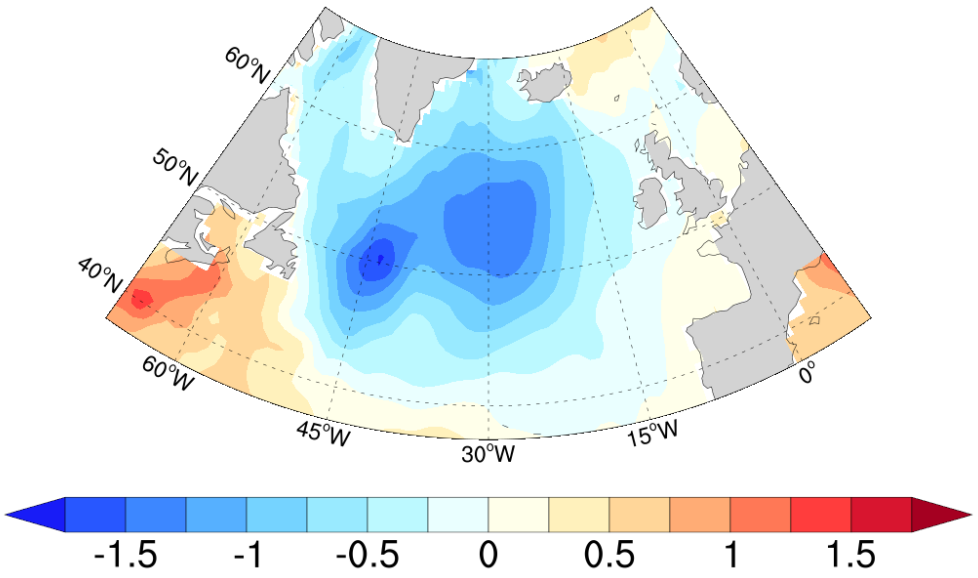
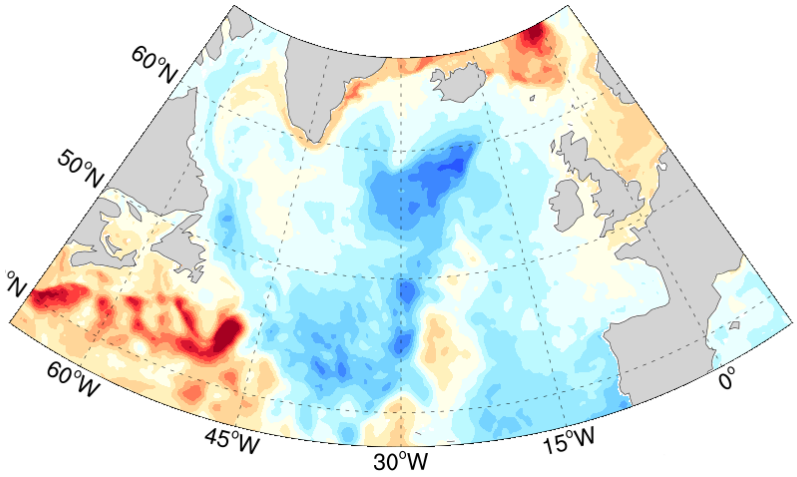
Subpolar SST in 2015

Observations



"Cold" ensemble mean hind_2014



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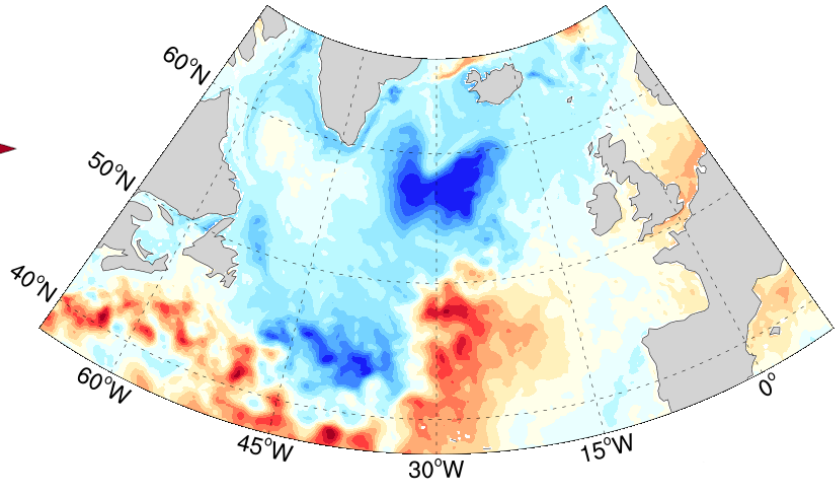

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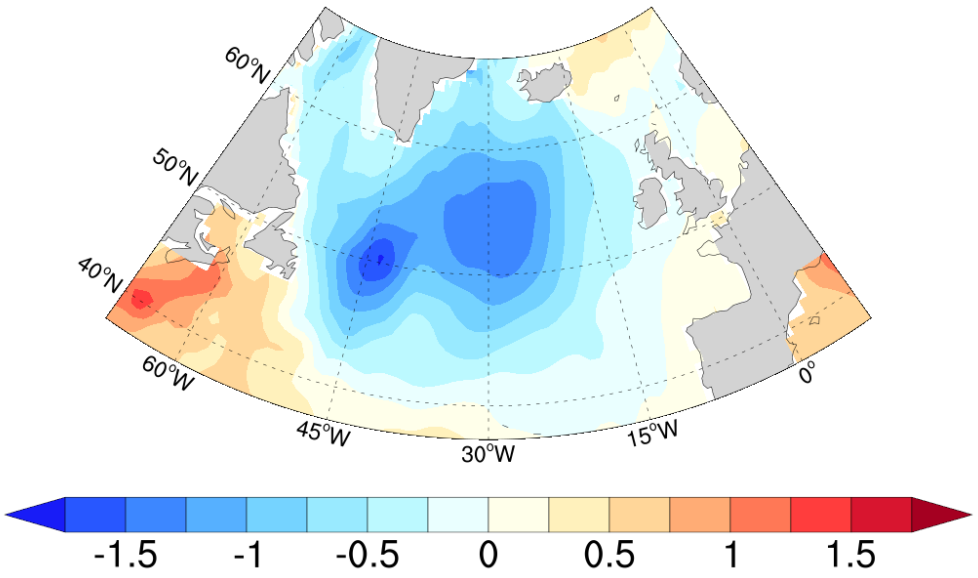
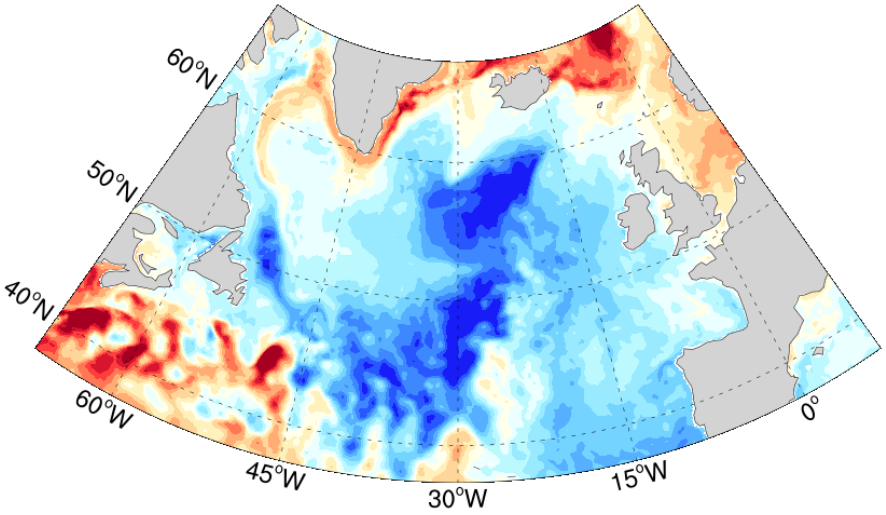
Subpolar SST in 2015

Observations



"Coldest" member hind_2014



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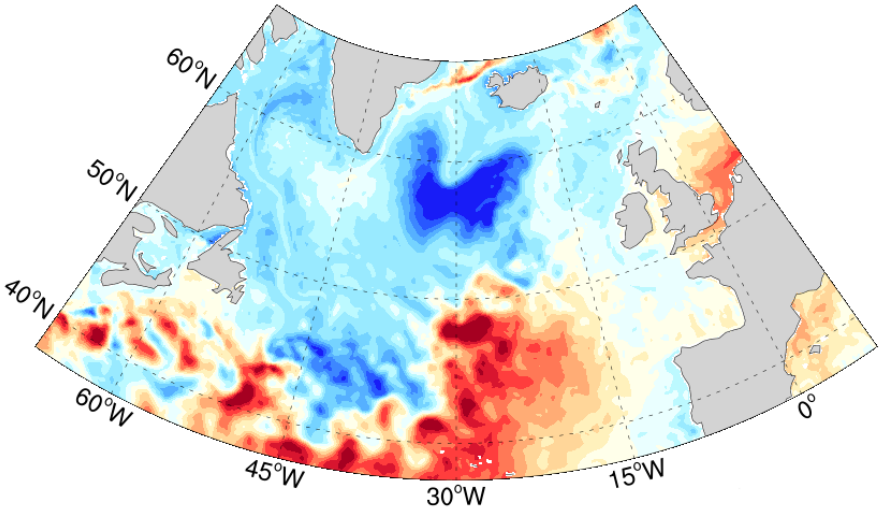

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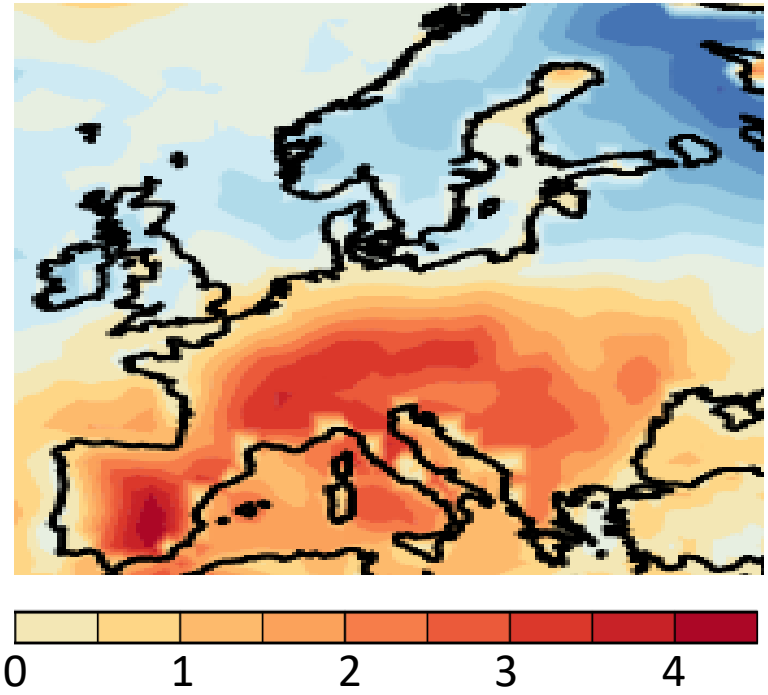
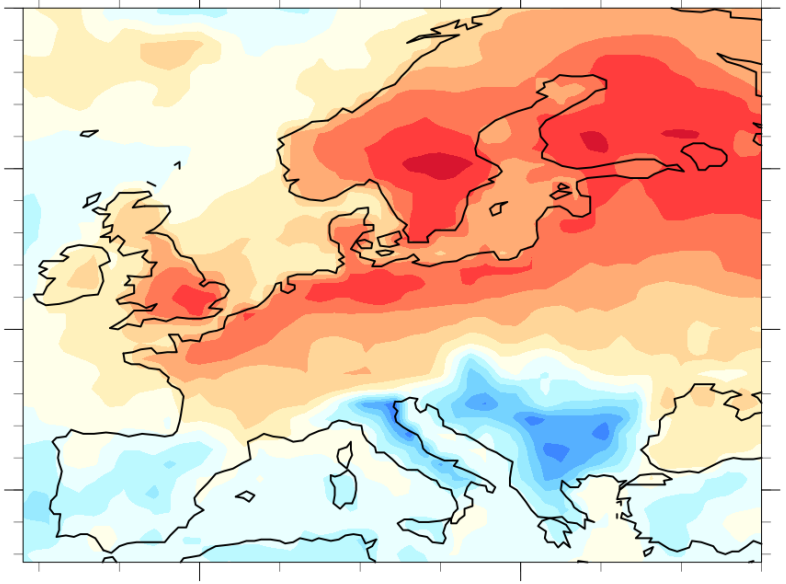
Surface air temperature in July 2015

ERA Interim



"Cold" ensemble mean hind_2014



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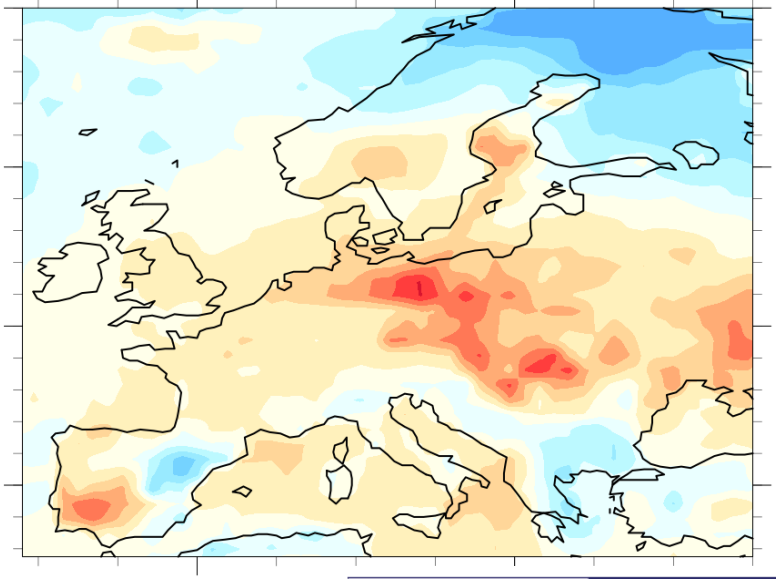

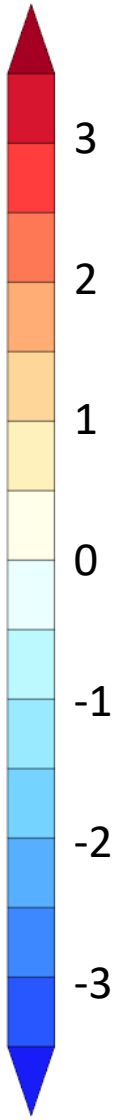

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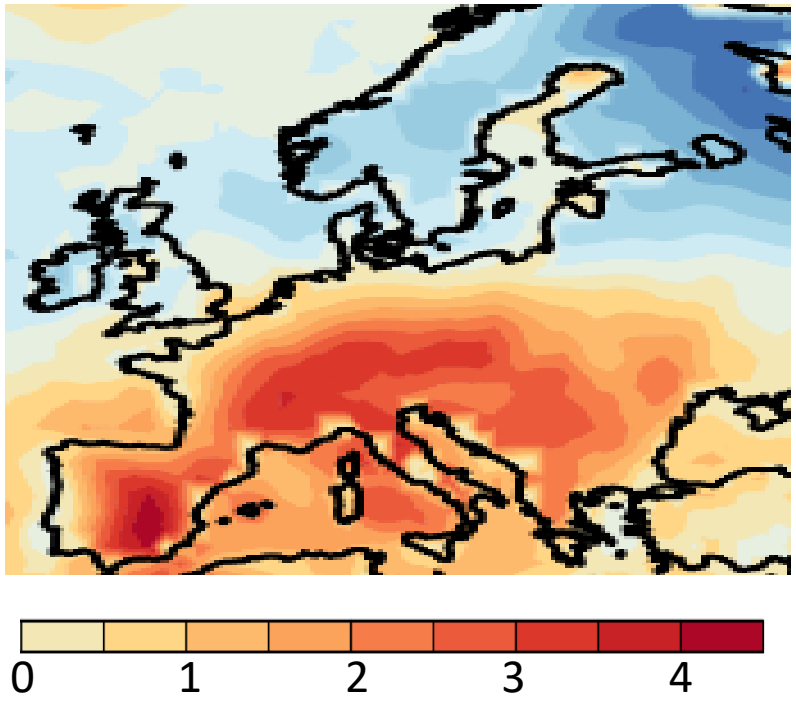
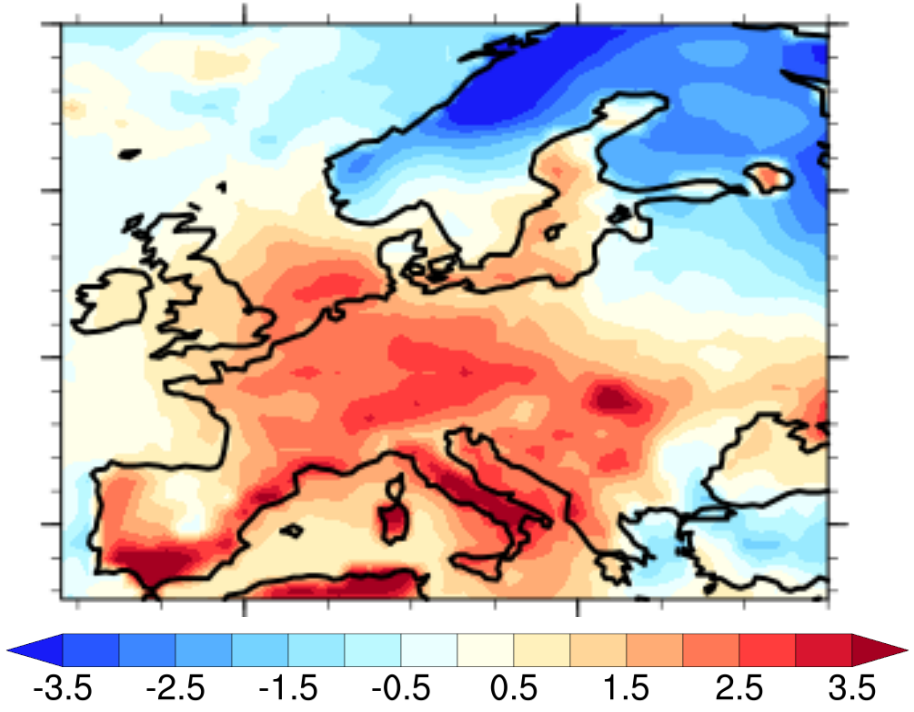
Surface air temperature

ERA Interim
in July 2015



"Coldest" member hind_2013
in June 2015



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Conclusions & *Outlook*

- **The "ocean eddy-resolving" grid configuration improves the mean state of subpolar SST**
- **Large enough ensembles can predict a 2015 Subpolar "Cold Blob" and associated European summer heat waves up to one year ahead**
- **Predicting spatial extent and timing remains a challenge → *assess NAO evolution in prediction experiments***
- ***Assess the predictability of 2015 subpolar "Cold Blob" and European summer heat waves in the "ocean-eddy-resolving" historical simulations***
- ***Assess the predictictability of 2015 subpolar "Cold Blob" and European summer heat waves in MPI-ESM-HR CMIP6 prediction and historical experiments ("ocean-eddy-permitting", identical initialisation and ensemble generation)***

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Thank you!

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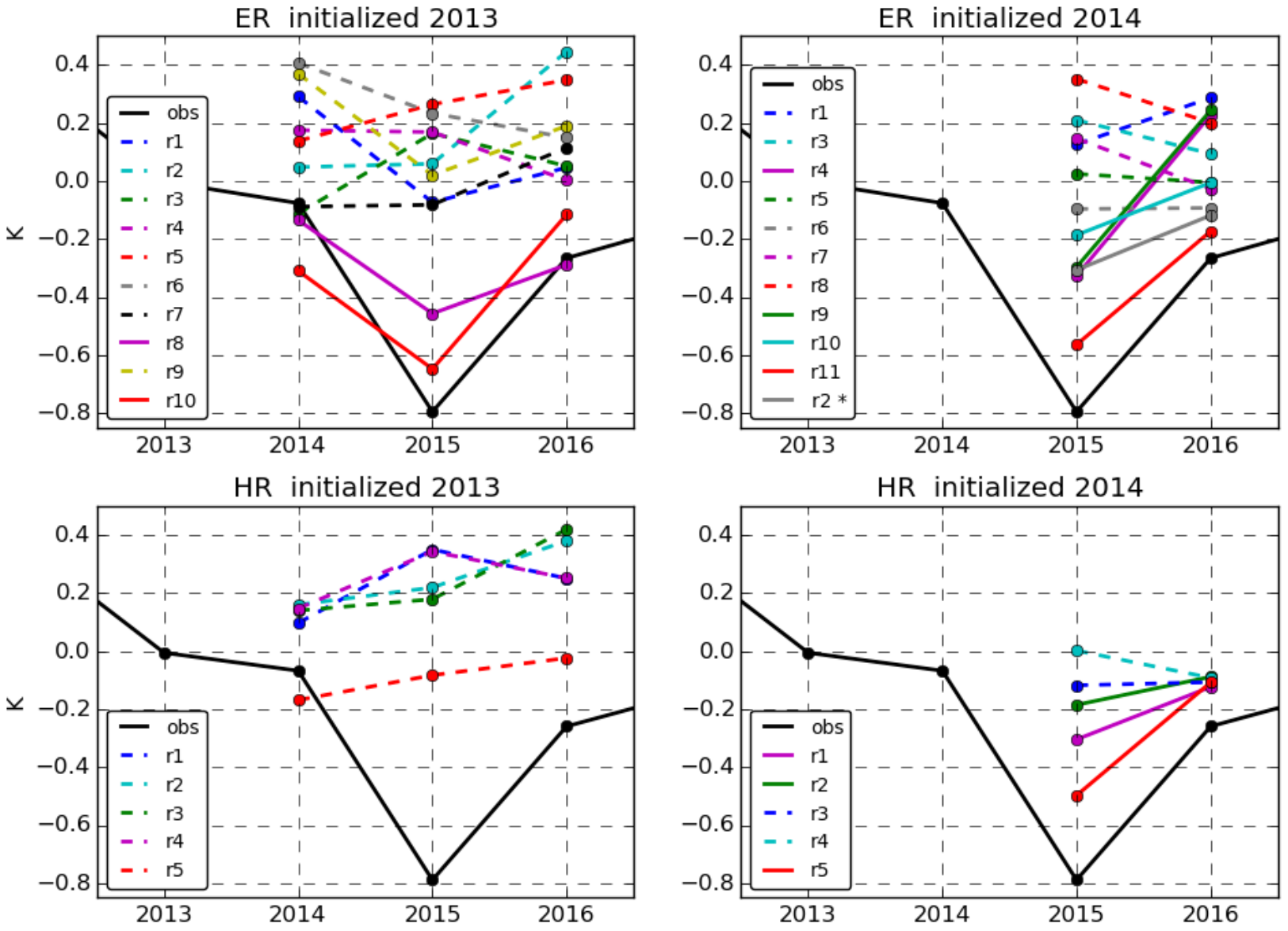
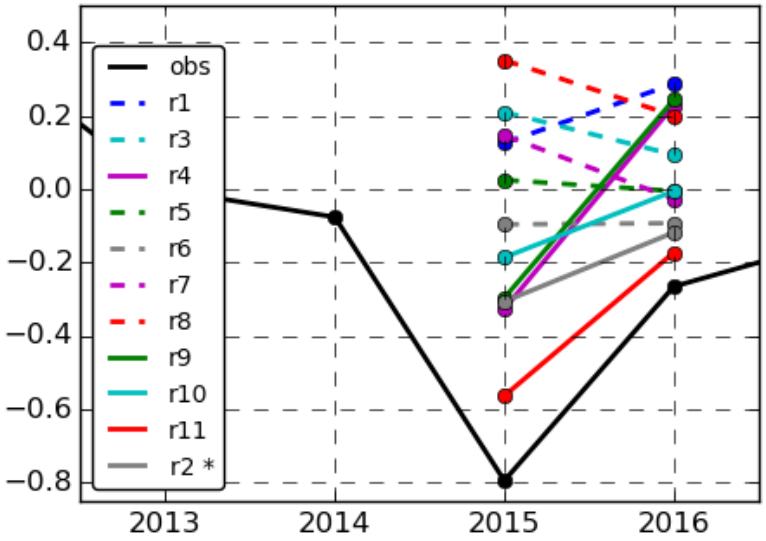
Subpolar SST

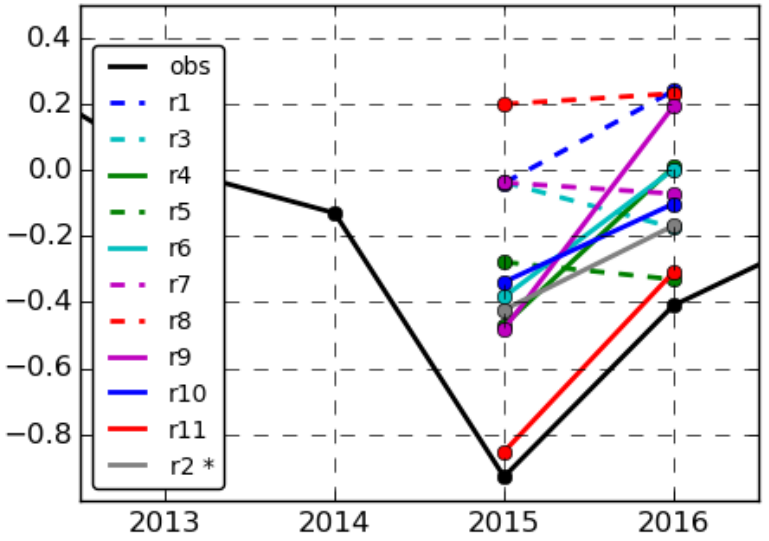


Subpolar SST

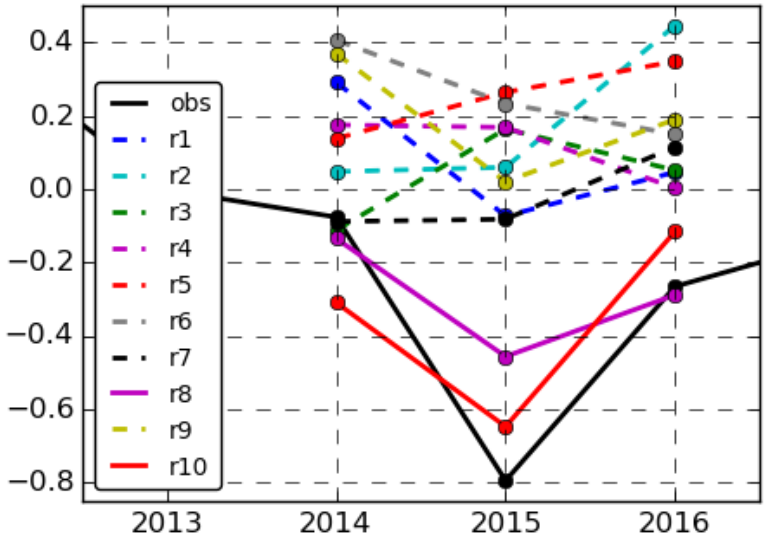
Eastern Subpolar SST

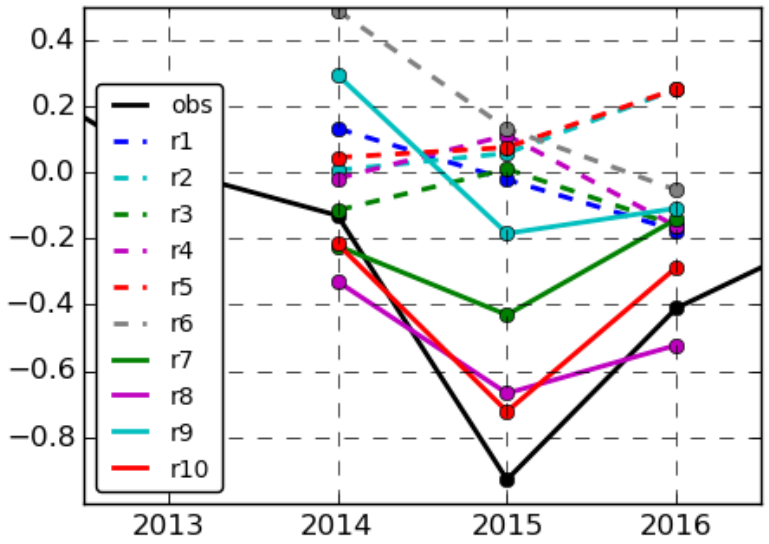
2014





2013





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