Met Office
Hadley Centre

Forecast
December 2014-February 2015

Sources of predictability

- ENSO (seasonal)
- QBO (seasonal)
- GLOBAL SST (seasonal)
- SEA ICE (interannual)
- SNOW (seasonal)
- VOLCANOES (interannual) – not expected to contribute this year
- SOLAR (interannual) – not expected to contribute this year

Sources of predictability

- ENSO (seasonal) – moderate El Niño → negative NAO late winter
  - observations, models

- QBO (seasonal) – easterly phase → negative NAO early winter
  - observations, models (to a certain extent)

- ATLANTIC SST (seasonal) – tripole in May SST → DJF NAO
  - observations, models

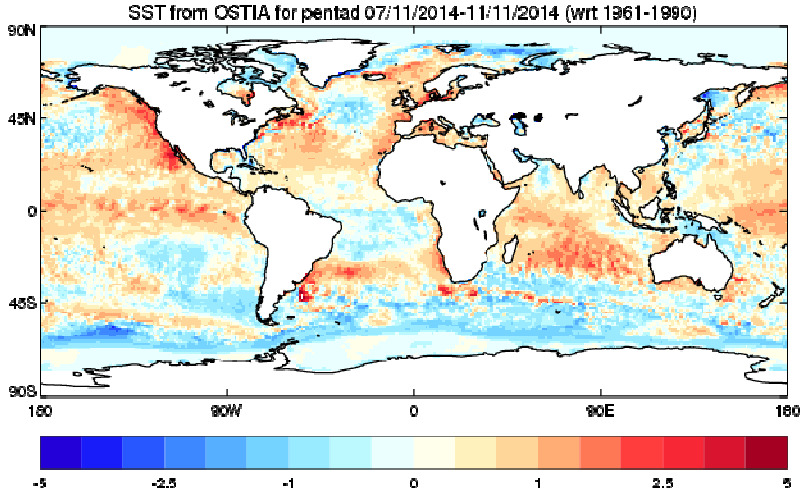
    - TNA negative – NAO+
    - Indıan Ocean

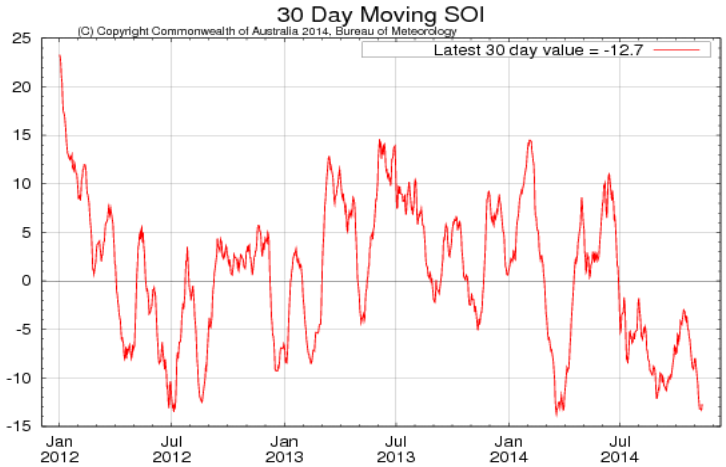
- SEA ICE (interannual) – low September sea-ice → negative DJF NAO
  - observations, models ; not yet well established

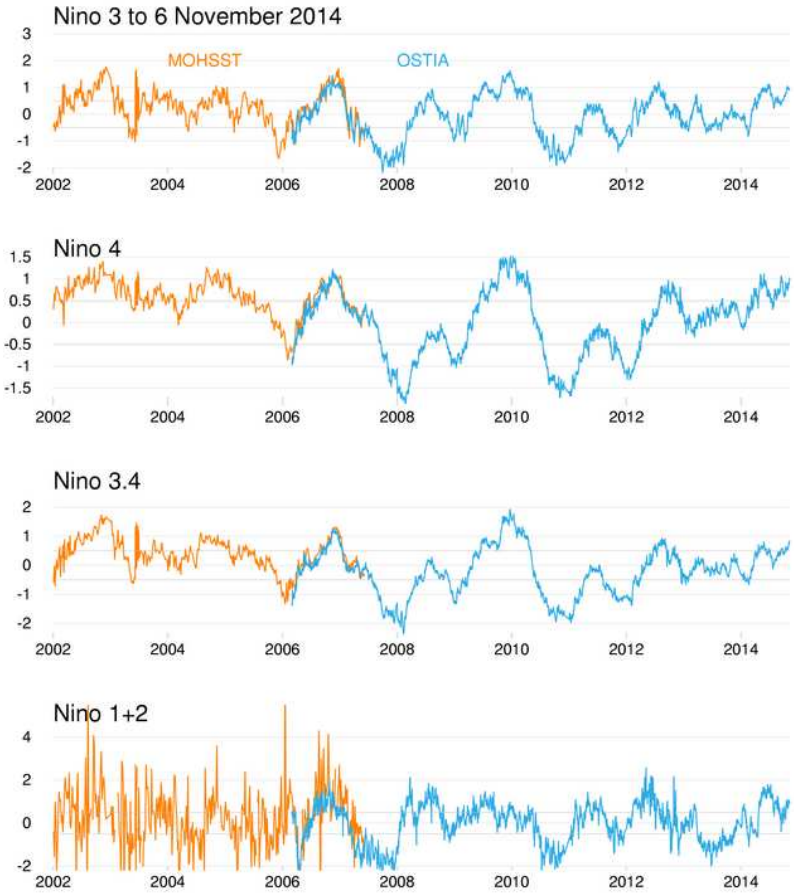
- SNOW (seasonal) – Eurasian snow cover or advance of snow in October → negative correlation with AO;
  - observations (no consensus), not in models

ENSO

7-11 Nov



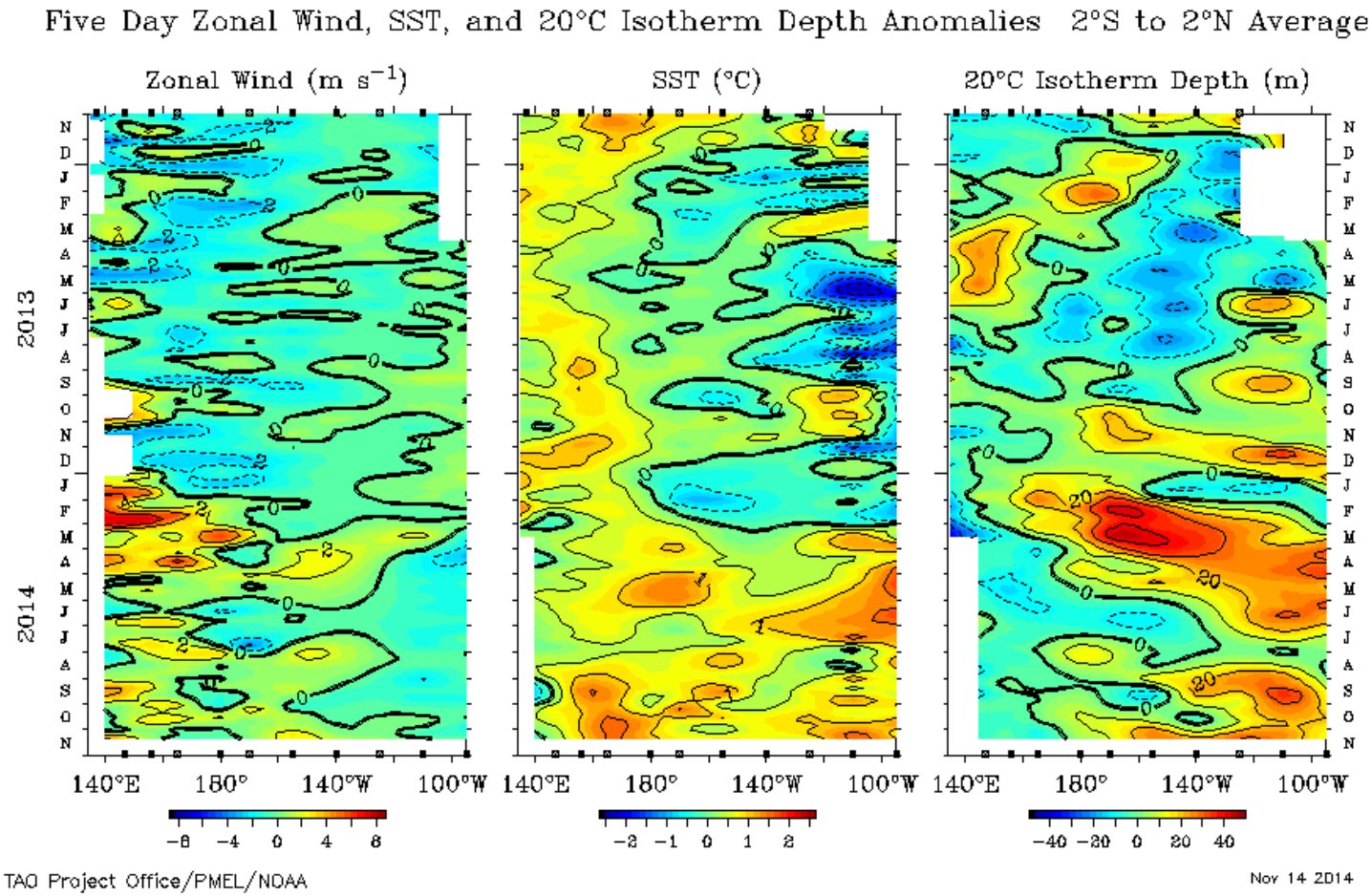




ENSO - 14 Nov

u wind SST 20 deg isotherm

Time



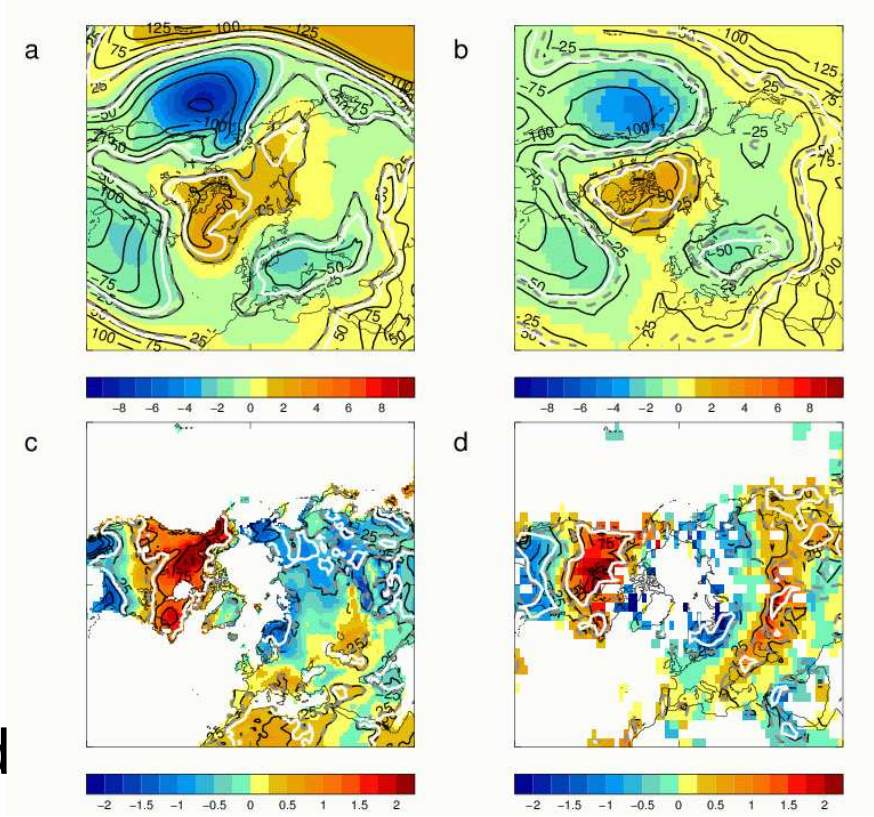
El Niño and Europe

Late winter North Atlantic – European response to El Niño tends to be:

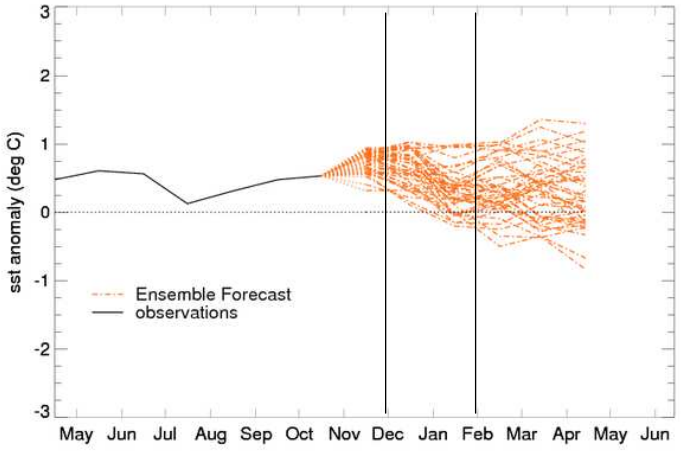
- pressure pattern resembling negative phase of the North Atlantic Oscillation (a, b)

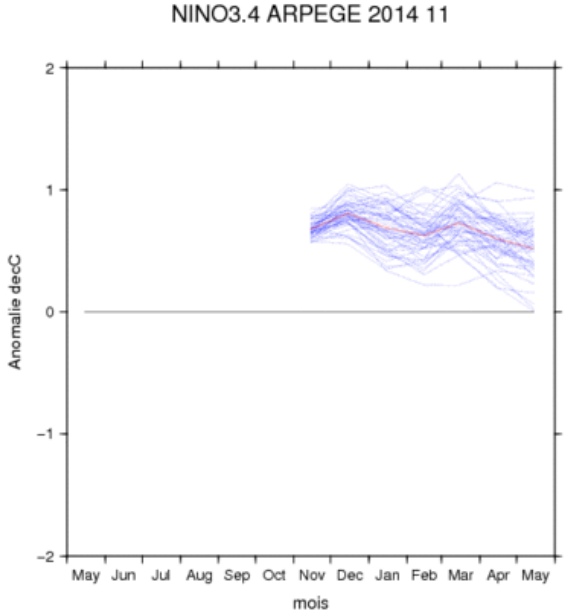
- cold in northern Europe, mild in southern Europe (c, d)

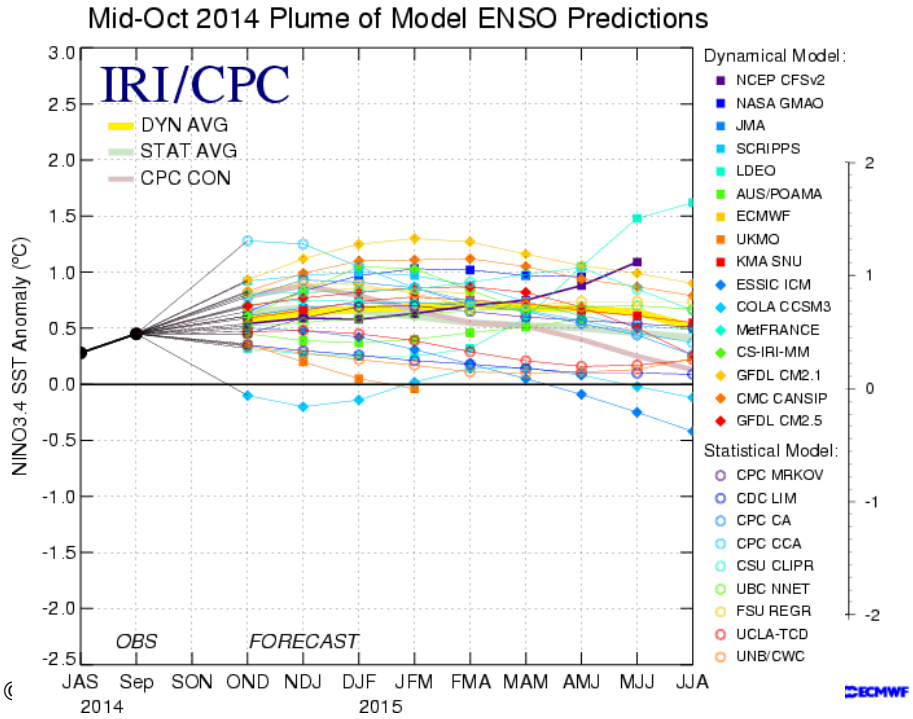
This response can be reproduced in a models which have a good representation of the stratosphere (Bell et al. 2009, Ineson and Scaife, 2009, Cagnazzo and Manzini 2009)

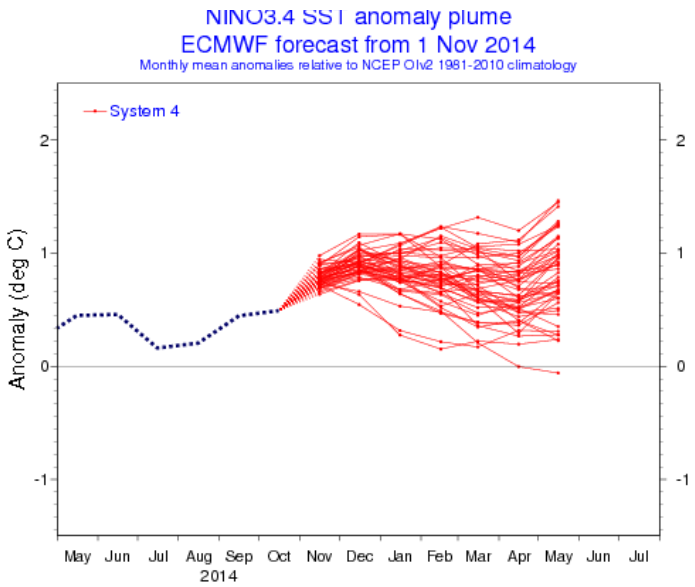


Nino3.4 forecasts Nov 2014- Apr 2015

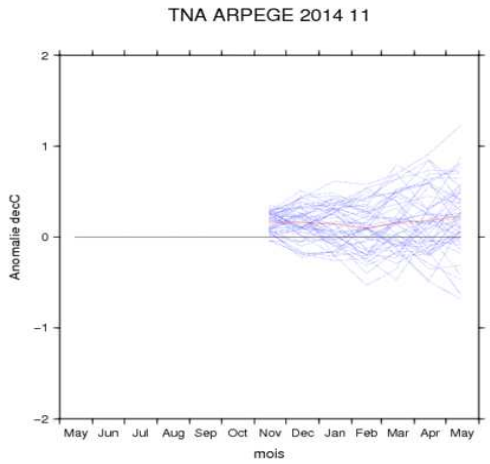


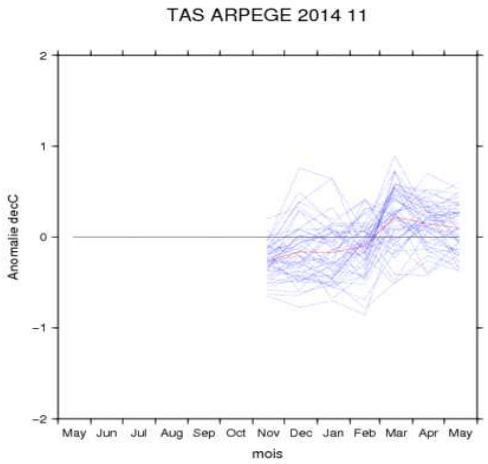


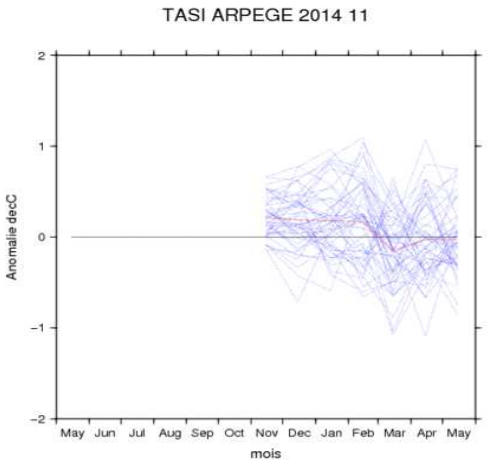


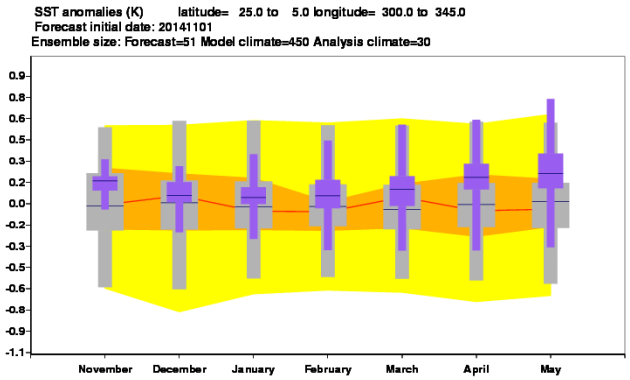


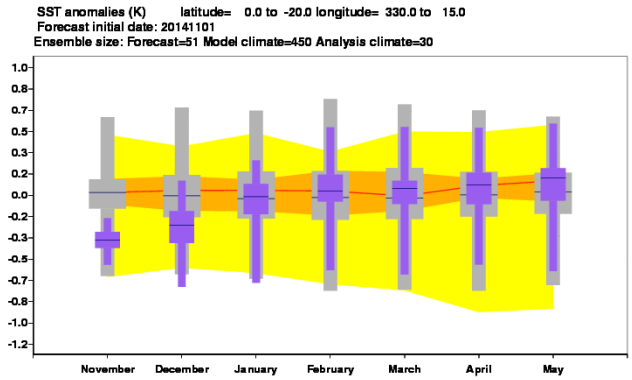
Tropical North Atlantic (TNA)

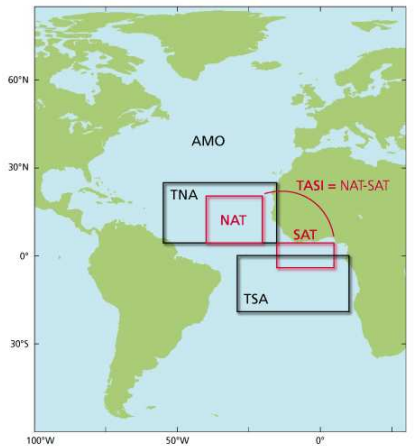






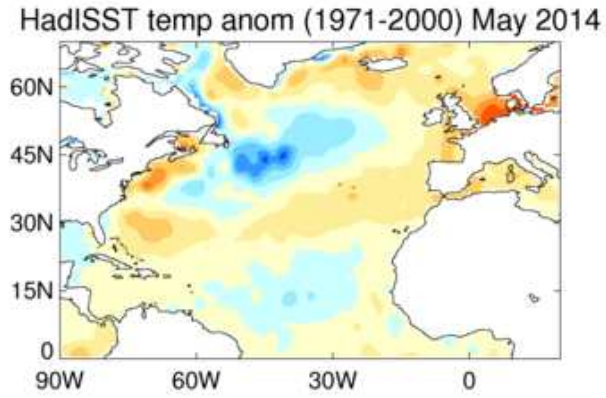






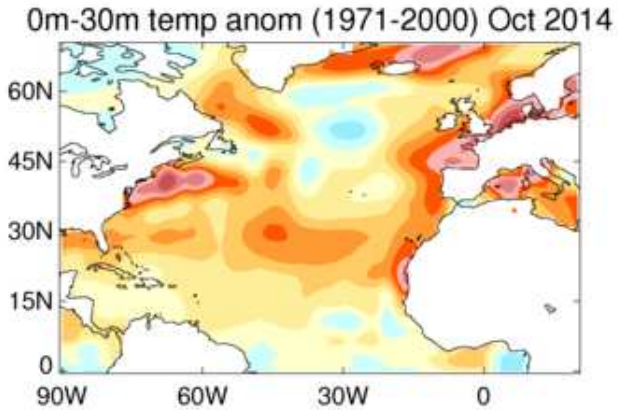
North Atlantic sea-surface temperature

May 2014



NAO prediction based on this factor alone: +0.5

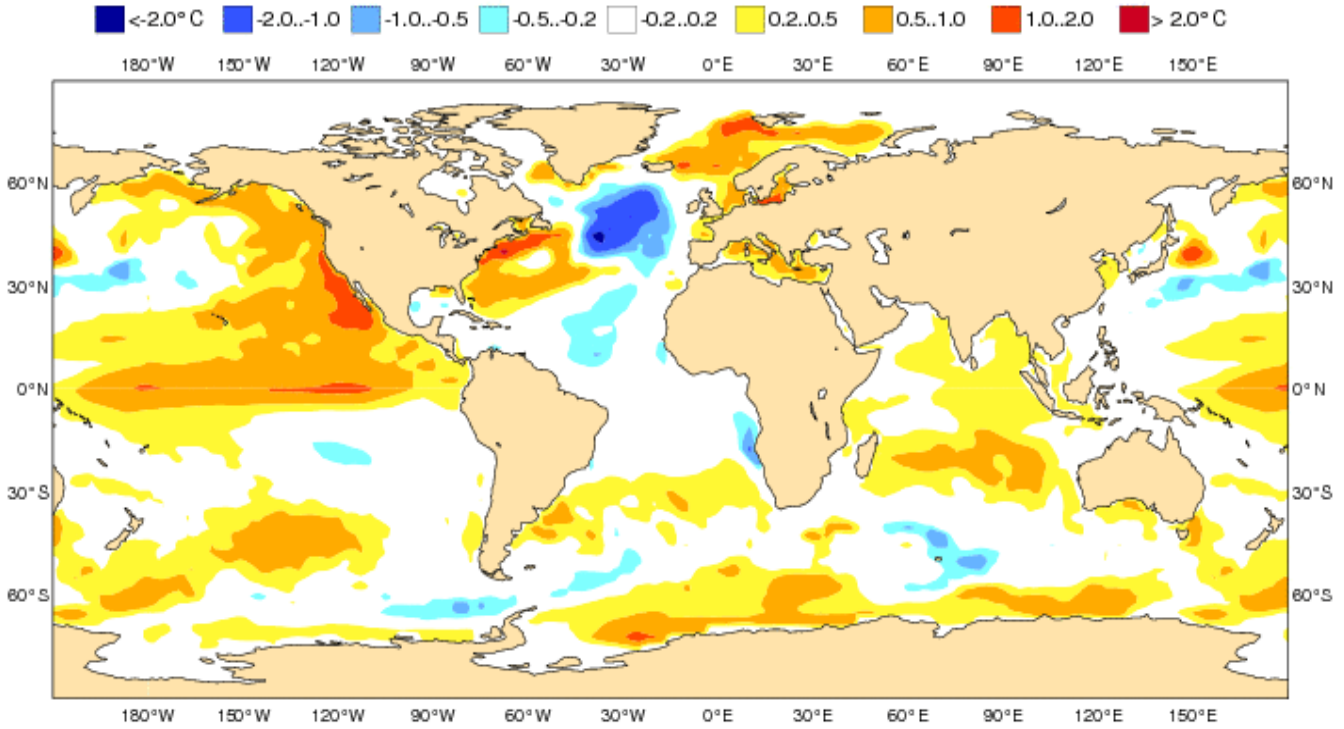
October 2014 – consistent with May pattern



Latest SST predictions
DJF

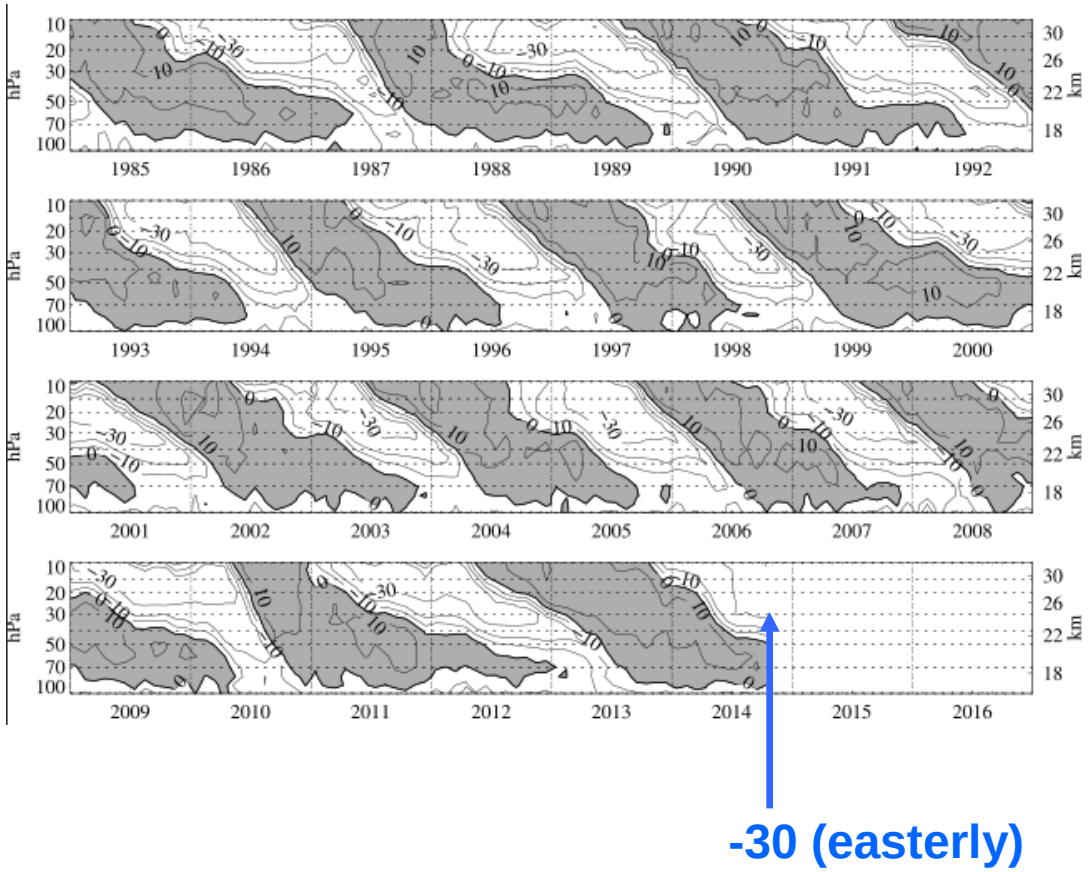
EUROSIP multi-model seasonal forecast
Mean forecast SST anomaly
Forecast start reference is 01/11/14
Variance-standardized mean

ECMWF/Met Office/Meteo-France/NCEP
DJF 2014/15



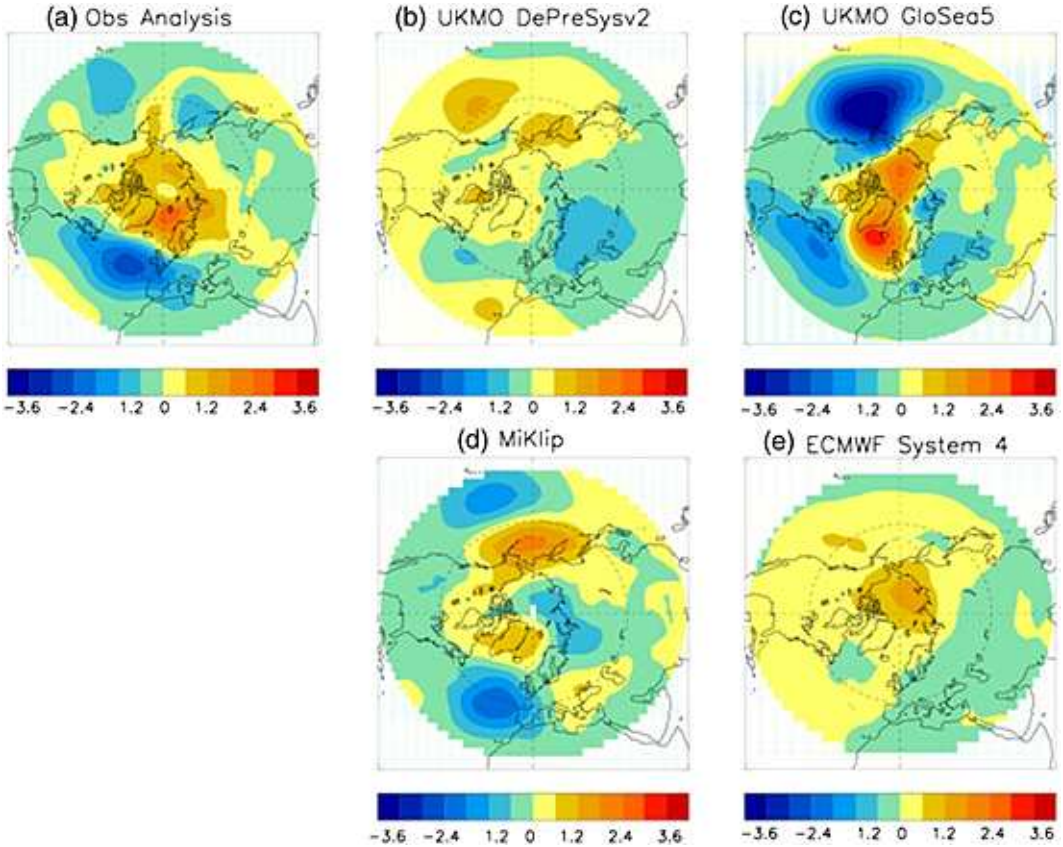
Stratosphere – QBO

Singapore ū (m s^{-1})

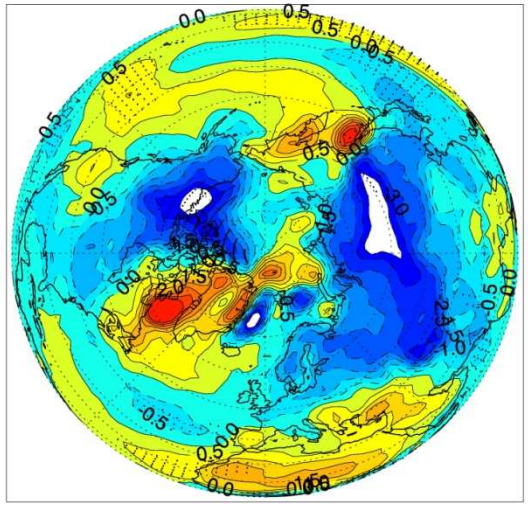


Quasi-Biennial Oscillation (QBO)
easterly-westerly phase
December-February

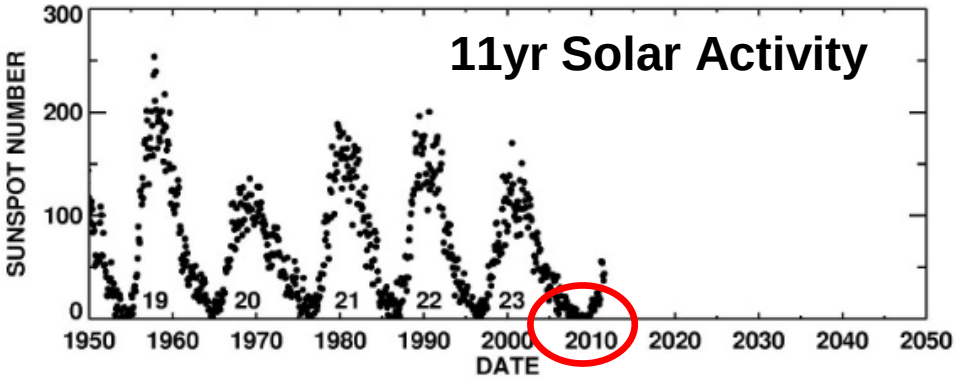
mean sea level pressure



temperature

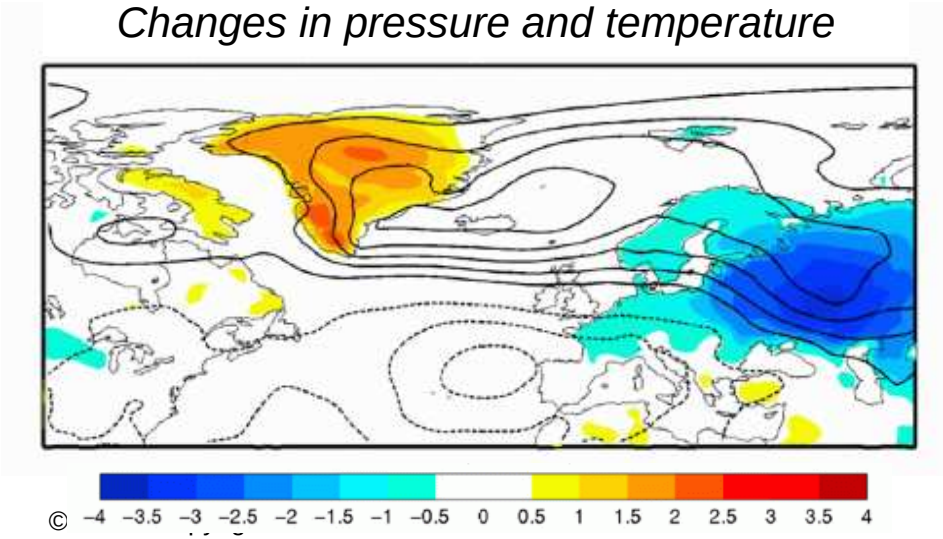


Solar variability



Solar Minimum minus Solar Maximum:

Changes in pressure and temperature

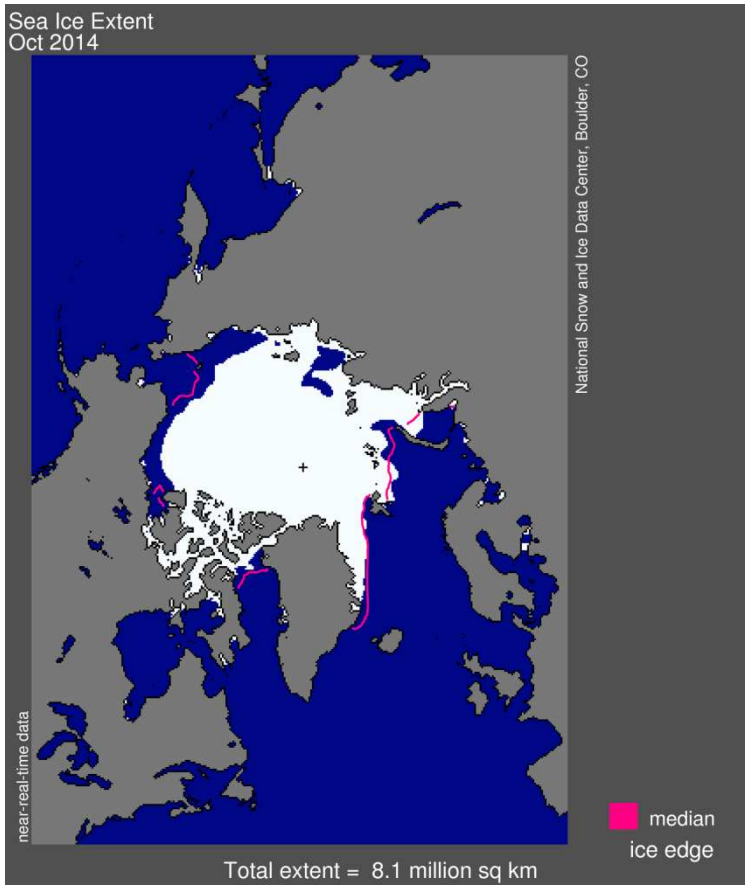


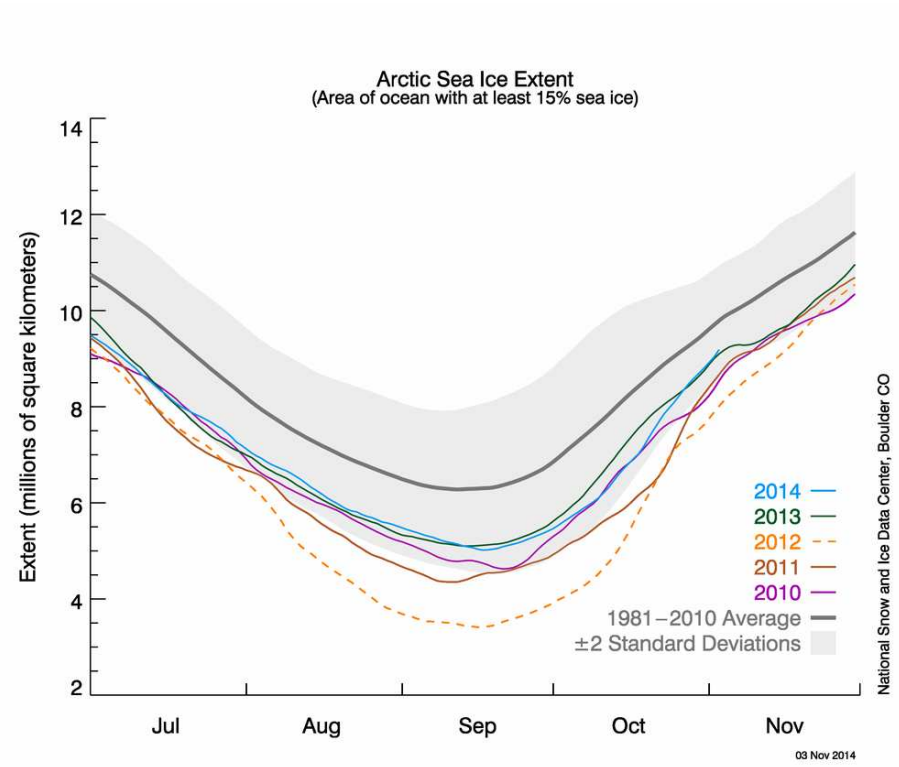
Surface air temperature anomalies **(Woollings et al, GRL)**

Solar min increases risk of:

- **Blocking**
- **Easterly weather types**
- **Cold Europe**
- **Cold UK**

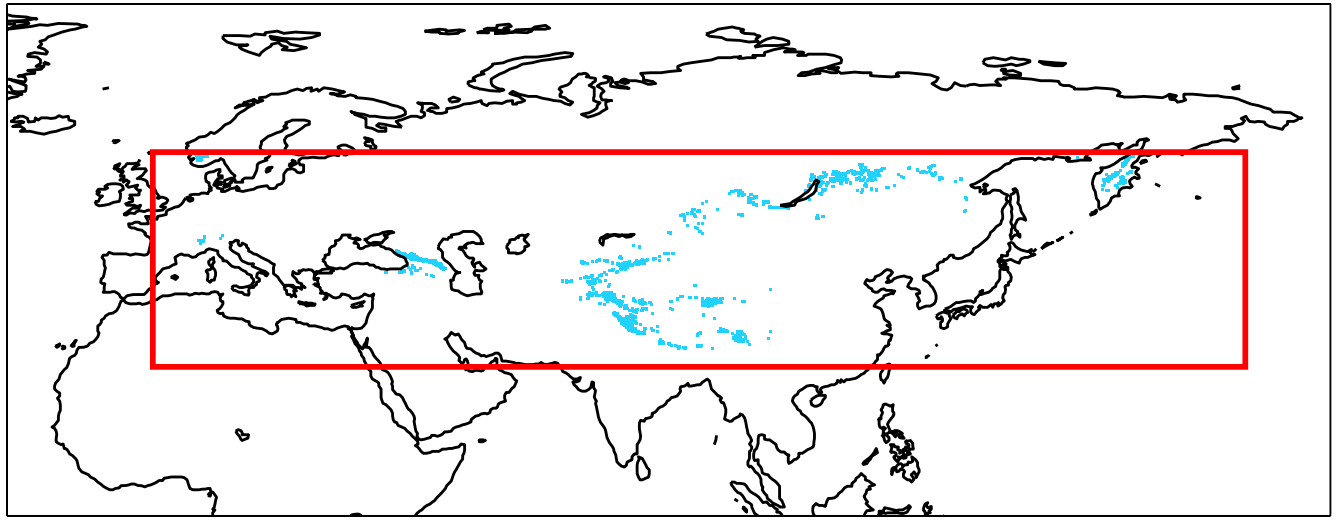
Arctic sea ice cover – to 14 Nov



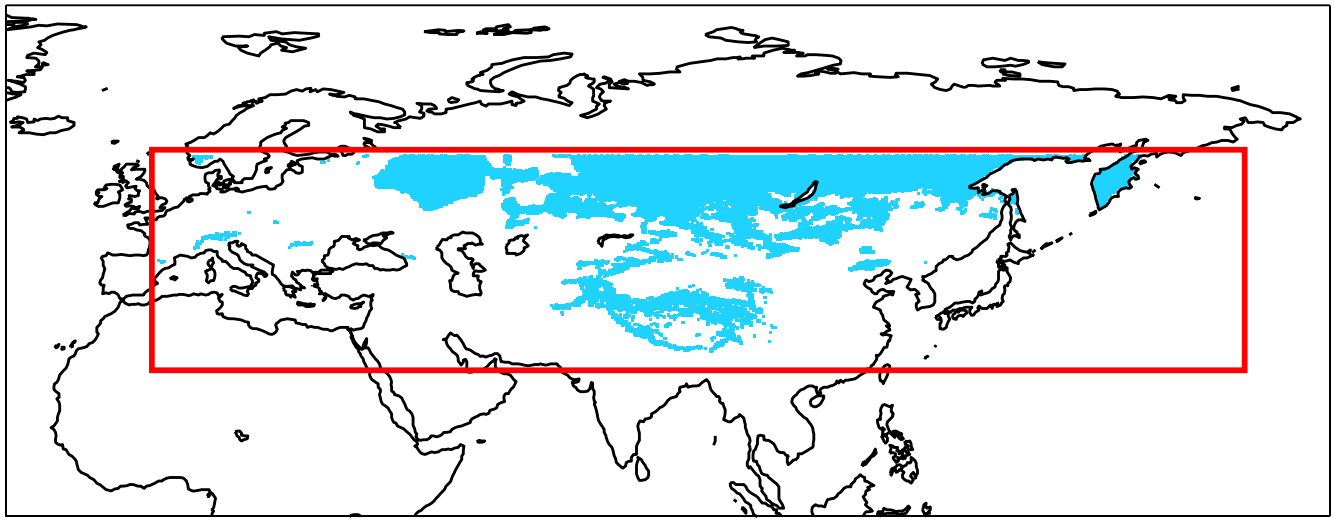


snow cover driven predictability

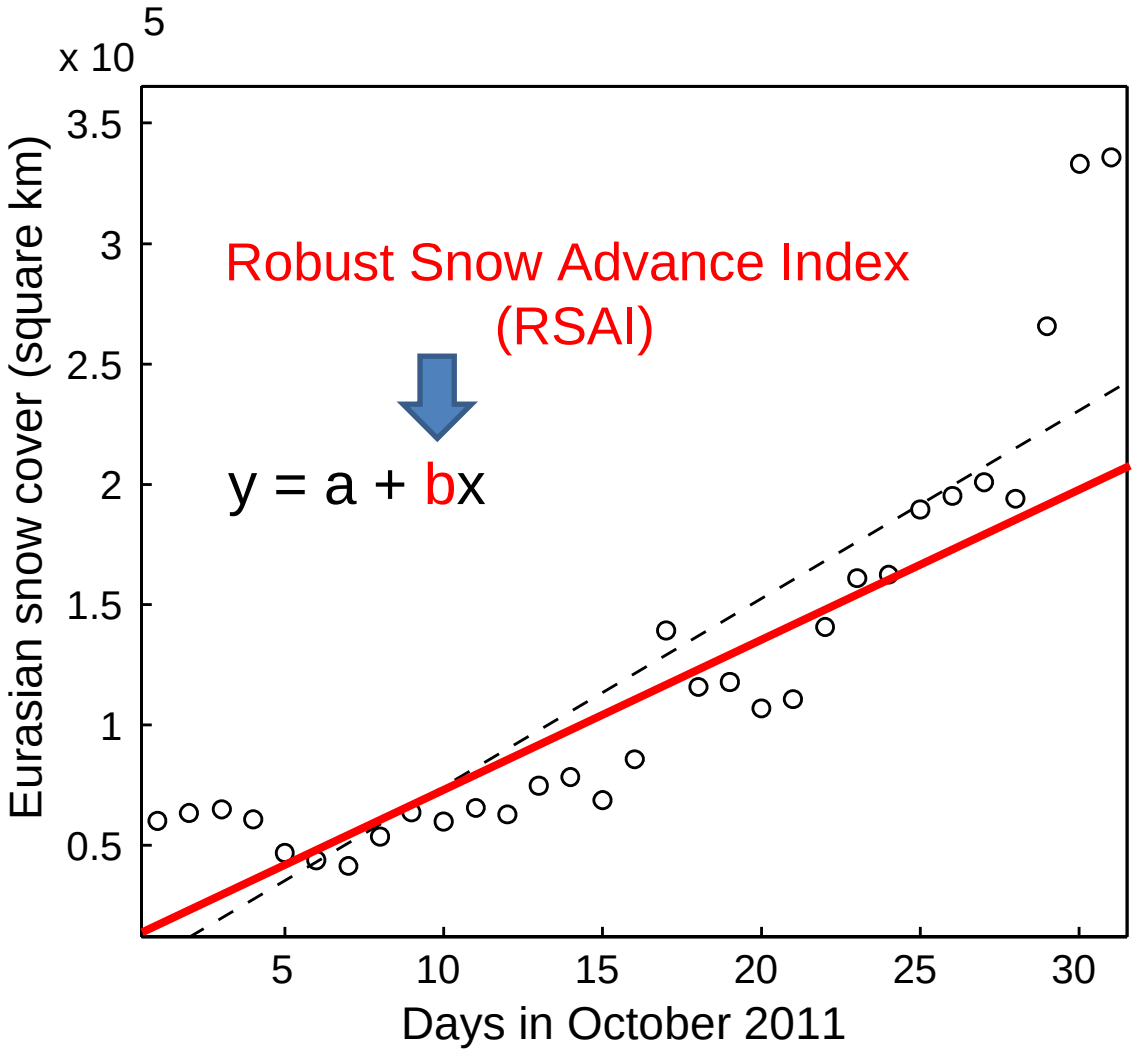
Snow cover on 01/10/2009



Snow cover on 31/10/2009



(October) Snow Advance Index (SAI)



Cohen and Jones (2011)
Brands et al. (2012)

Brands et al. (2014)

Hindcasts" with a longer index: weekly SAI (n = 39)

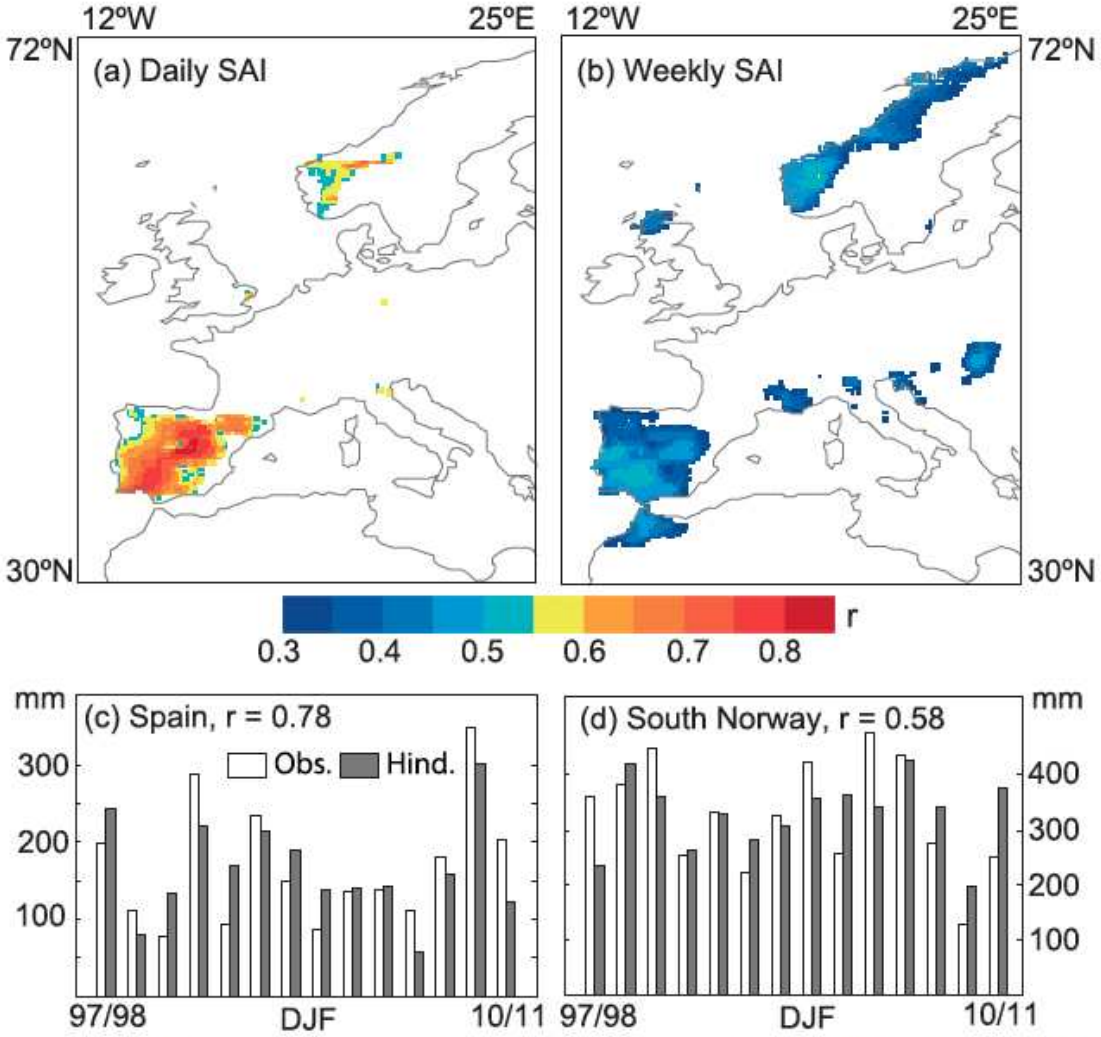
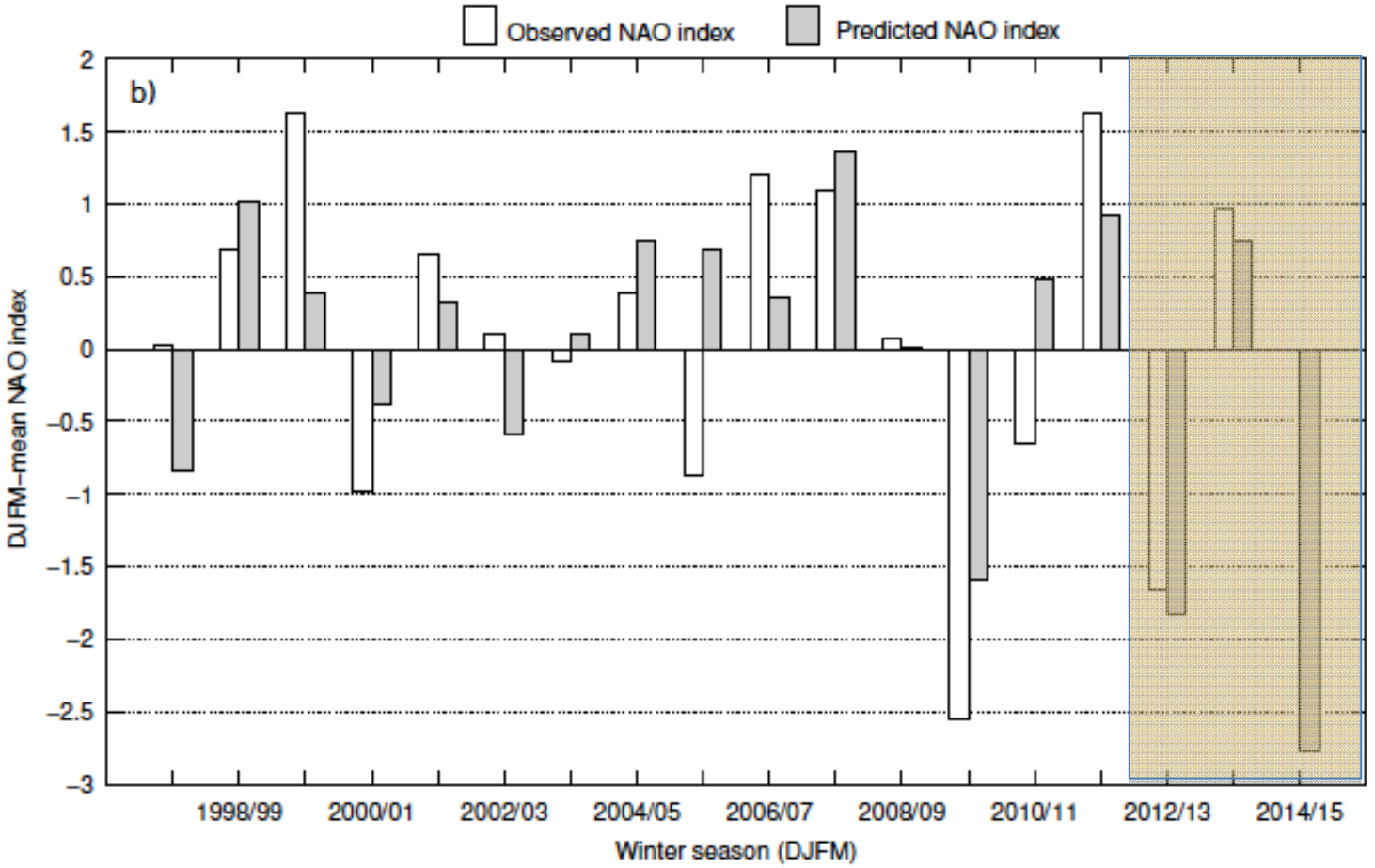


FIG. 2. Significant ($\alpha_{local} = 0.05$) r between hindcast and observed DJF precipitation sums, applying (a) the daily SAI ($n = 14$; critical value = 0.53) and (b) the weekly SAI ($n = 39$; critical value = 0.32). Spatially averaged hindcasts based on the daily SAI are contrasted against its corresponding observations for (c) Spain and (d) southern Norway; all calculations are based on E-OBS.

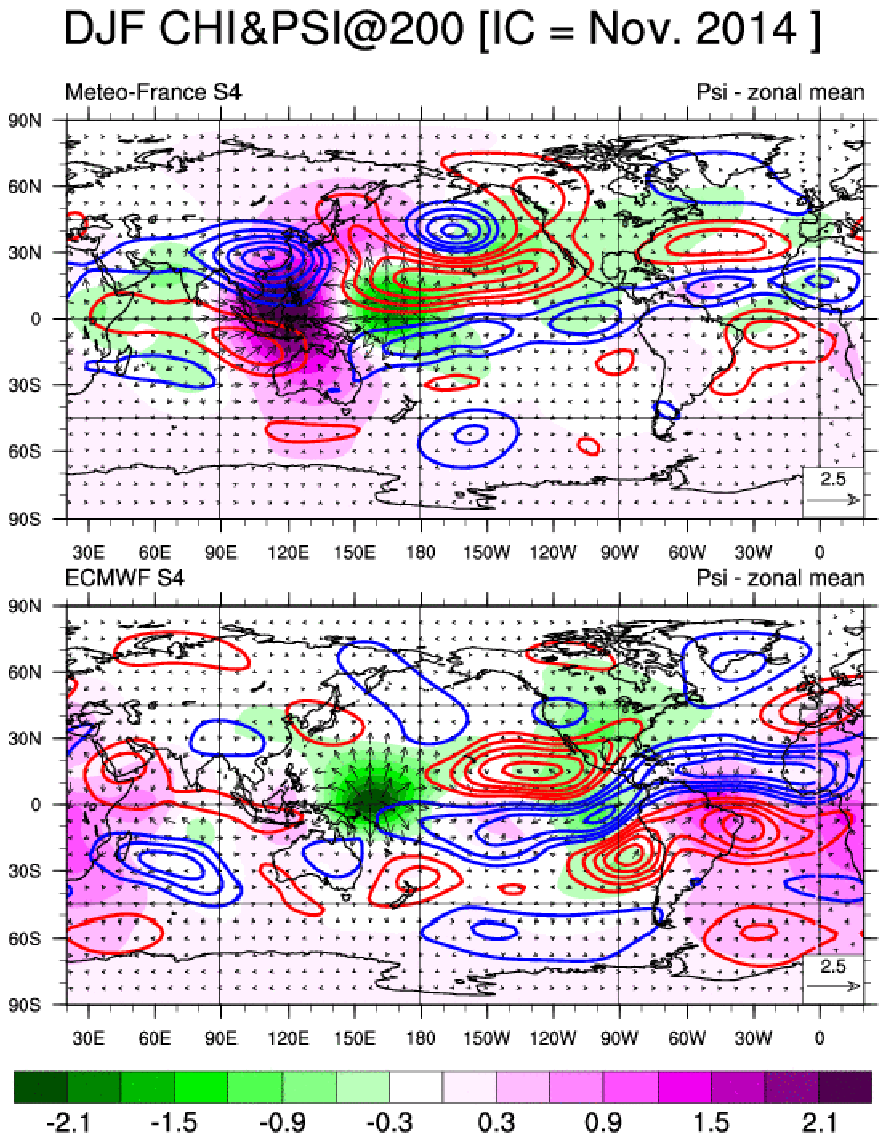
Predictibilidad de la NAO

(media de DJF, detrended)



Correlación entre el RSAI en Octubre y la NAO en invierno (media de DJF, detrended)

Tropical response and forcing - DJF



Upper troposphere circulation fields (200 hPa)

Shaded area : velocity potential anomalies (divergent circulation anomalies)

green <-> upward motion anomaly

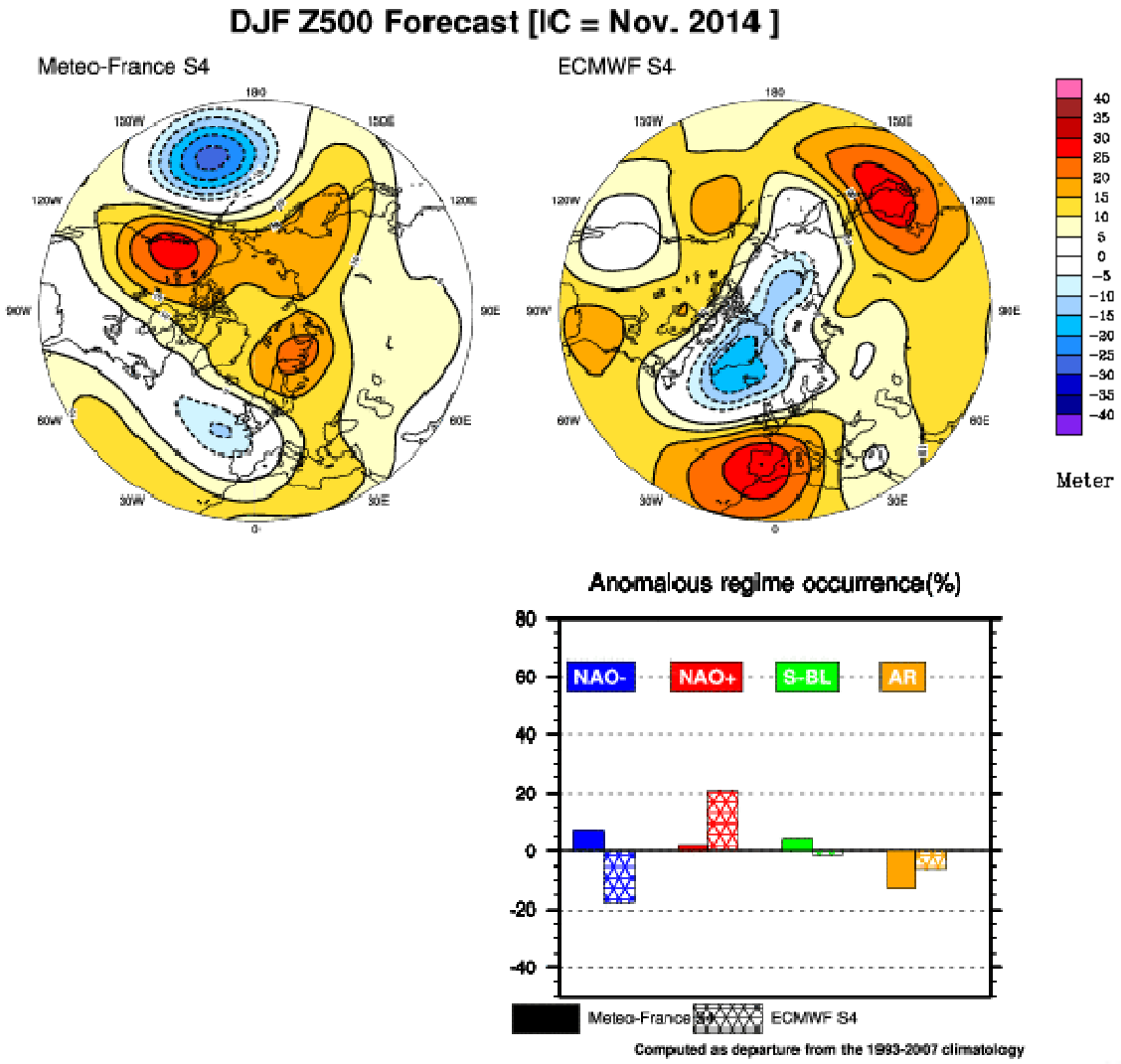
pink <-> downward motion anomaly

Isolines : stream function anomalies (rotational circulation anomalies)

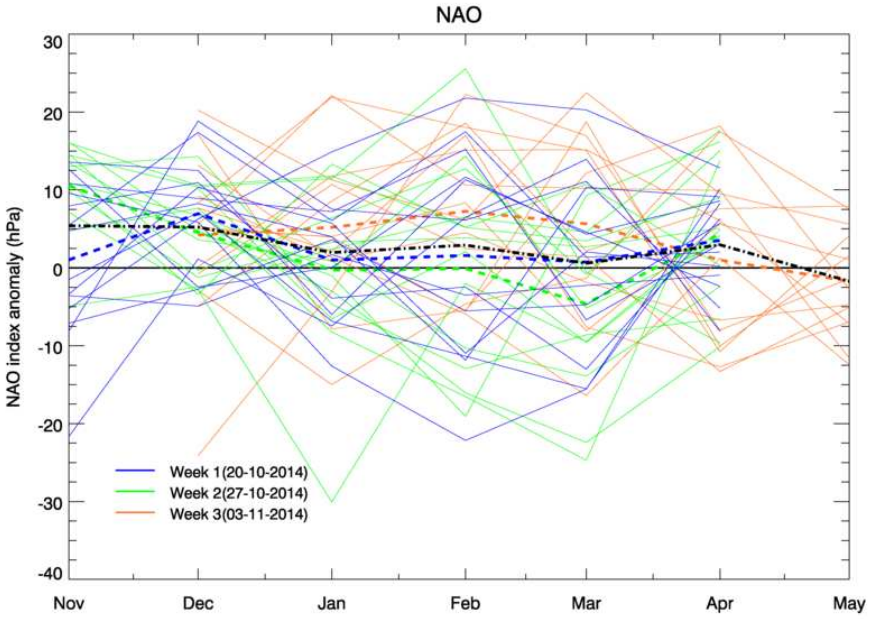
blue lines <-> cyclonic (in NH)

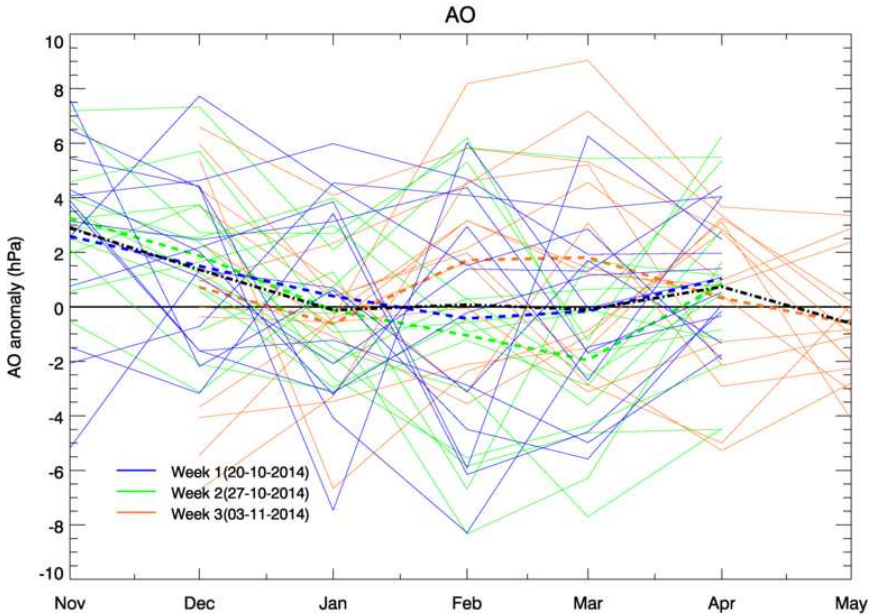
red lines <-> anticyclonic (in NH)

Mid-Latitude Response - DJF



NAO and AO
November 2014 – April 2015



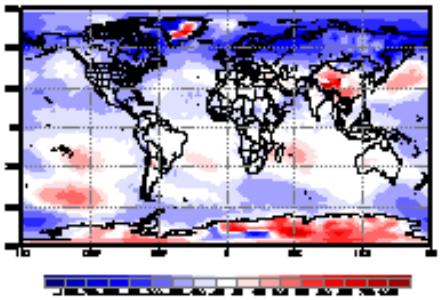


GPC output DJF PMSL anom

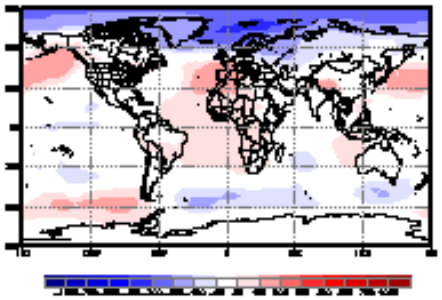
lat=−90 90
lon=−180 180

Mean Sea Level Pressure : 02014 (issued on Nov) [Unit: Pa]

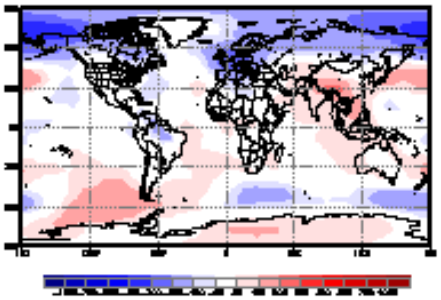
GPC_CPTEC



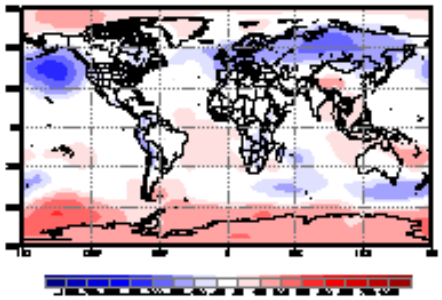
GPC_ECMWF



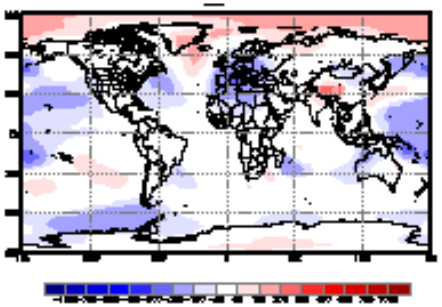
GPC_Melbourne



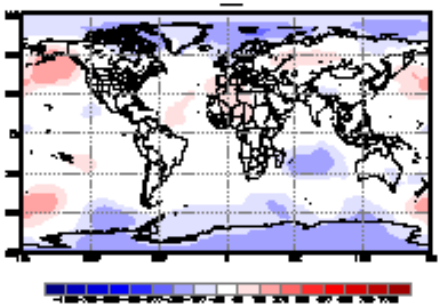
GPC_Montreal



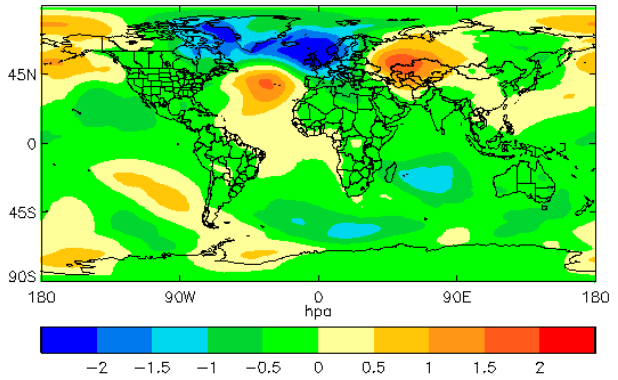
GPC_Moscow

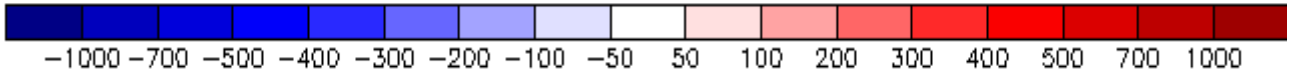


GPC_Seoul



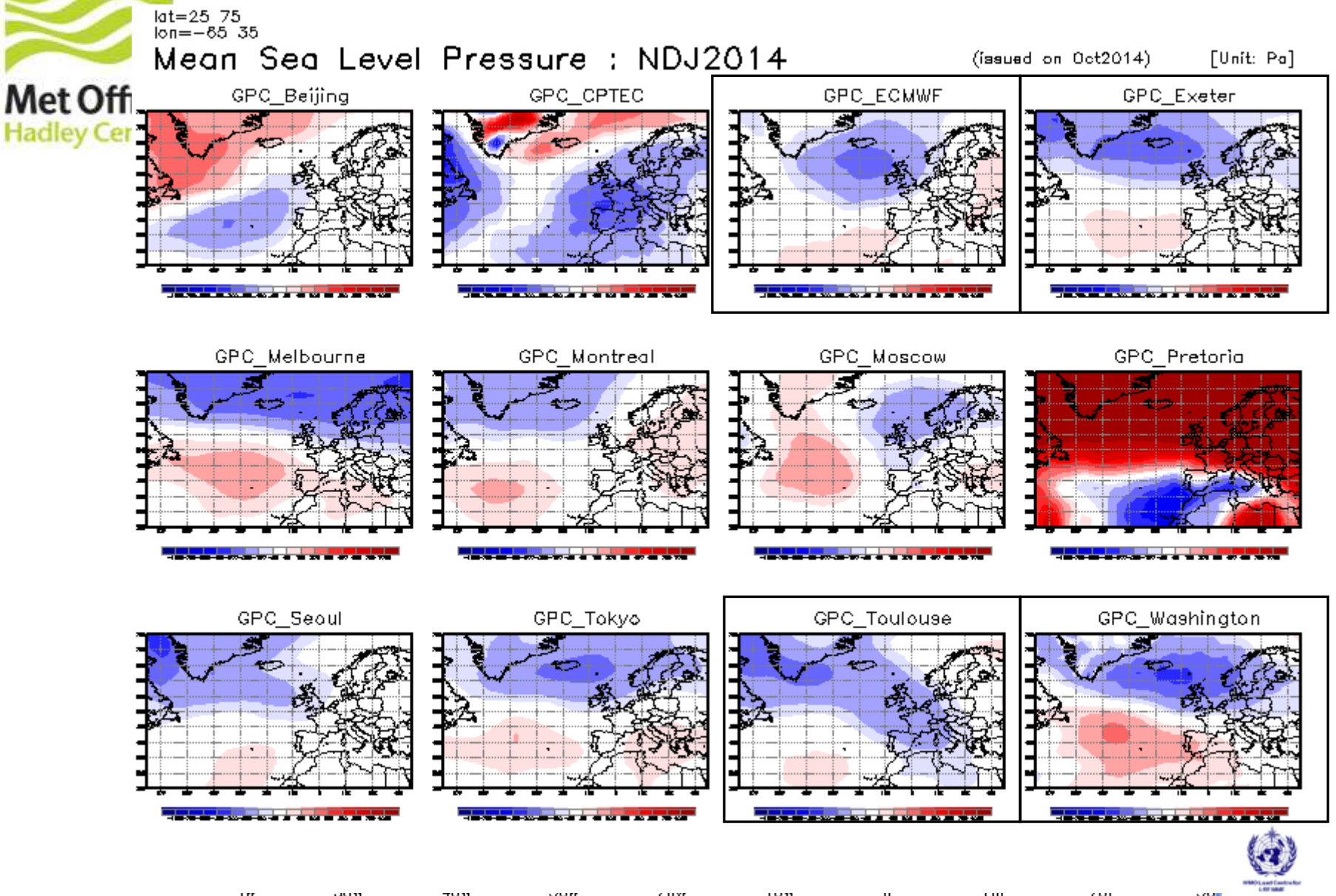
Ensemble mean anomaly : mean sea level pressure : Dec/Jan/Fe
Issued November 2014



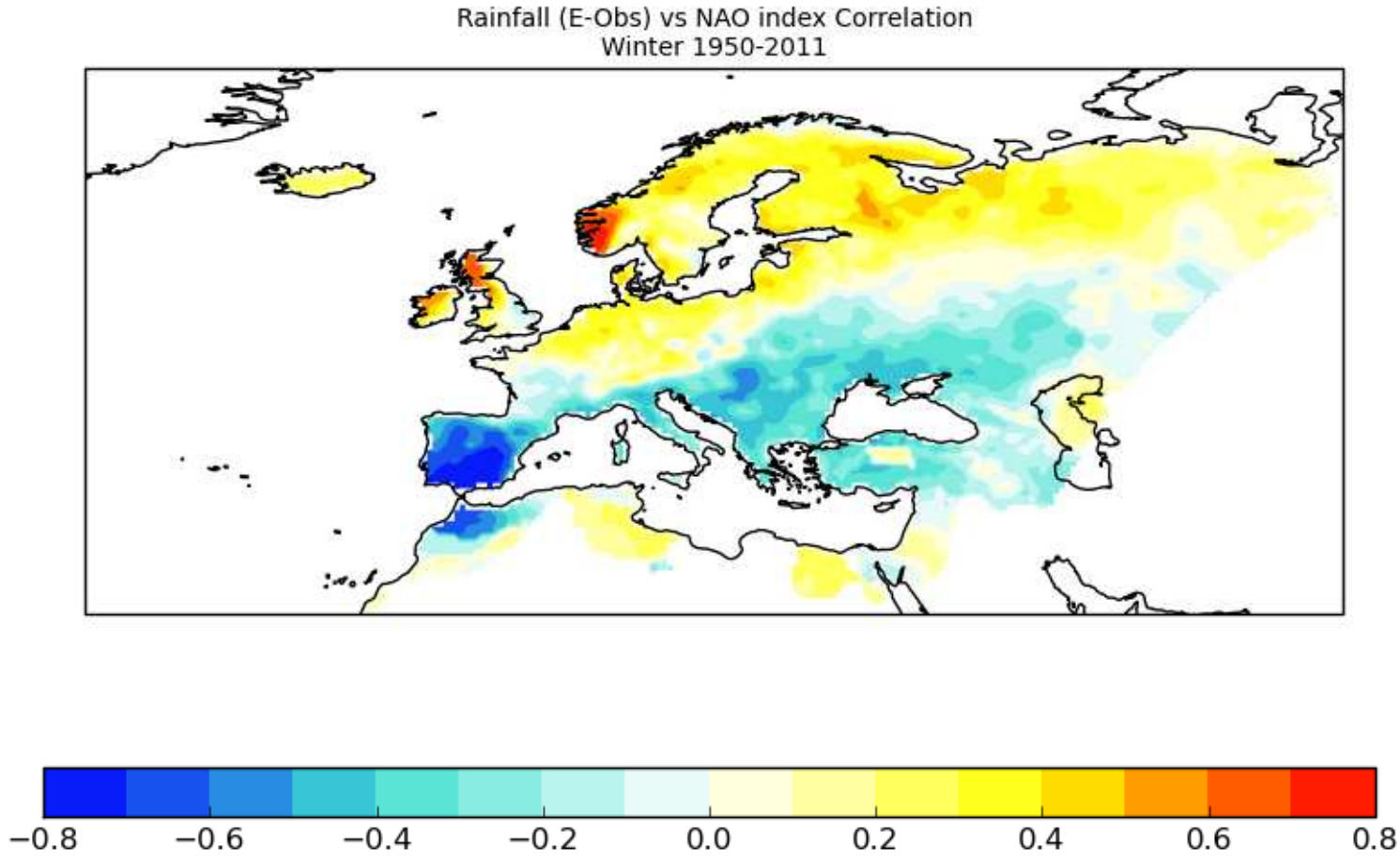


Pa

GPC output NDJ PMSL anom



How well does the NAO ‘describe’ local conditions?



Summary

- signal from models weak, mainly for positive NAO for DJF 2014/15
- sources of predictability for this period
  - large scale: TNA, tropical Pacific, QBO, ENSO?
  - local: SST (Med, Black Sea, Atlantic), Siberian October snow advance
  - clımate change
- sources of complications: ENSO specifics
- subseasonal variations more important role than usual?

The end

Solar Cycle (From NASA)