Climate predictive drivers for the Mediterranean region

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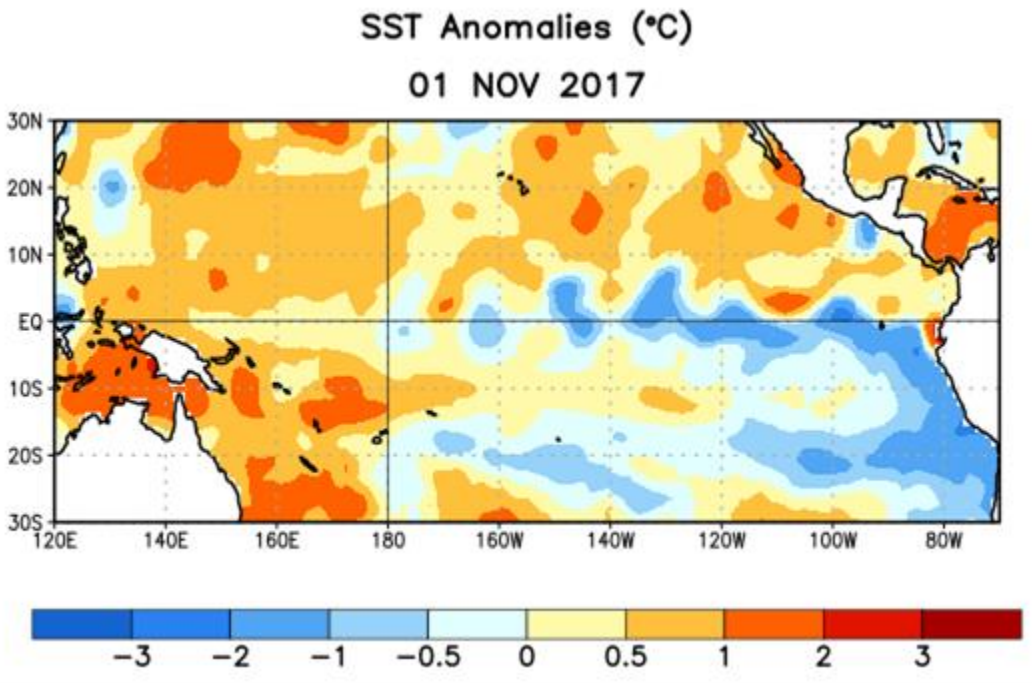
Overview

- SSTs
  - Tropical SSTs
    - ENSO
    - Tropical Atlantic Variability
  - Decadal variability in oceans (PDO and AMO)
  - North Atlantic
    - Lagged SSTs (May SSTs)
  - Land and Ocean Temperature (cold blob in NA)
  - SST Forecast
- Snow cover
- Arctic Sea ice
- Stratosphere (polar vortex and QBO)
- Other factors: global warming
- Observed drivers of predictability (synthesis)
- SLP forecast
- NAO forecast
- Conclusions

ENSO

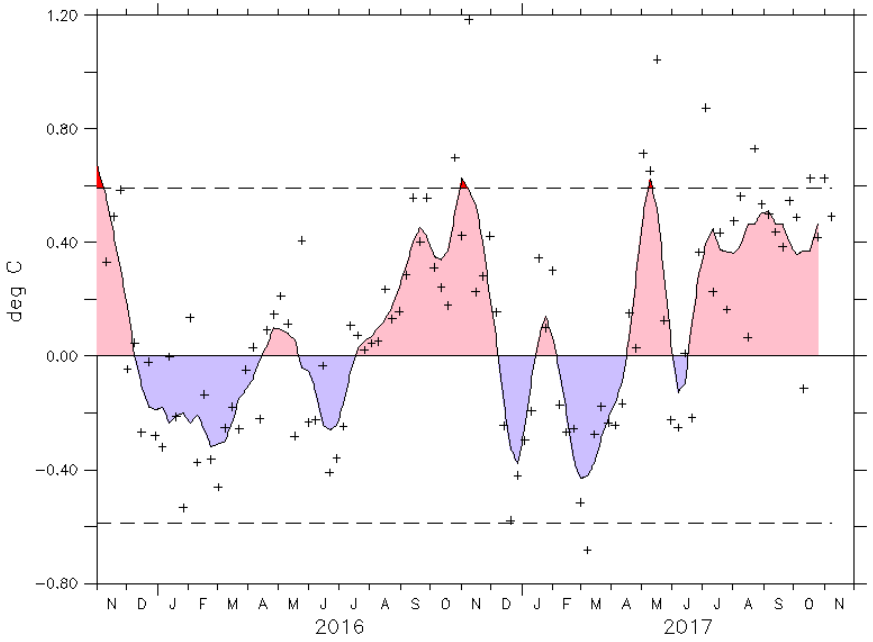
ENSO is in a weak negative phase since October. La Niña is favored to persist (~65-75% probability) through the winter 2017-18.

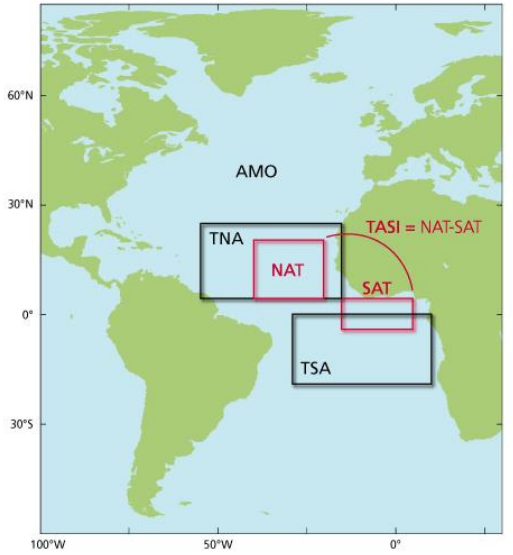


Source: http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/

Tropical Atlantic Variability

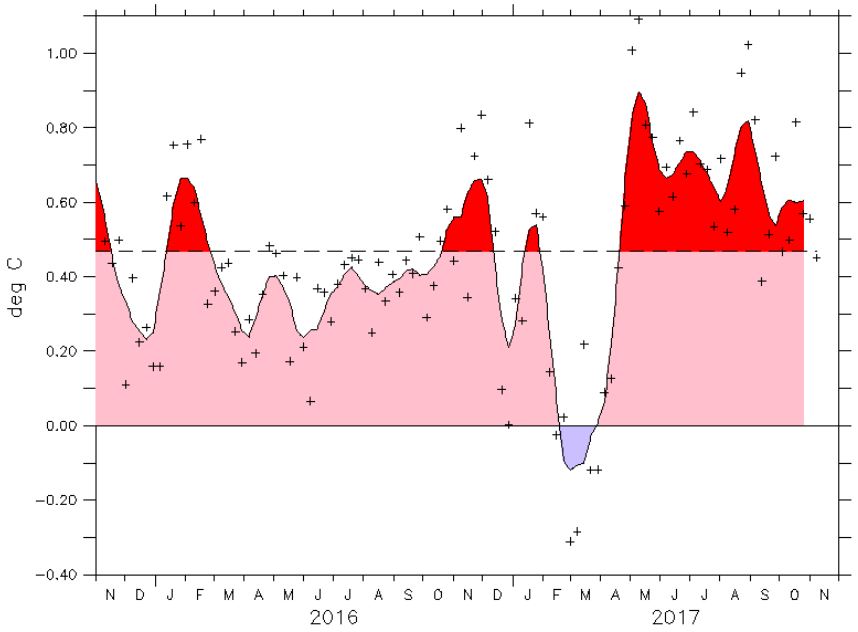
The TASI SST anomaly index is an indicator of the meridional surface temperature gradient in the tropical Atlantic Ocean. It is calculated as the difference of the NAT and SAT indices.

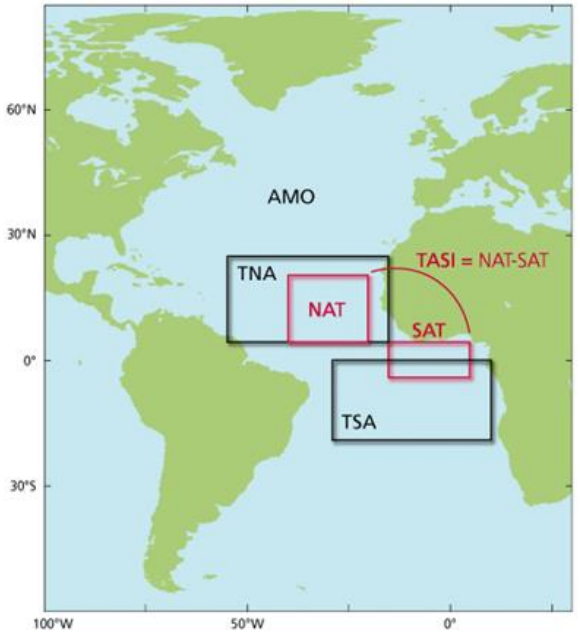




Source: https://stateoftheocean.osmc.noaa.gov/sur/atl/tasi.php

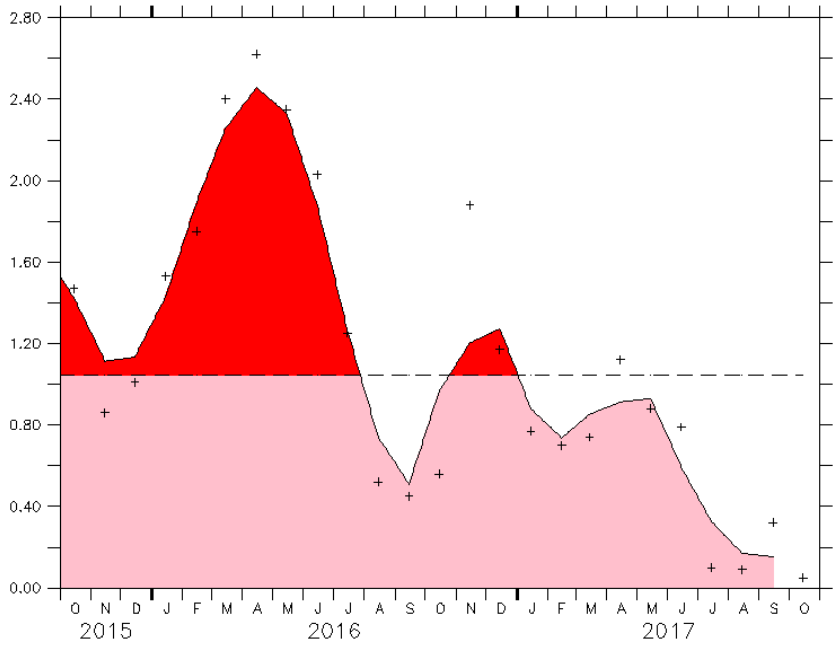
NAT phase





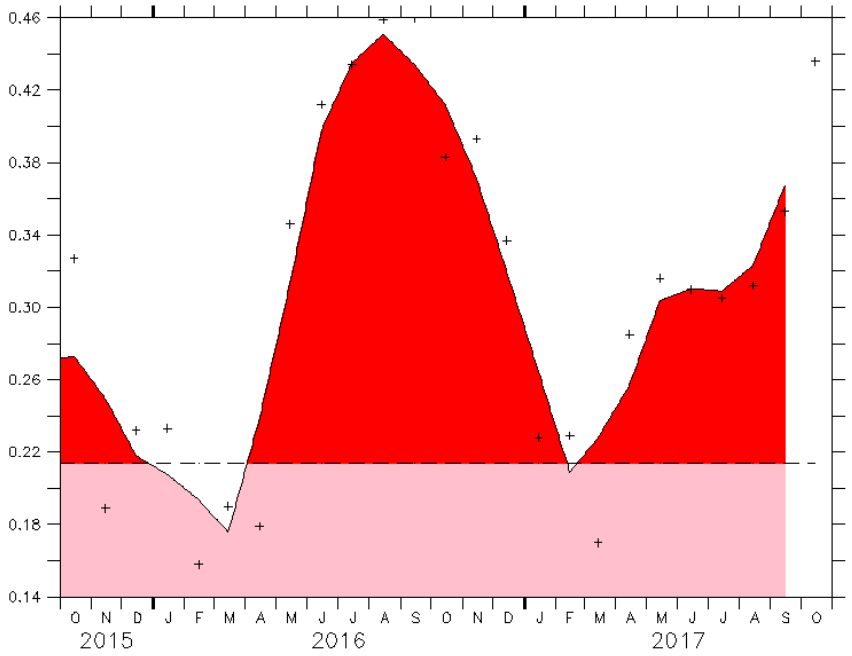
Source: https://stateoftheocean.osmc.noaa.gov/sur/atl/nat.php

PDO phase



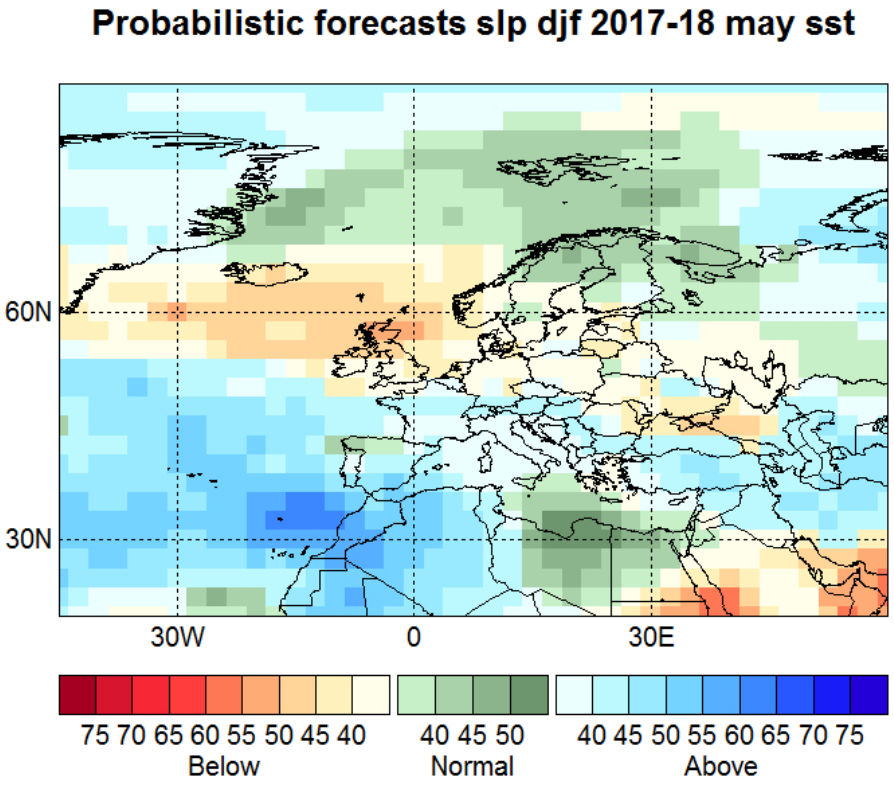
Source: http://stateoftheocean.osmc.noaa.gov/atm/pdo.php

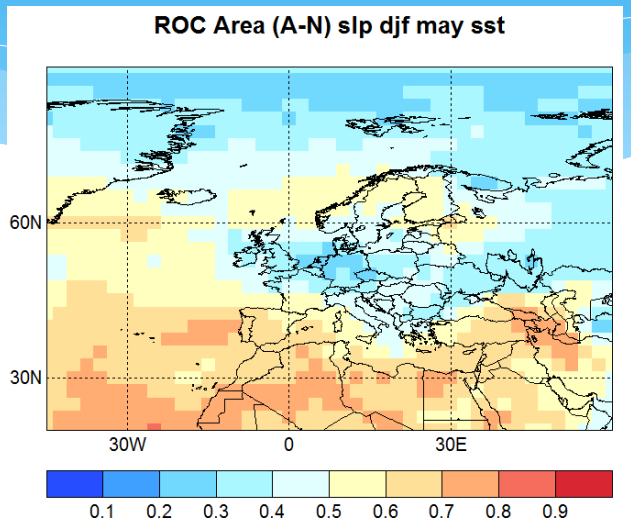
AMO phase

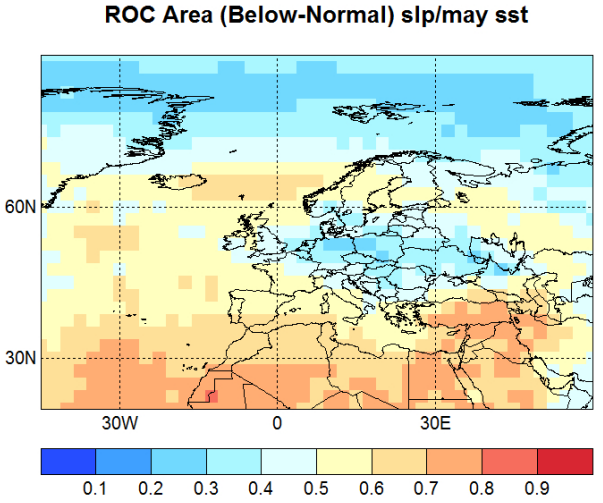


Source: http://stateoftheocean.osmc.noaa.gov/atm/amo.php

Lagged SSTs (May SSTs)

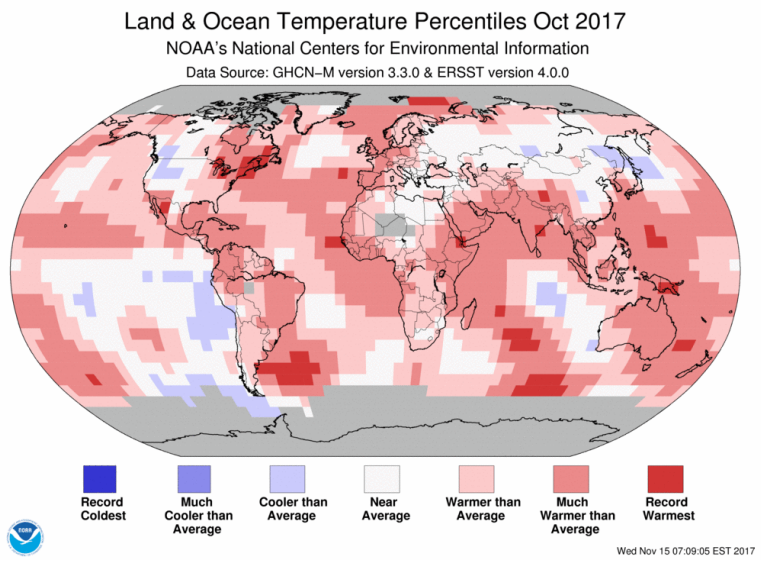




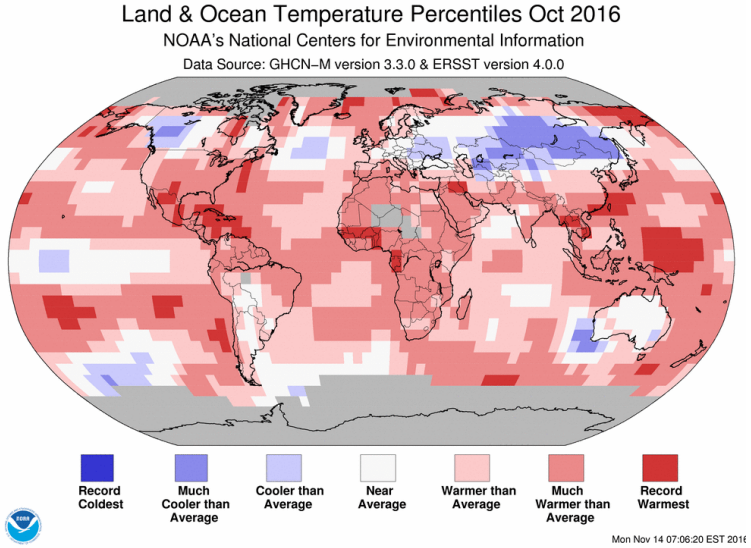


Land and Ocean Temperature

October 2017

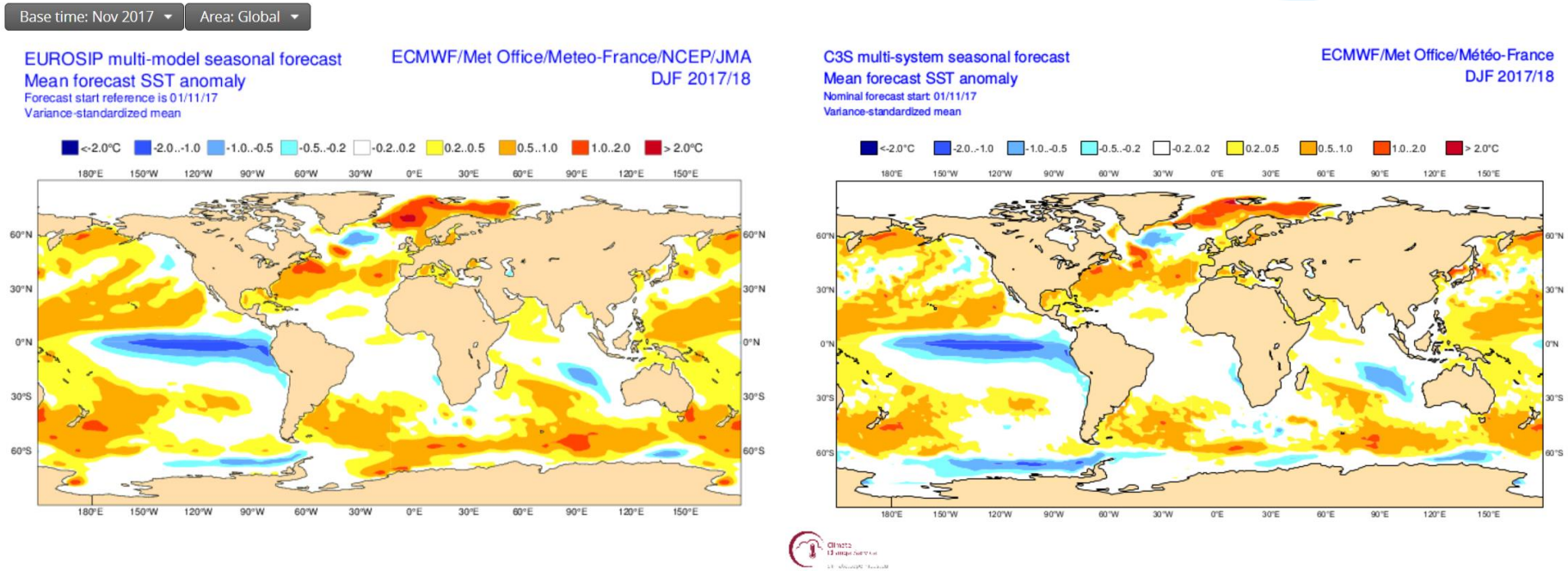


October 2016



Reduced cold blob in 2017 compared to 2016. Possible effects on the jet stream position in the Atlantic-European area. Impact on winter conditions over Europe?

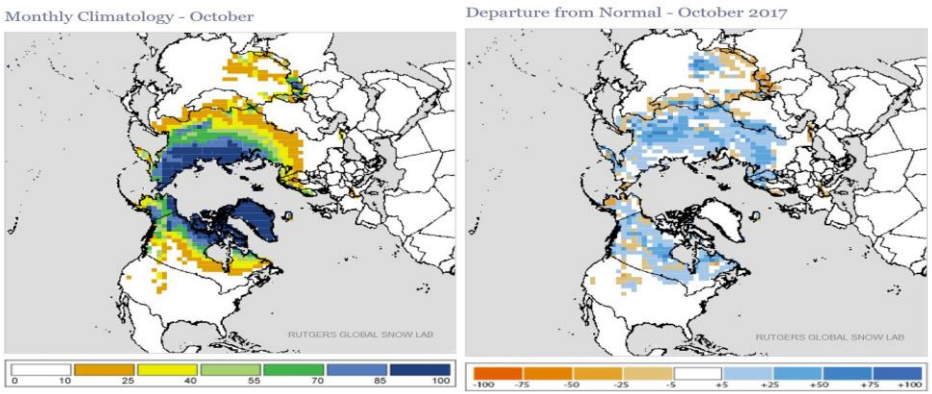
SST forecast

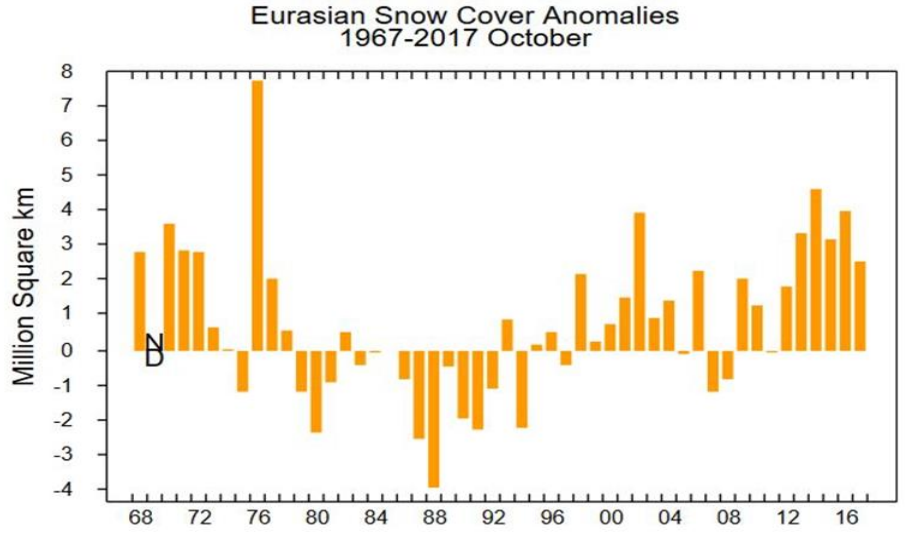


Source: ECMWF

Cold blob is reemerging in winter. Possible effects on the jet stream position in the Atlantic-European area. Impact on winter conditions over Europe?

Snow-cover signal

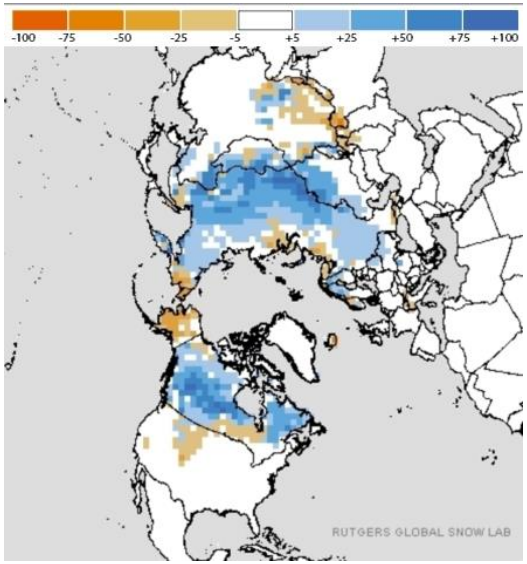




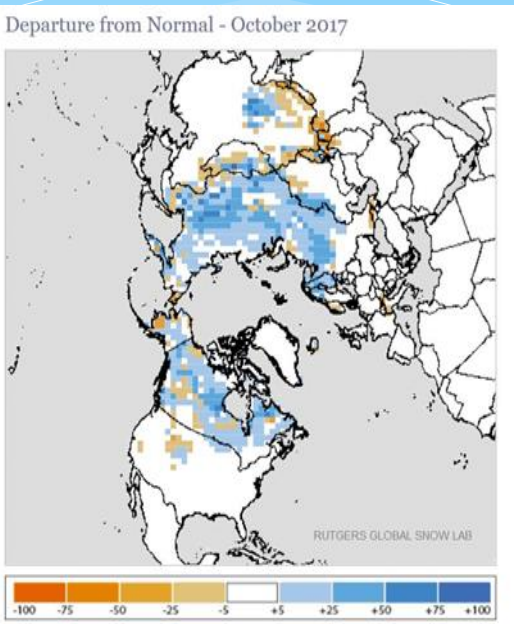
Slightly negative AO/NAO is favored in the winter 2017-2018

Snow-cover signal

Snow cover anomalies 2016



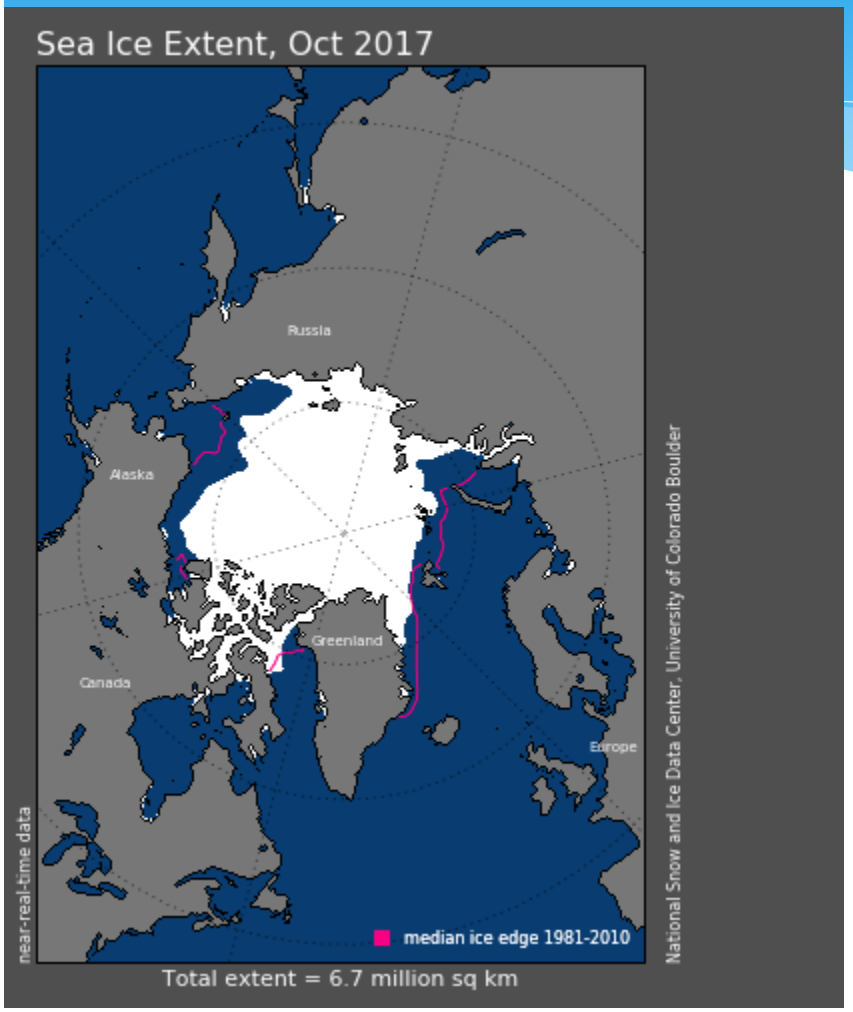
Snow cover anomalies 2017

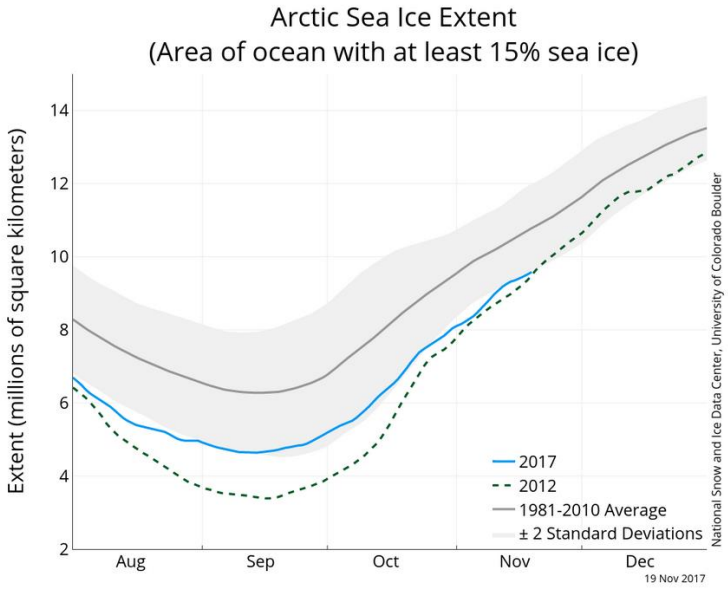


Source: Rutgers University (USA)
http://climate.rutgers.edu/snowcover

Extended snow cover over the Southern Siberia seems consistent with slightlynegative AO/NAO.

October Arctic Sea Ice



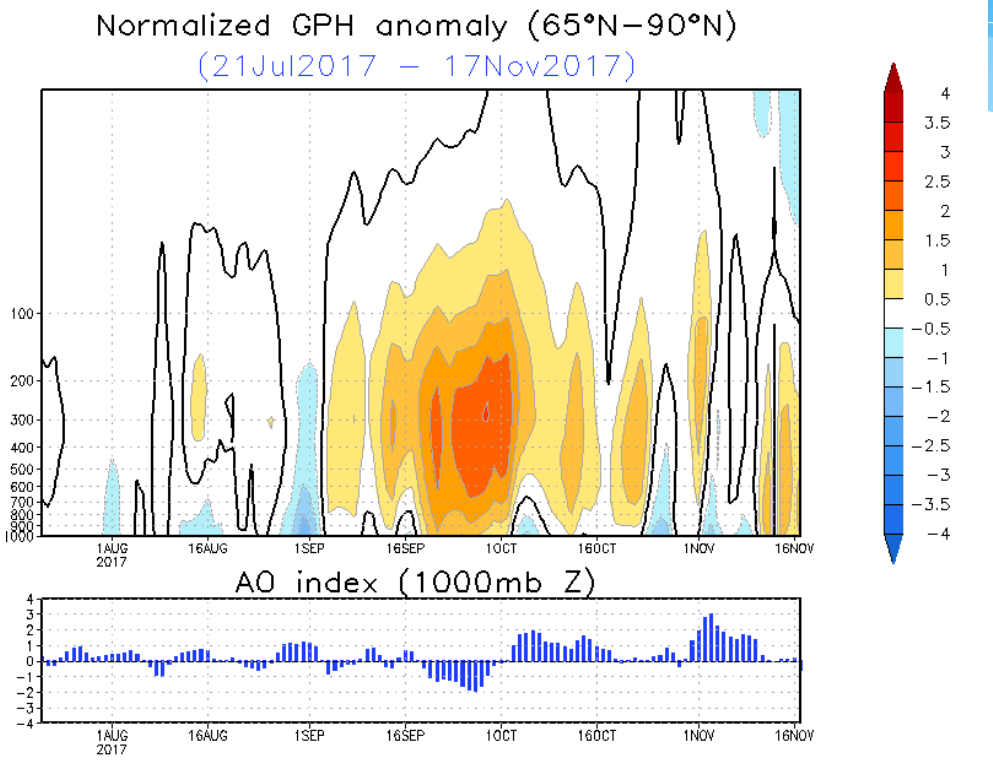


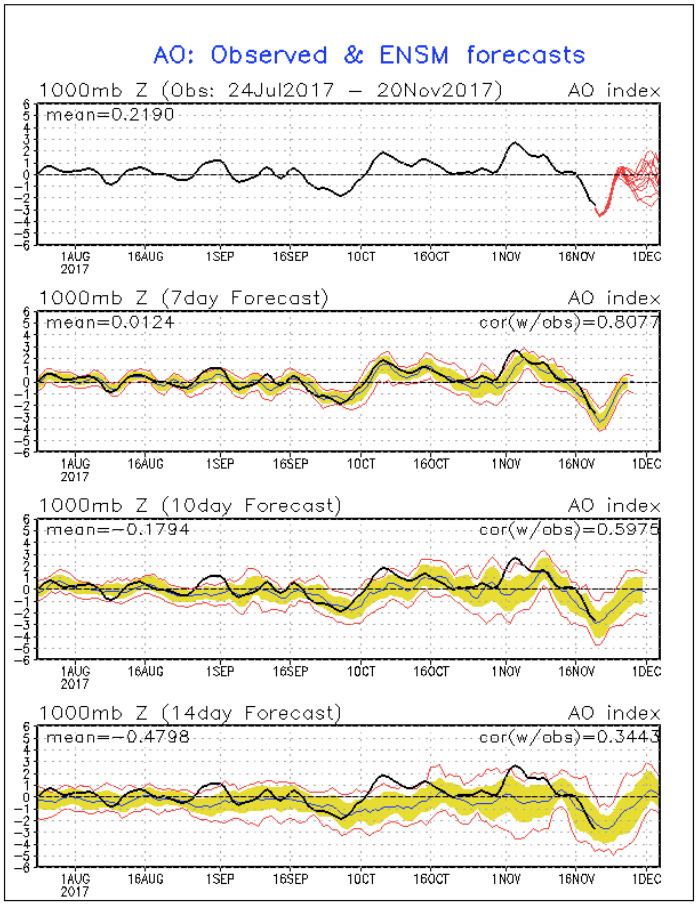
Source: NSIDC (USA)
http://nsidc.org/data/seaice_index/

Negative anomalies in the ice extent over Arctic regions are usually related to favorable conditions for atmospheric blockings over the Northern Hemisphere.

Conditions in the stratosphere

Possible tendency towards strong Polar vortex in December



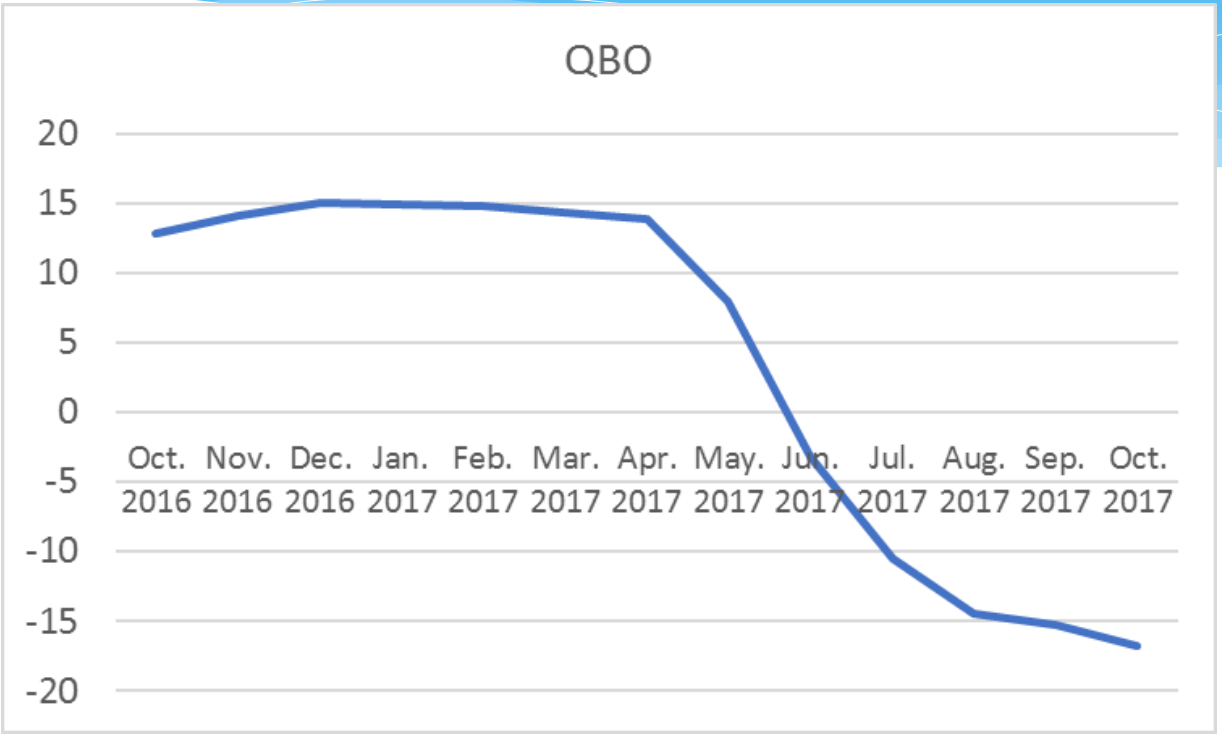


Source: CPC (USA)
http://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/hgt.shtml

Stronger polar vortex is consistent with zonal circulation prelevance over the NH in winter (i.e. mild conditions over Europe). However, we do not know if the strong polar vortex will persist into the winter.

Conditions in the stratosphere

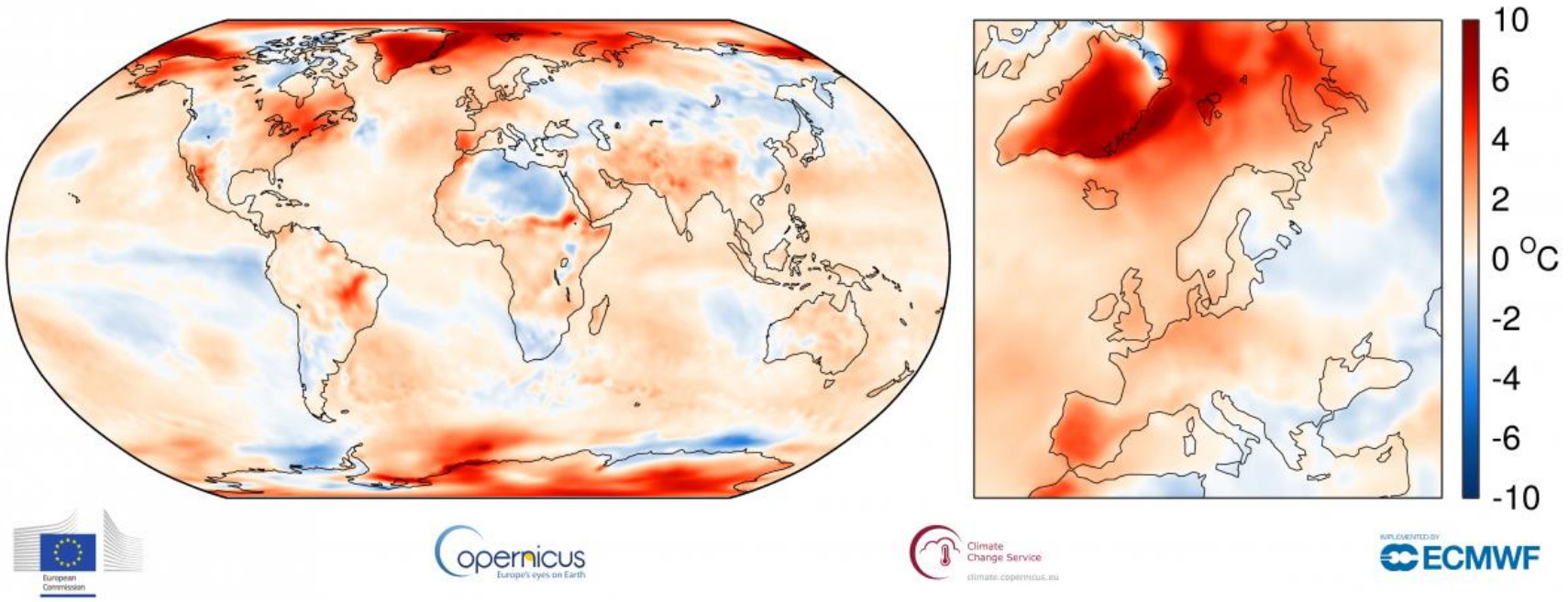
Easterly QBO



Source: NOAA
https://www.esrl.noaa.gov/psd/data/climateindices/list/

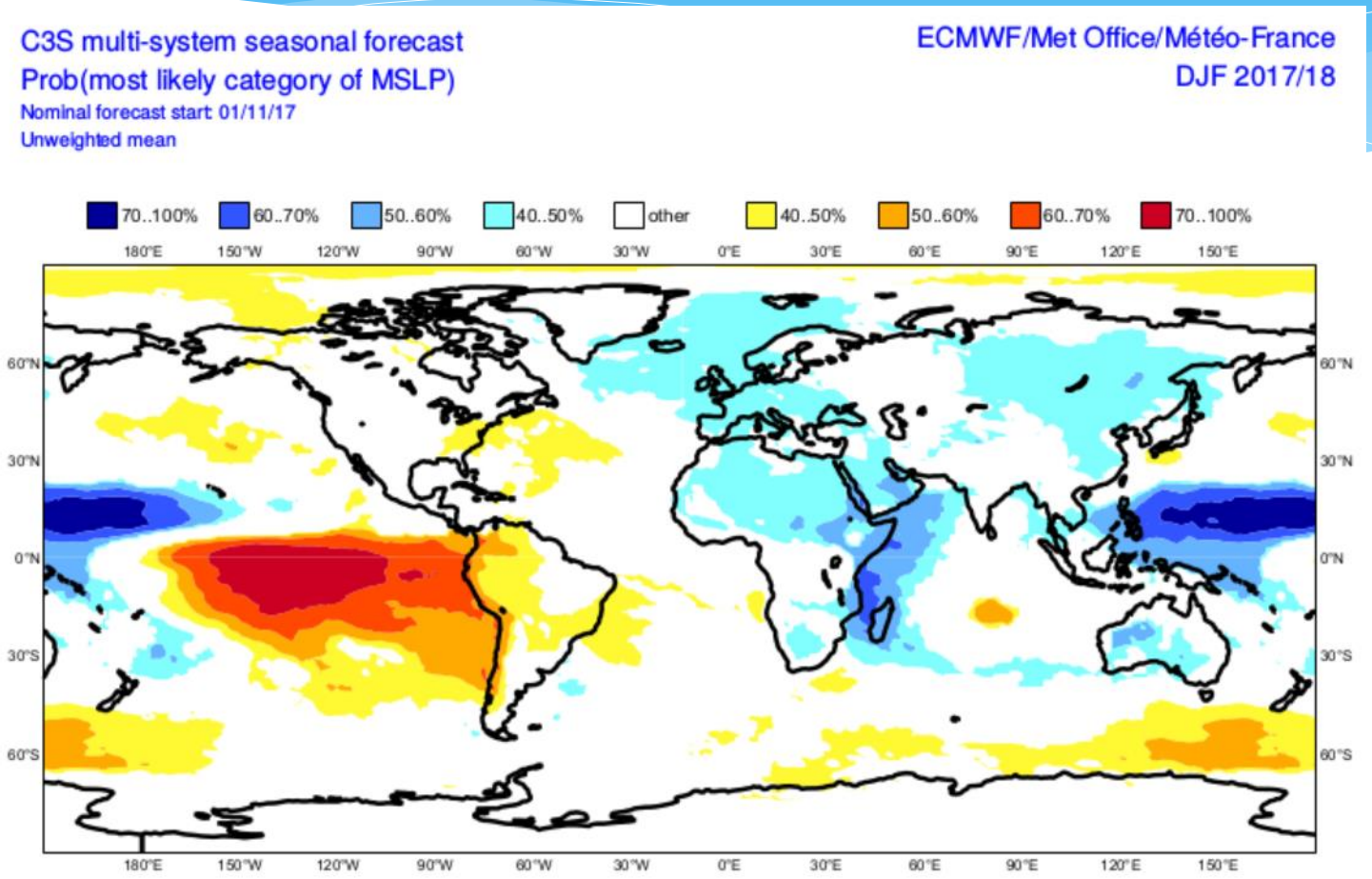
Easterly QBO (from the zonal average of the 30mb zonal wind at the equator) is consistent with blocking circulation prelevance over the NH in winter (e.g. severe winter conditions over regions in Europe).

Global warming

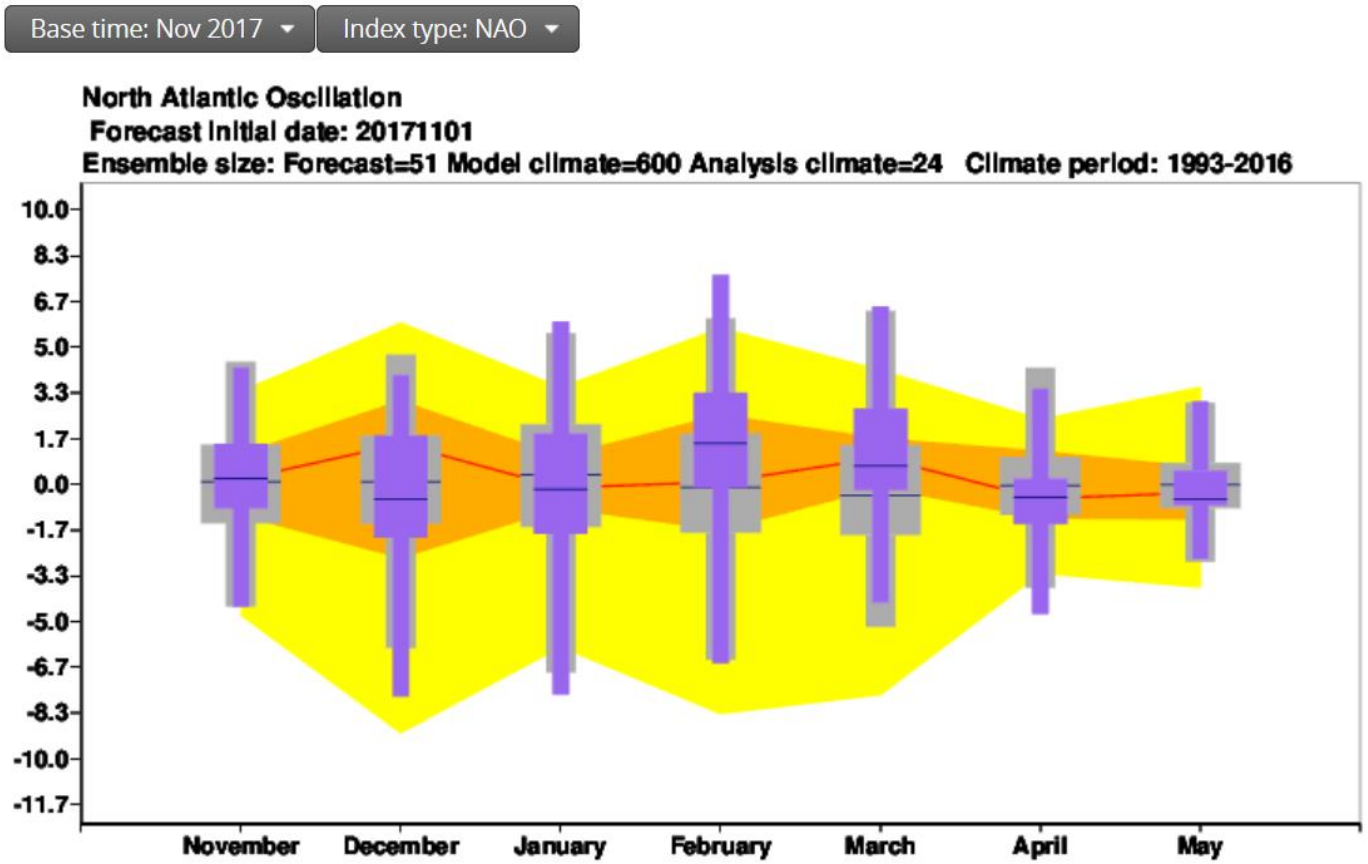


https://climate.copernicus.eu/resources/data-analysis/average-surface-air-temperature-analysis/monthly-maps/surface-air-2

SLP prediction



NAO prediction



Source: ECMWF

Observed drivers of predictability

Phenomenon/Mechanism/factor	Atmospheric blocking events in Atlantic/European area	Zonal circulations	Stratospheric warmings	NAO phase	Shifts in the jet stream position/intensity over Atlantic/Europen area
Weak La Nina			Yes		
Slightly positive NAT SST index		less frequent, (reduced trade winds)		negative	yes
Positive AMO					
Positive PDO					yes
May SST		slightly enhanced		slightly positive	Northward over Europe?
More snow cover extent in Eurasia	enhanced	less frequent		negative	Southward over Europe?
Reduced Arctic sea ice concentration	enhanced	less frequent		negative	yes
Strong polar vortex?	less frequent (in the first part of the winter)	enhanced (in the first part of the winter)		positive (in the first part of the winter)	Northward over Europe?
Eaesterly QBO		less frequent	yes	negative	Southward over Europe?

Conclusions

- The EUROSIP and C3S ensembles suggest higher chance for positive NAO in the next winter (DJF) (mild conditions)
- Observed drivers offer a mixed picture for the future winter (DJF), with a slightly higher chance for negative NAO
- La Nina is favored in the next winter by the EUROSIP ensemble (possible severe episodes in late winter)
- AO/NAO phase may change sign on sub-seasonal scale