

Météo-France Seasonal Forecast Bulletin

APRIL - MAY - JUNE 2020

1. General synthesis
 1. AMJ 2020
2. Oceanic analysis of February 2020
 1. SST anomalies
 2. vertical section
 3. Hovmöller diagram of the 20°C isotherm
 4. Pacific Ocean : Nino3.4 index history
 5. Indian Ocean - DMI index history
 6. Atlantic Ocean : SAT index history
7. Oceanic forecast
 1. SST anomaly
 2. NINO3.4 Plume diagrams
 3. C3S Nino3.4 re-scaled plume diagrams
 4. Synthesis from IRI
 5. Indian ocean - DMI evolution
 6. Atlantic ocean - SAT evolution
7. Drivers
 1. Atmospheric circulation forecasts
 1. velocity potentiel and stream function at 200hPa
 2. polar vortex
 3. 500 hPa Geopotential anomalies
 4. Z500 anomalies in C3S models
 5. Z500 anomalies multi-systems
 6. Strong MSLP decrease
 7. Modes of variability
 1. forecast
 2. NAO impacts
 3. EA impacts
 4. Weather regimes
 1. summer MSLP
 2. Forecast of climatic parameters
 1. Temperature probabilities
 2. T2M probabilities over Europe in C3S models
 3. Température synthèse de l'IRI
 4. Precipitation
 5. Precipitation probabilities over Europe in C3S models
 6. IRI precipitation synthesis
 7. Tropical Storm Frequency
8. Monthly forecast of 20200316
 1. Z500
 2. temperature
 3. precipitation
 4. summer SLP weather regimes
5. Synthesis map for Europe
 1. Temperature
 2. Precipitation

General synthesis : AMJ 2020

A) Oceanic forecast :

good agreement between models.

- **neutral ENSO situation** for the coming 3 months. Cold anomaly over the southeastern Pacific. Warmer than normal elsewhere.

- **IOD slightly positive** with warmer SST anomaly along the African coasts than in the eastern part of the Indian Ocean

- **South tropical Atlantic** still significantly warmer than climatology.

B) Atmospheric circulation :

rather good agreement between models.

- Upward velocity potential over western Indian Ocean/Eastern Africa and North Pacific. Downward potential velocity over South Pacific and maritime continent more or less marked.

- On northern hemisphere **EA+ and NAO+ continue to be favoured by most of the models**, in continuity with the last month's forecast.

=> Most likely conditions :

- generally warmer than normal with the exception of Canada.

Wetter than normal over eastern Africa and at high latitudes in the northern hemisphere (in particular Scandinavia).

Dry over southern Africa and South America.

- **over Europe : warmer than normal (high probabilities over Eastern Europe). Wetter than normal on the Northern countries (particularly Scandinavia).**

Next bulletin : scheduled on April 20th
--

Oceanic analysis of February 2020 : SST anomalies

Current situation : Neutral ENSO conditions.

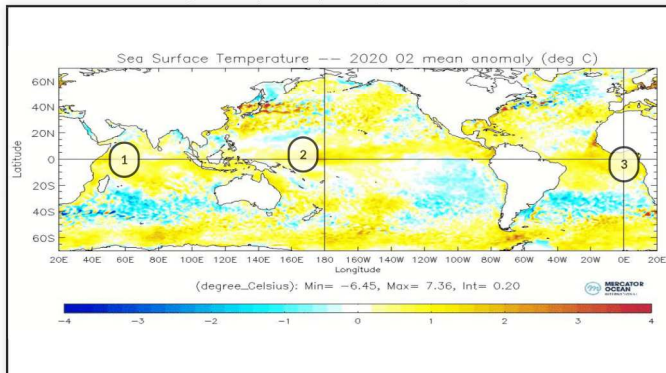
Index issued from Mercator Ocean PSYV4R2 analysis :

NINO3.4 : +0.5 °C (see BOM site for weekly values : http://www.bom.gov.au/climate/enso/monitoring/nino3_4.png)

DMI : close to 0°C Returning to normal seasonal values

(see BOM site for weekly values : <http://www.bom.gov.au/climate/enso/monitoring/iod1.png>)

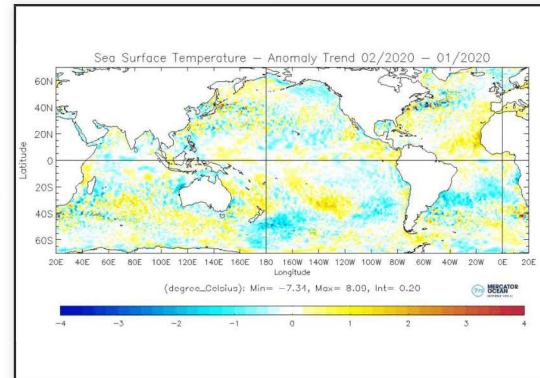
SAT : ~ +1°C Still a strong anomaly, corresponding to a strong deviation from normal.



1- warmer than normal all along the equator

3- Strong positive SST anomalies relative to the climatology

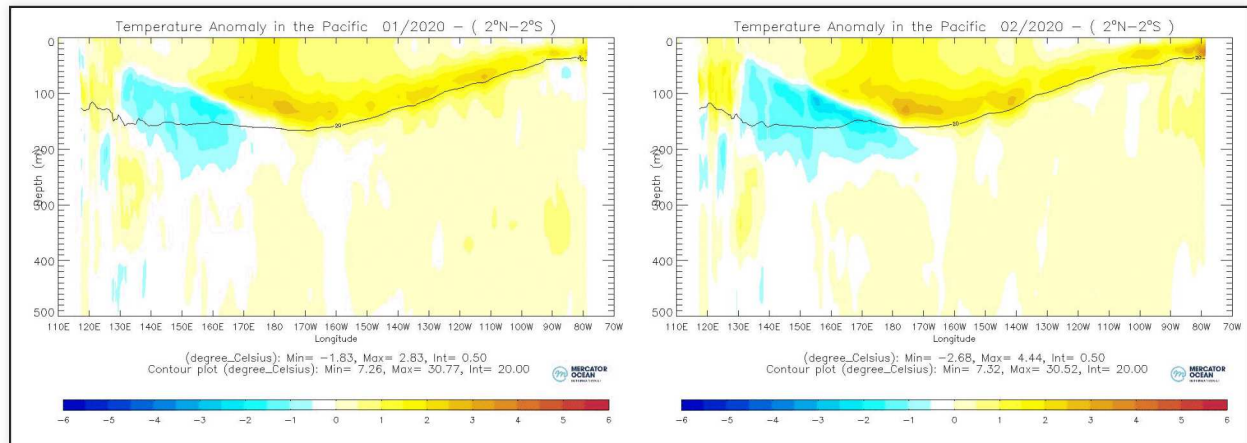
2- still warmer than normal in the western equatorial Pacific, neutral in the eastern part of the basin.



SST Anomalies and trend with the previous month (c) Mercator-Ocean

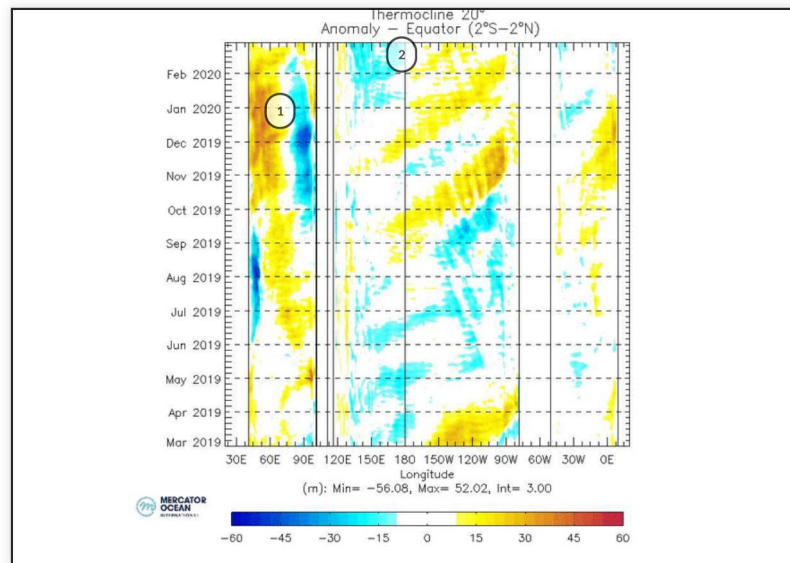
Oceanic analysis of February 2020 : vertical section

Stable situation with quite a strong contrast between West (cooler than normal) and Central and West (warmer than normal)



Ocean temperature anomalies in the first 500 meters of the equatorial Pacific basin, monthly average. (c) Mercator-Ocean

Oceanic analysis of February 2020 : Hovmöller diagram of the 20°C isotherm



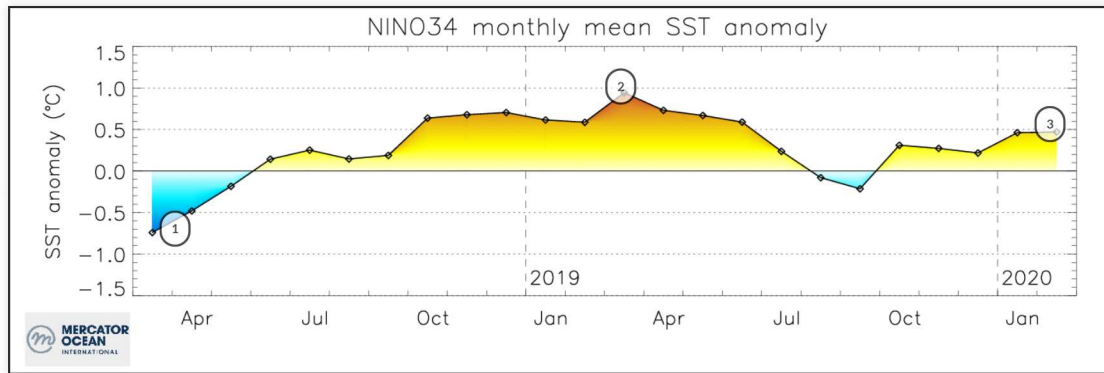
1- Strong IOD

2- Anomaly dipole in subsurface, opposite to the SST anomaly dipole

Evolution of the anomalies of depth of the thermocline (m) (materialized by the 20 ° C isotherm) (c) Mercator-Ocean

Oceanic analysis of February 2020 : Pacific Ocean : Nino3.4 index history

ENSO remains in neutral conditions. Nino 3.4 close to El Niño threshold, but the SST anomaly pattern along the equator is not compatible with an El Niño event.



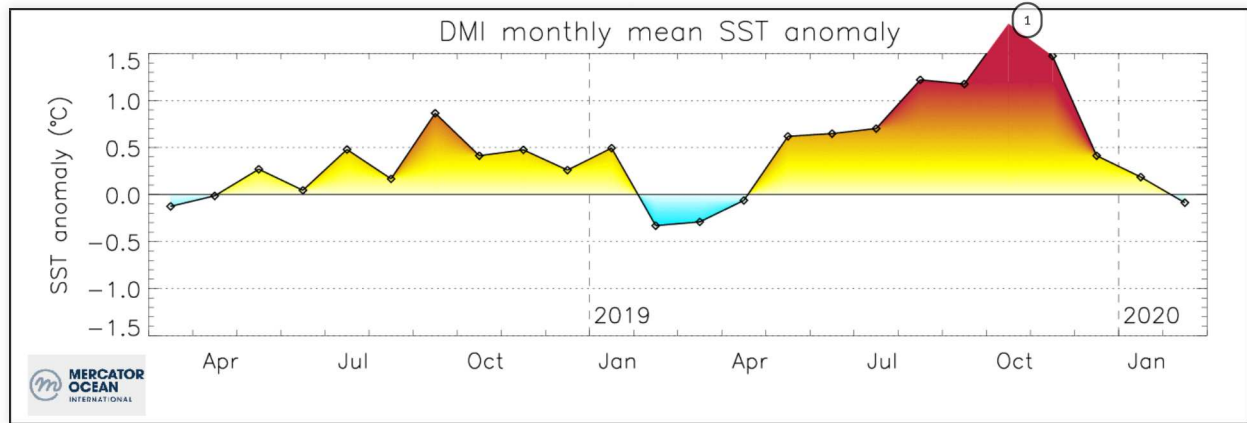
1- La Nina event of winter 2017-2018

2- Weak El Niño during winter 2018-2019 and spring 2019

3- Neutral conditions

Evolution of SST in the NINO3.4 box

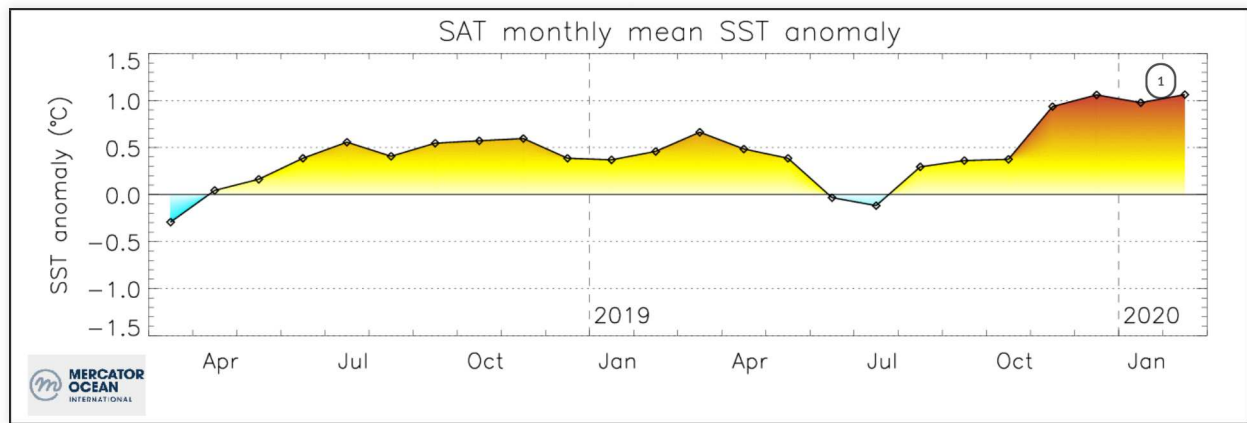
Oceanic analysis of February 2020 : Indien Ocean - DMI index history



1- IOD on record in october

Evolution of SST in the DMI box

Oceanic analysis of February 2020 : Atlantic Ocean : SAT index history



1- Strong deviation from normal for this index

Evolution of SST in the SAT box

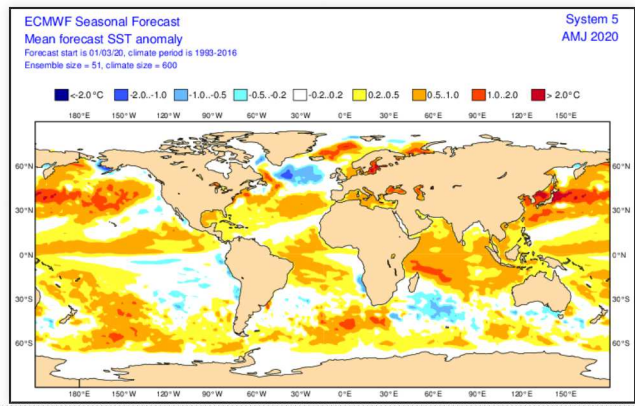
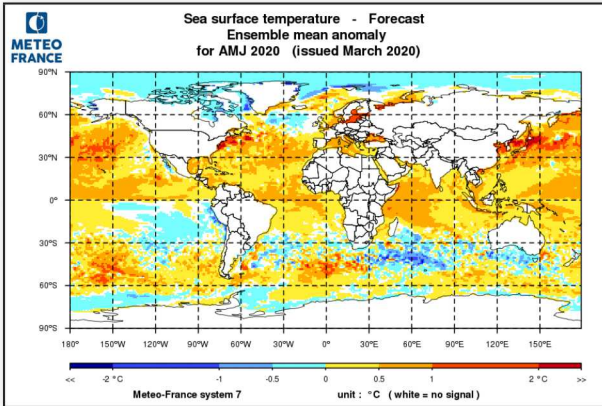
Oceanic forecast : SST anomaly

Good agreement between MF-S7 and ECMWF-SEAS5

In the Pacific Ocean : South of the equator, the cold anomaly over the eastern half should persist (this is clear with MF-S7, less clear with SEAS5). Everywhere else the ocean is expected to be warmer than normal. The average anomaly over the Nino3.4 zone, straddling the equator, should remain slightly positive.

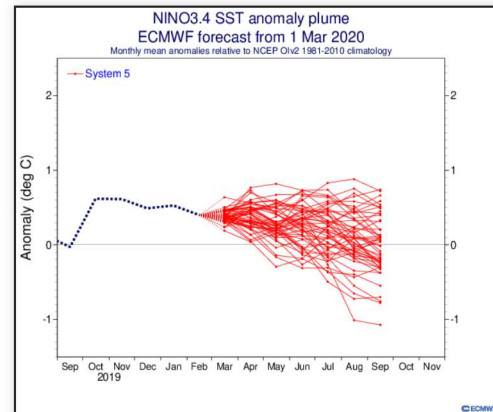
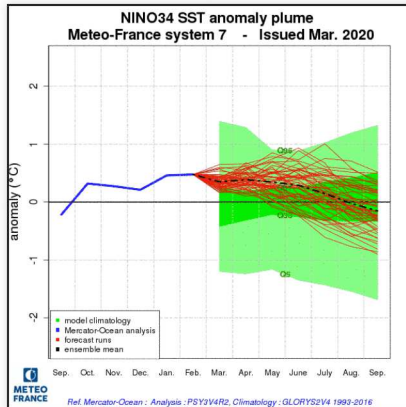
In the Indian Ocean : Generalized warm anomaly forecasted north of 30°S. Colder than normal south of 30°S.

For the Atlantic, Persistence of a large positive anomaly from the North American coasts and the Caribbean sea to the Iberian Peninsula. Persistence of the cold anomalies in southwest Iceland. Persistence of the positive anomaly south of the equator. A noticeable difference between the 2 models in the Gulf of Guinea (C3S models show divergent forecasts)



Oceanic forecast : NINO3.4 Plume diagrams

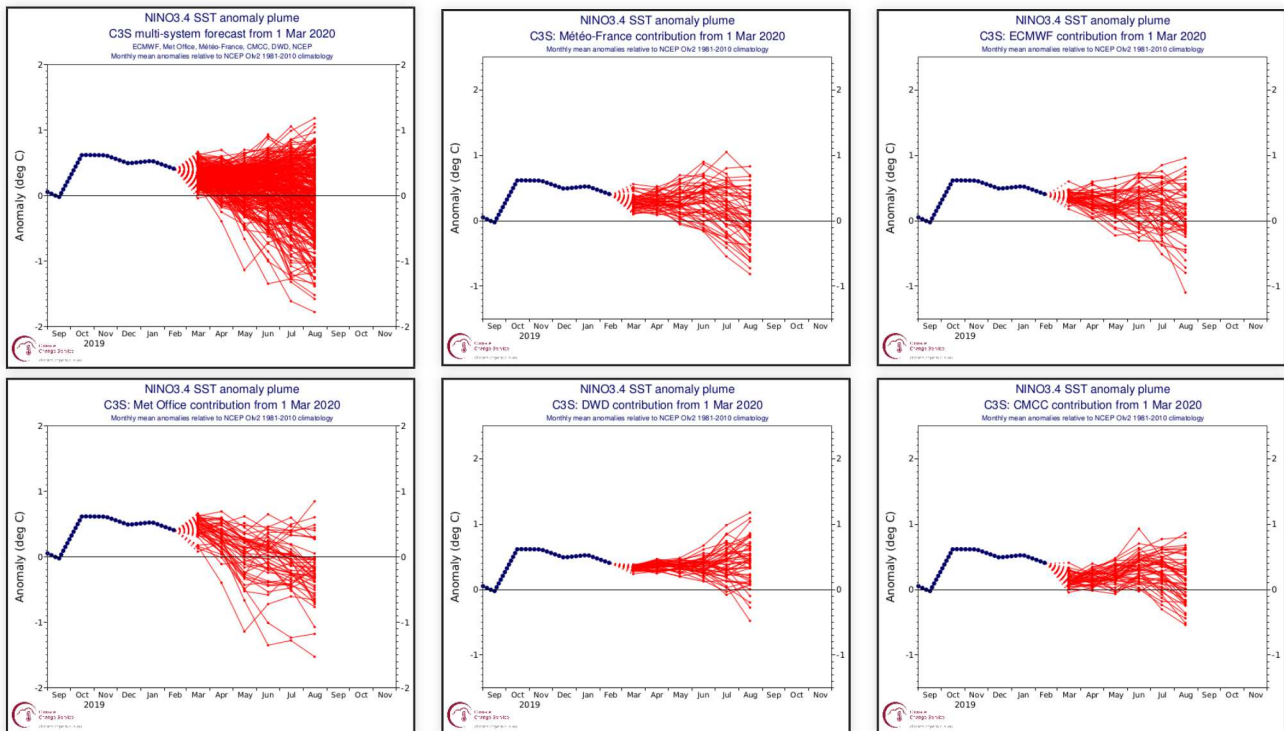
Agreement on neutral phase for AMJ. High probabilities for persistence of these neutral conditions afterwards in Summer.



Oceanic forecast : C3S Nino3.4 re-scaled plume diagrams

Good agreement between models. Most members forecast a weak positive anomaly. Neutral El Nino conditions are therefore most likely for the coming months.

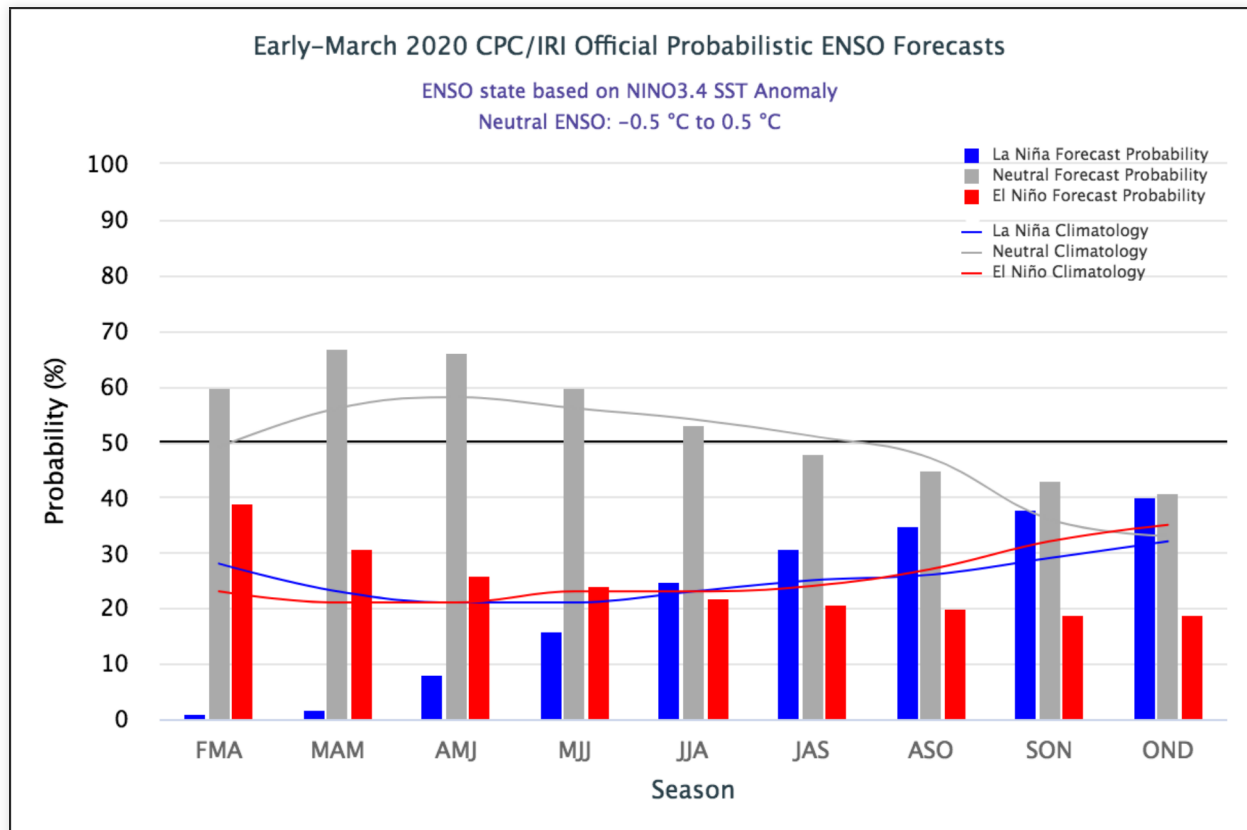
Forecasted Phase : neutral conditions



C3S plume diagrams re-scaled from the variance of observations for the period 1981-2010. https://climate.copernicus.eu/charts/c3s_seasonal/

Oceanic forecast : Synthesis from IRI

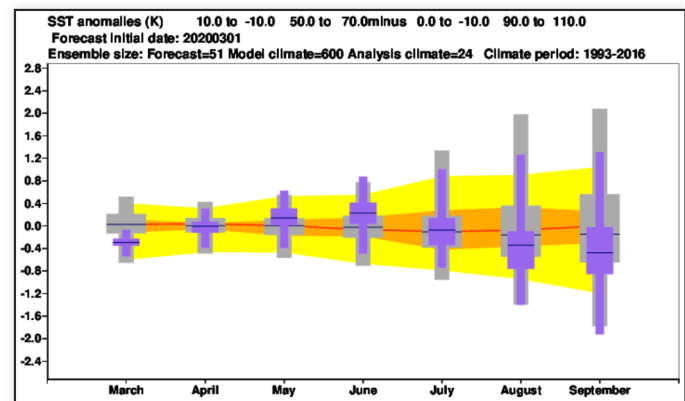
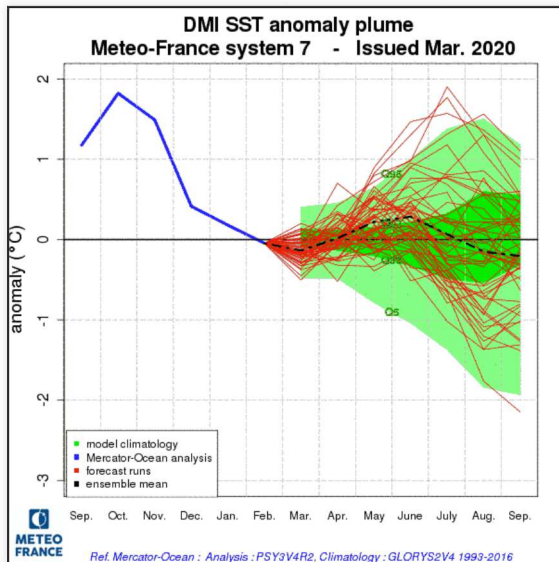
Neutral conditions are most likely (about 70 %) for AMJ



Probability of Niño, Niña, and neutral phases for the next 8 quarters. source <http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/>

Oceanic forecast : Indian ocean - DMI evolution

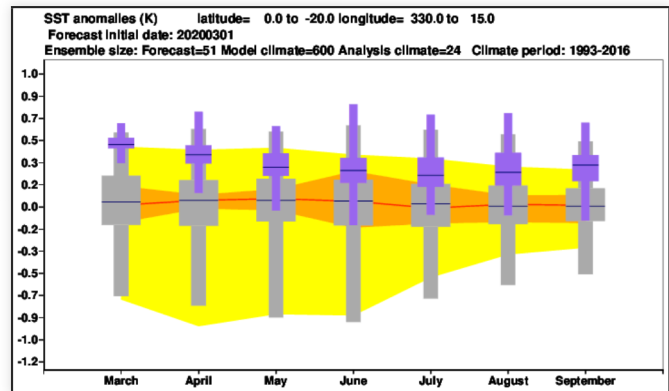
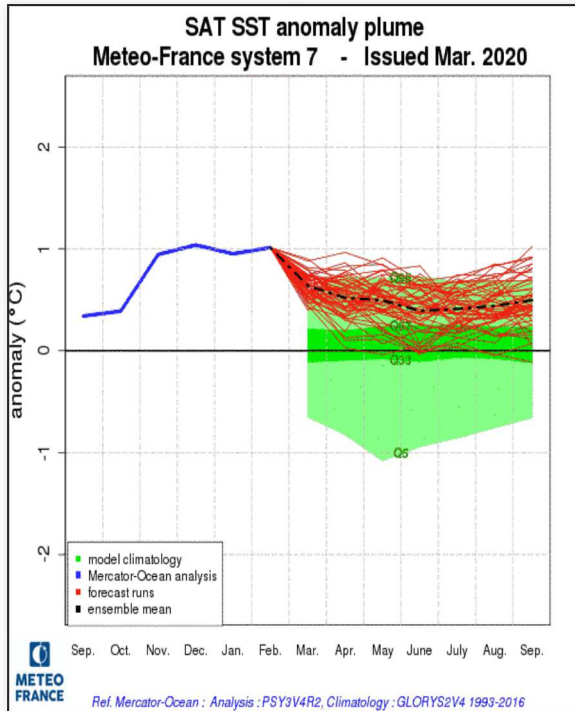
The expected DMI stay close to the normal (slightly positive)



DMI index : analysis, forecasts and model climatology with MF7 on the right and SEAS5 on the left

Oceanic forecast : Atlantic ocean - SAT evolution

Gradual decrease of the SAT index. However fairly strong anomaly values in the coming months compared to climatology (most members in the upper tercile).



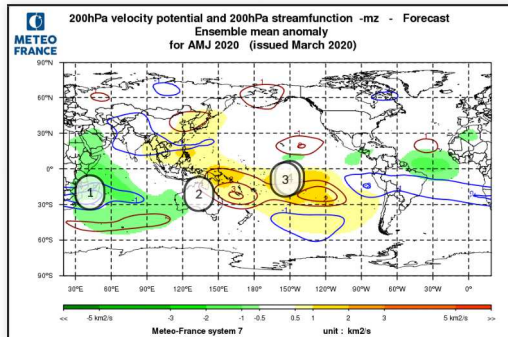
Anomaly on the SAT box : analysis, forecasts and model climatology with MF7 on the right and SEAS5 on the left

Drivers : undefined

Atmospheric circulation forecasts : velocity potentiel and stream function at 200hPa

Velocity Potential : Globally, anomalies are weak. The four models agree on a dominant area of upward motion over the western Indian Ocean/eastern Africa. This is consistent with a slightly positive DMI. A downward motion anomaly pole is hardly visible over the Maritime Continent (weaker than in the last month's forecast). Over the central Pacific, one can notice an anomaly dipole on both sides of the equator, maybe a response to the SST anomaly dipole. Over the Atlantic, as for SST, models diverge

Streamfunction : over the Indian and the Pacific oceans, models are fairly coherent. Over the Atlantic, less agreement between models : anomalies are weak in MF-S7, but the 3 others are globally forecasting the same dipole in the Northern hemisphere (a kind of NAO+ pattern, shifted southward).

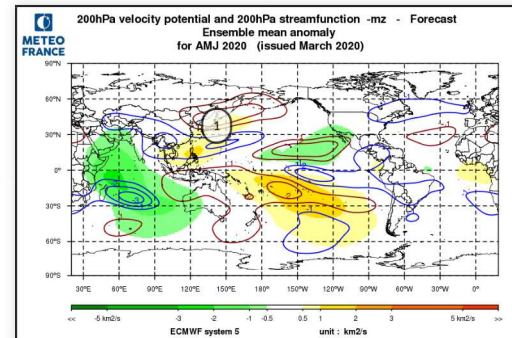


1- The strongest VP anomaly

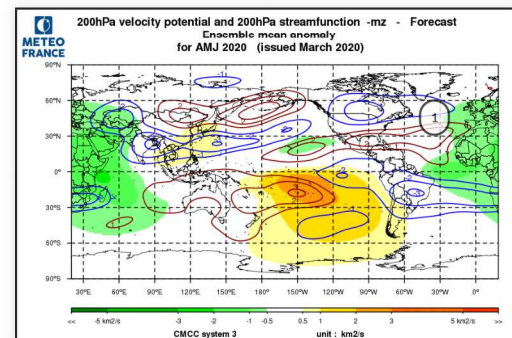
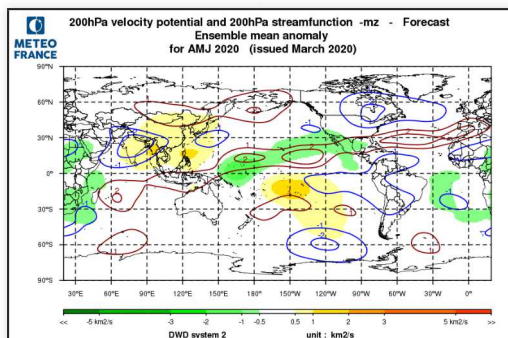
2- Positive VP anomaly (downward motion anomaly)

3- Negative pole of the North-South dipole, on both sides of the equator

4- Positive pole of the North-South dipole, on both sides of the equator



1- FC dipole, possibly the trace of a teleconnexion (already forecasted last month).

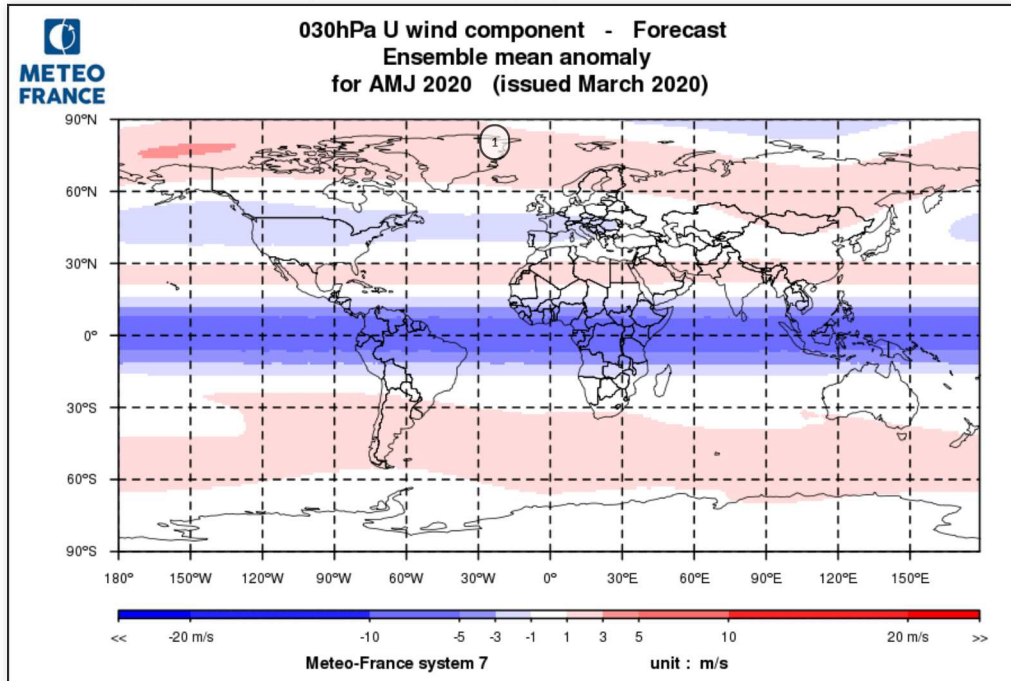


1- FC anomaly dipole, visible in several models. Limited confidence, anyway.

MF7, SEAS5, DWD and CMCC 200hPa velocity potential anomalies (color range, green : ascending, orange: subsidence) and stream function anomalies

Atmospheric circulation forecasts : polar vortex

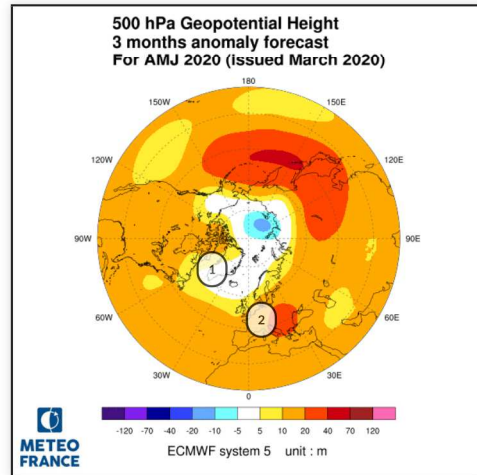
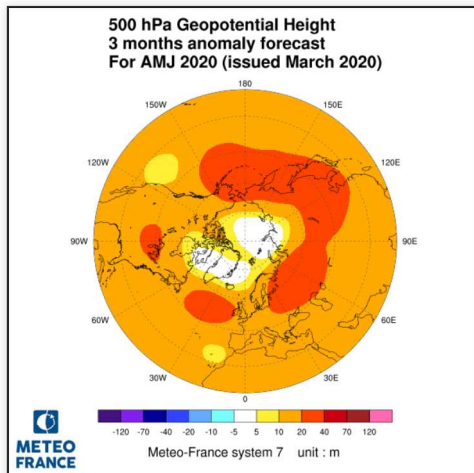
30 hPa zonal wind anomaly shows enhanced polar vortex for the coming 3 months. This should favour AO+ and NAO+ modes.



1- enhanced polar vortex

Atmospheric circulation forecasts : 500 hPa Geopotential anomalies

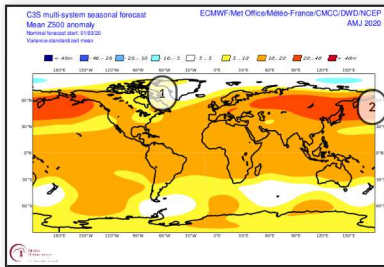
MF7 and ECMWF are coherent over North Pacific (especially the strong positive anomaly) and at the pole (low anomaly values). They also agree on a high value belt at mid latitudes, but with a southward shift with ECMWF-SEAS5 compared to MF-S7.



polar projection of MF7 and SEAS5 500hPa geopotential height anomalies.

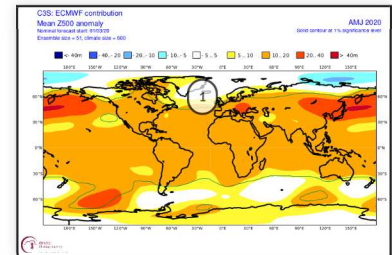
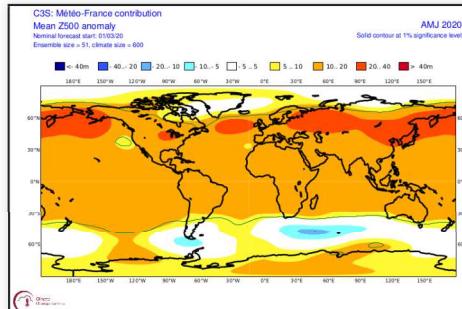
Atmospheric circulation forecasts : Z500 anomalies in C3S models

In the northern hemisphere, relatively good agreement between models regarding the main anomaly patterns. Over the North Atlantic, they correspond to NAO+ and/or EA+ modes of variability, like the last month's forecast. Thus Europe would be covered by a positive geopotential anomaly.

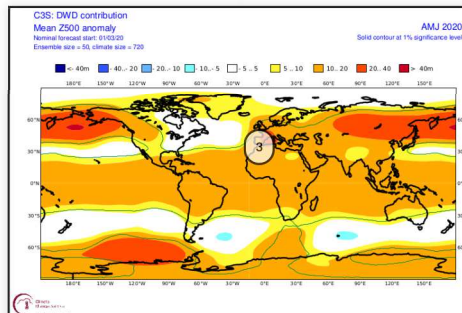
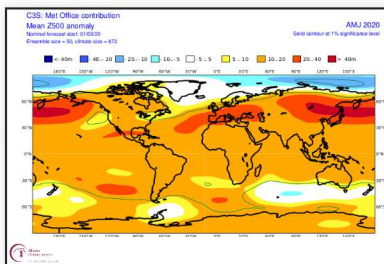


2- High geopotential structure present in all models

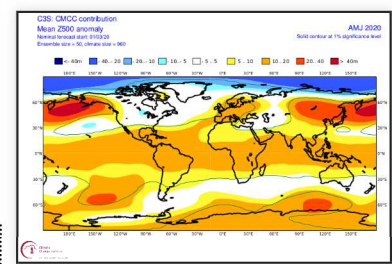
1- Relative negative geopotential anomaly forecasted by all models



1- With SEAS5, southward shift of the anomaly dipole (already seen in stream-functions)



3- DWD is significantly different from the other models over the Atlantic, although it also forecasts a high anomaly over Europe.

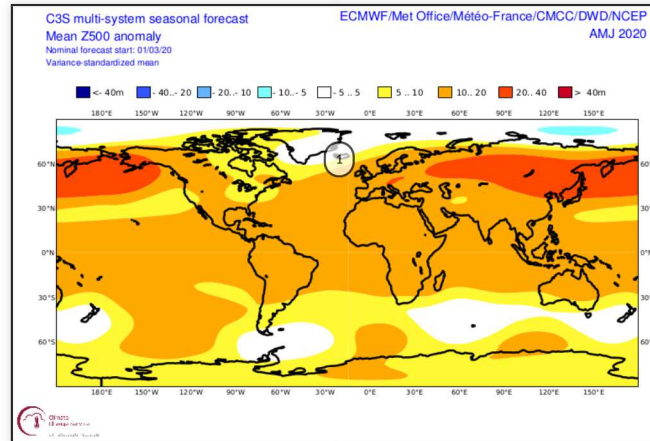


C3S multi-system, MF-S7, SEAS5, UKMO, DWD and CMCC 500hPa geopotential height anomalies.

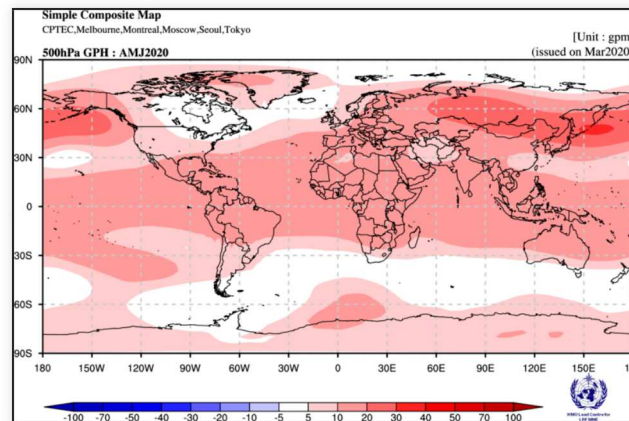
Atmospheric circulation forecasts : Z500 anomalies multi-systems

Good consistency between the C3S multi-model and all but C3S multi-model (bottom map).

Over North Atlantic, it may be noted that C3S multi-model is shifted northward.

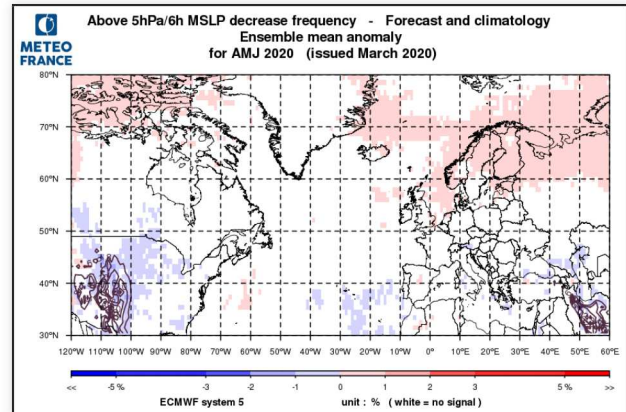
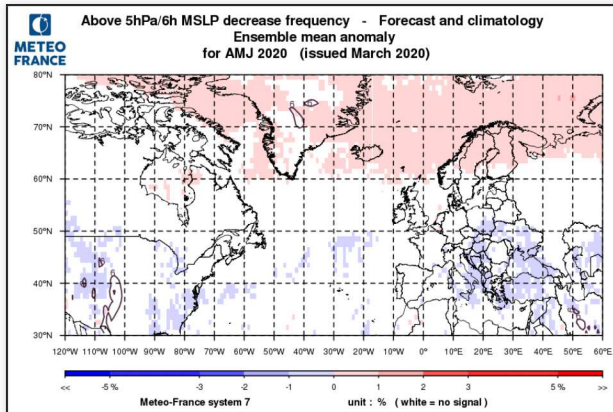


1- Northward shift of C3S multi-model



Atmospheric circulation forecasts : Strong MSLP decrease

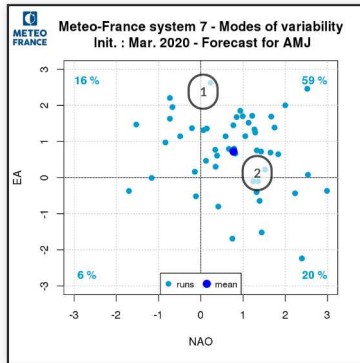
With both models, the frequency of lows is increased in the North of the Atlantic basin. The positive anomaly area is shifted Southward with SEAS5, consequence of the shift already observed in Z500 or SF200.



Frequency of more than 5hPa/6h MSLP decrease in MF-S7 (left) and ECMWF-SEAS5 (right)

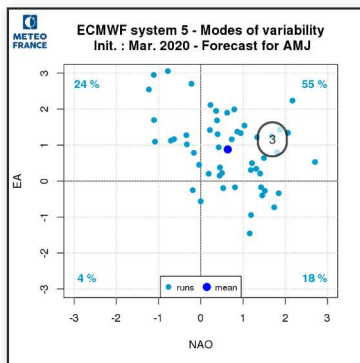
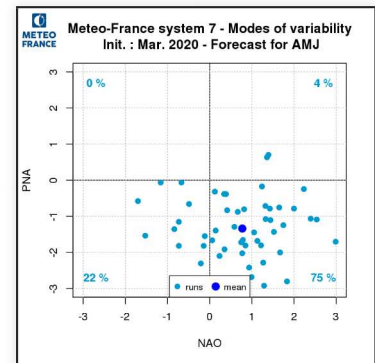
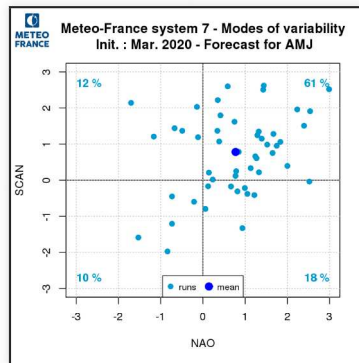
Modes of variability : forecast

As last month, both models suggest a high probability of positive NAO mode, positive EA mode and negative PNA mode.

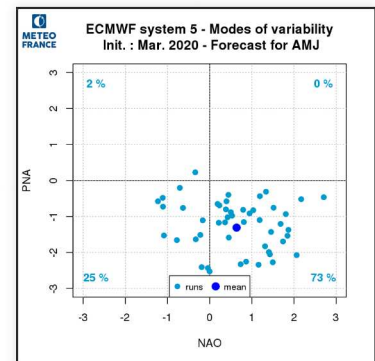
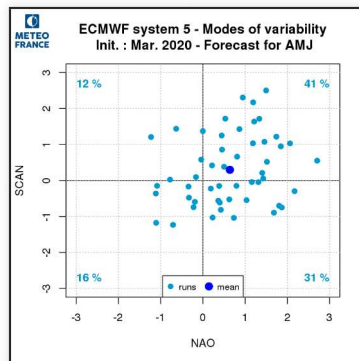


1- positive EA for 81% of runs.

2- positive NAO for 79% of runs.



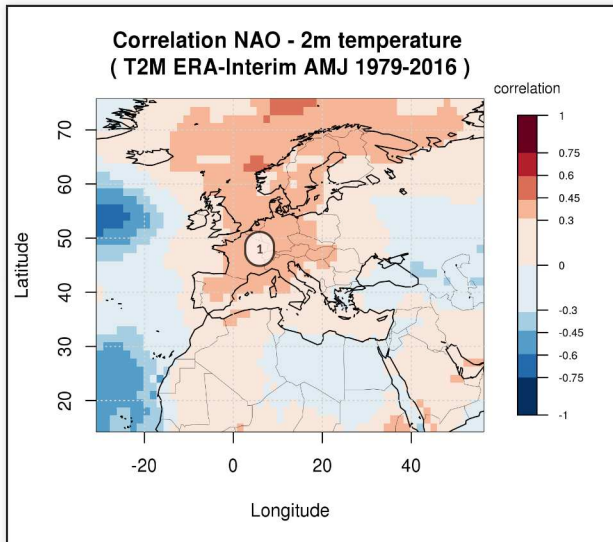
3- EA+ / NAO+ favoured



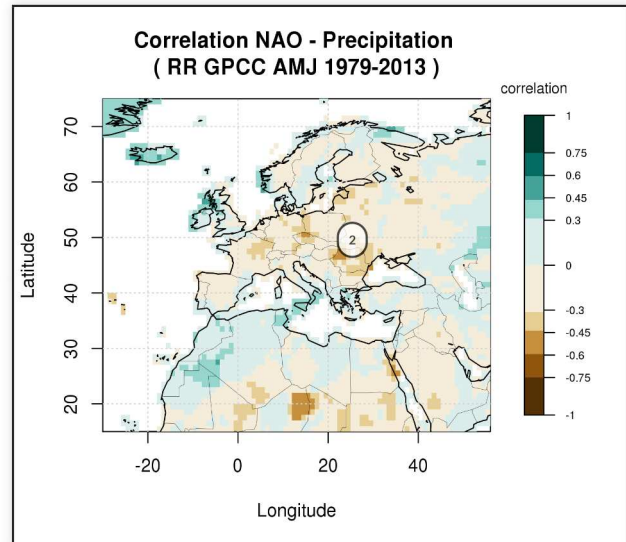
see the modes of variability patterns

Modes of variability : NAO impacts

NAO+ mode should be favoured



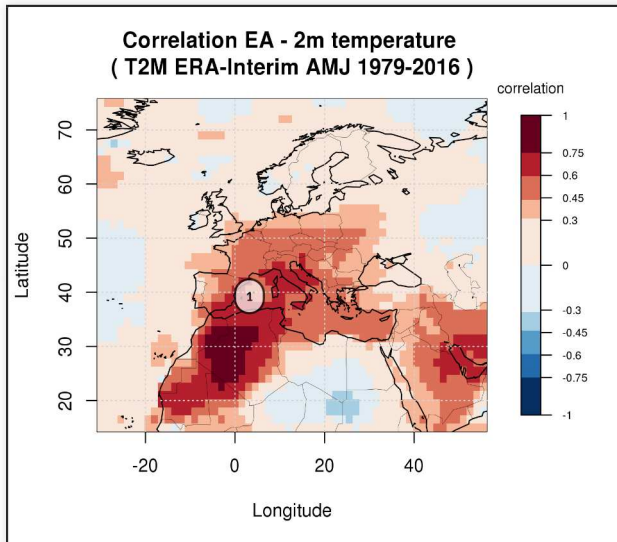
1- Warmer than normal over Europe



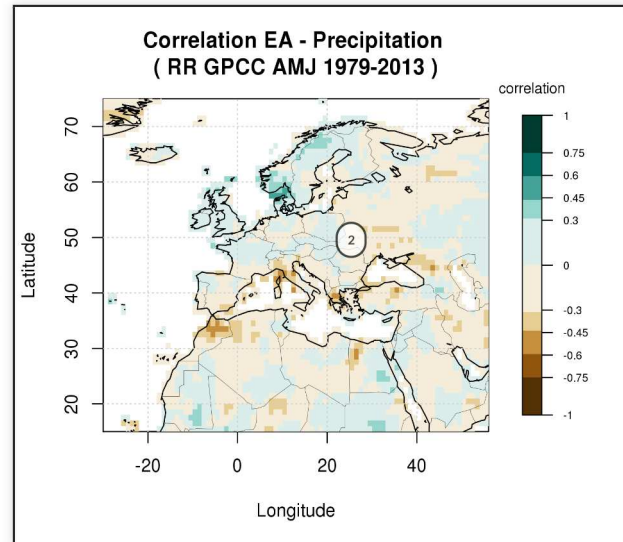
2- weak correlation in general.

Modes of variability : EA impacts

EA+ mode should be favoured



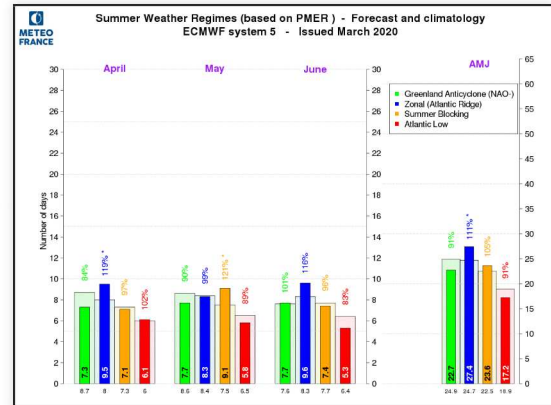
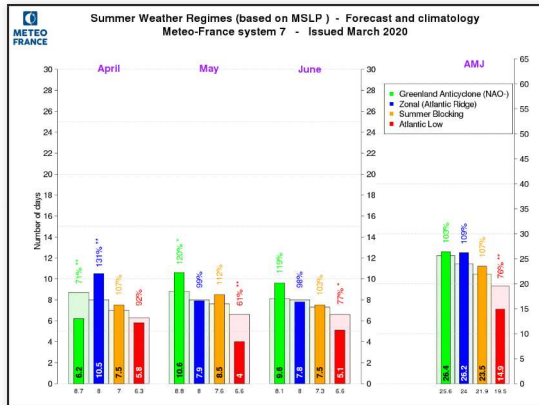
1- Warmer than normal over southern Europe and the Mediteranean basin



2- weak correlation in general.

Weather regimes : summer MSLP

Some differences between models. But they agree on an excedence of Atlantic Ridge (significant in SEAS5) and deficit of Atlantic Low (very significant in MF-S7)

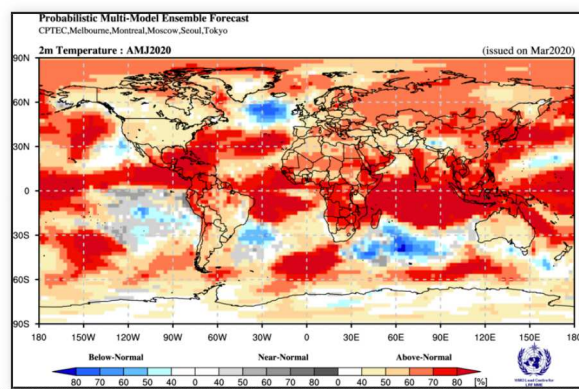
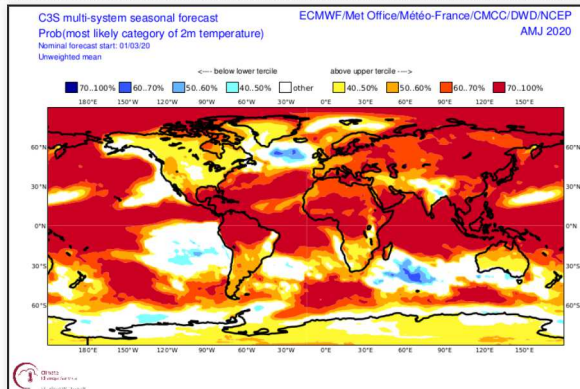
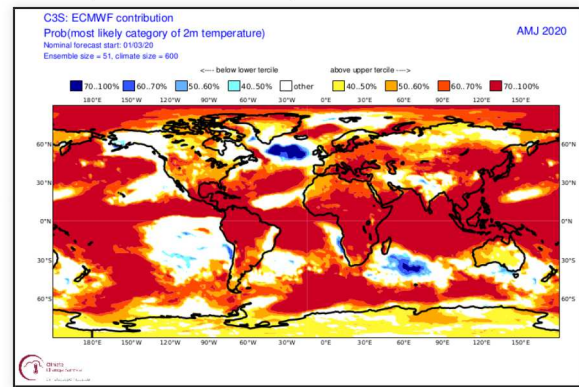
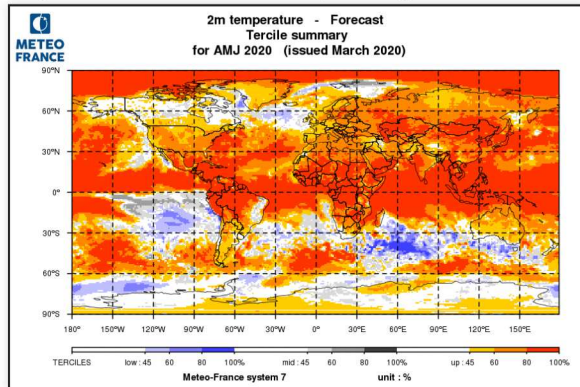


Frequency of SLP weather regimes, compared to model's own climatology, for the next three months and aggregation over the entire quarter, for MF-S7 (left) and SEAS5 (right).

See the summer weather regime patterns

Forecast of climatic parameters : Temperature probabilities

Good agreement between models over the continents, mainly warmer than normal (partly the climate change signal). Some divergence over Canada, where we provided a cool scenario (consistent with a positive Z500 anomaly over North Pacific).

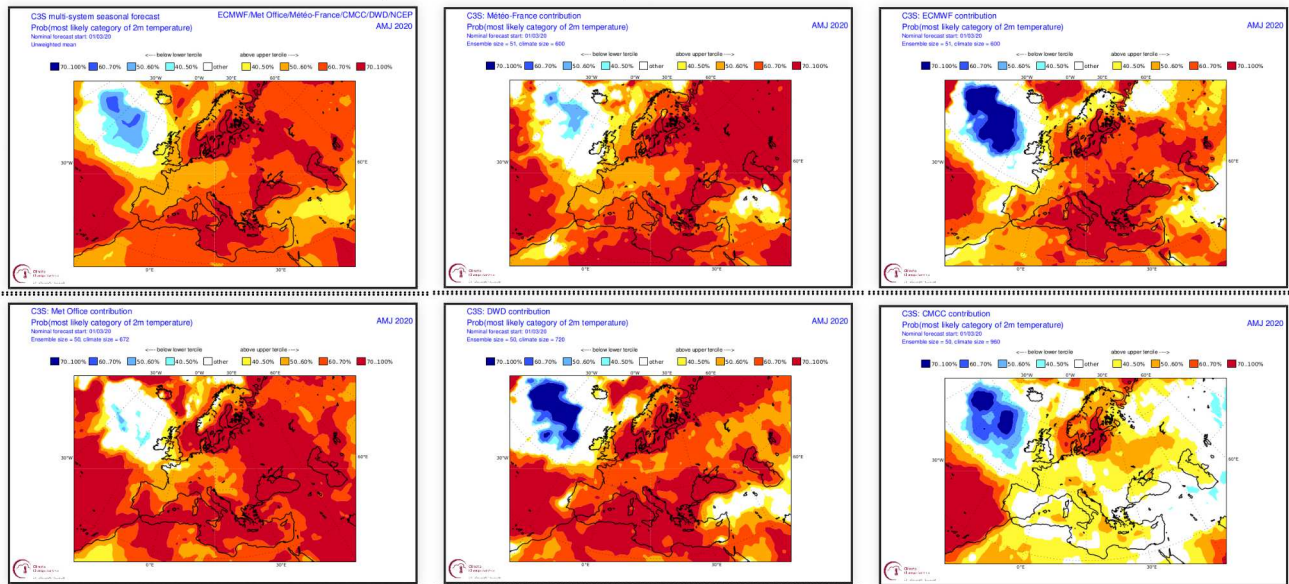


2m temperature probability map from MF-S7 (top left), ECMWF-SEAS5 (top right), C3S multi-models(bottom left) and others models of WMO multi-models (bottom right)

Forecast of climatic parameters : T2M probabilities over Europe in C3S models

In agreement with their general circulation pattern, all the models favor a warm option over Europe and the Mediterranean basin.

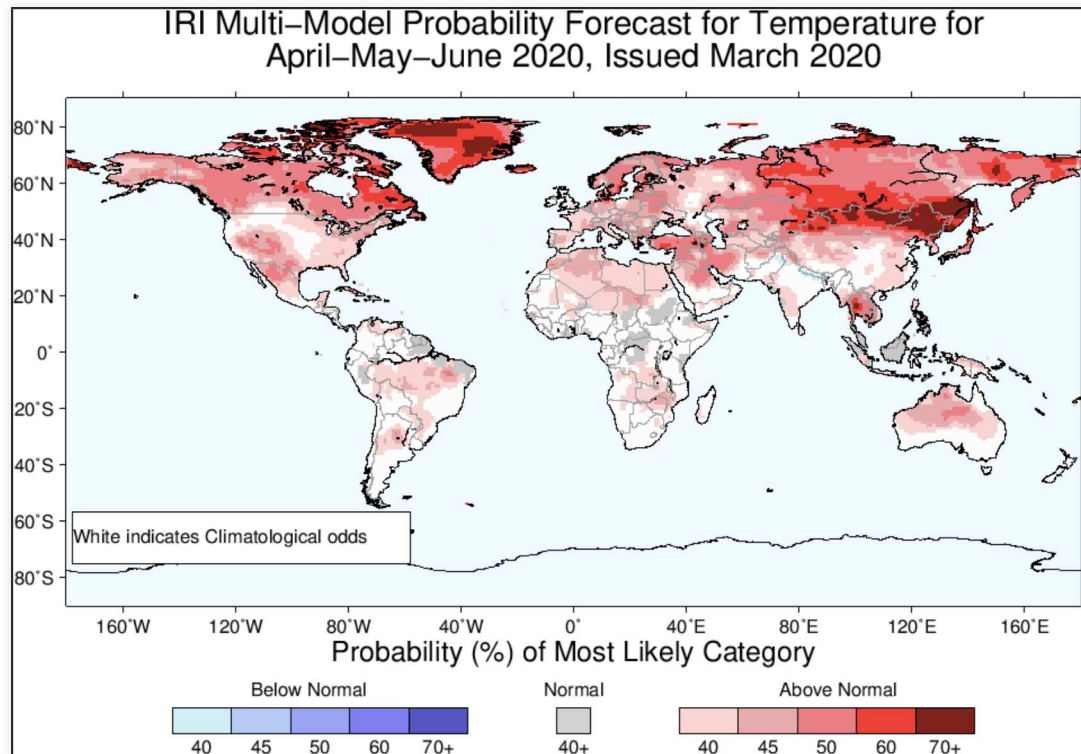
The circulation is forecasted to be mainly zonal (except for DWD, closer to a European Blocking), this could explain lesser probability for the above tercile over Western Europe than over Eastern Europe.



C3S multi-models probability map (top left) and MF-S7, ECMWF-SEAS5, UKMO, DWD, CMCC models.

Forecast of climatic parameters : Température synthèse de l'IRI

The multi-model synthesis of IRI is consistent with other ensemble systems, although the warm signal is weaker, especially in tropical latitudes. It may be noted a high probability for "above normal" above Canada, which is not the signal we privileged (see 2 slides above).



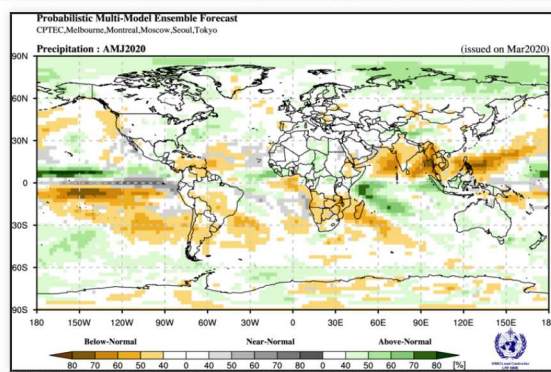
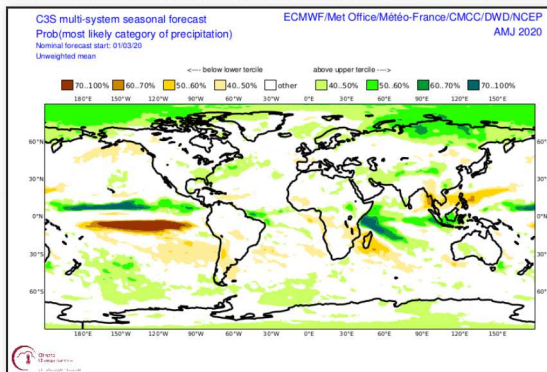
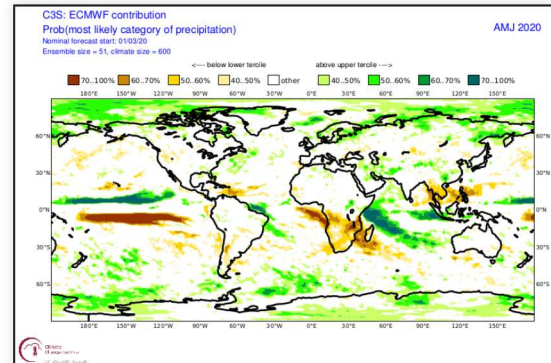
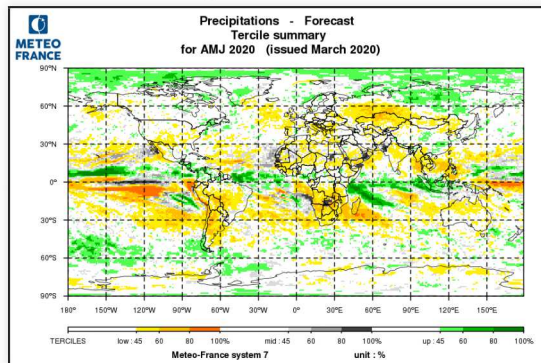
<https://iri.columbia.edu/our-expertise/climate/forecasts/>

Forecast of climatic parameters : Precipitation

Weak signal in general.

In the tropical belt, the signal is closely linked to SST anomalies. Nearby terrestrial regions are impacted. The clearest signal is the anomaly dipole over South of Africa (Dry) and West Indian Ocean tropics (Wet).

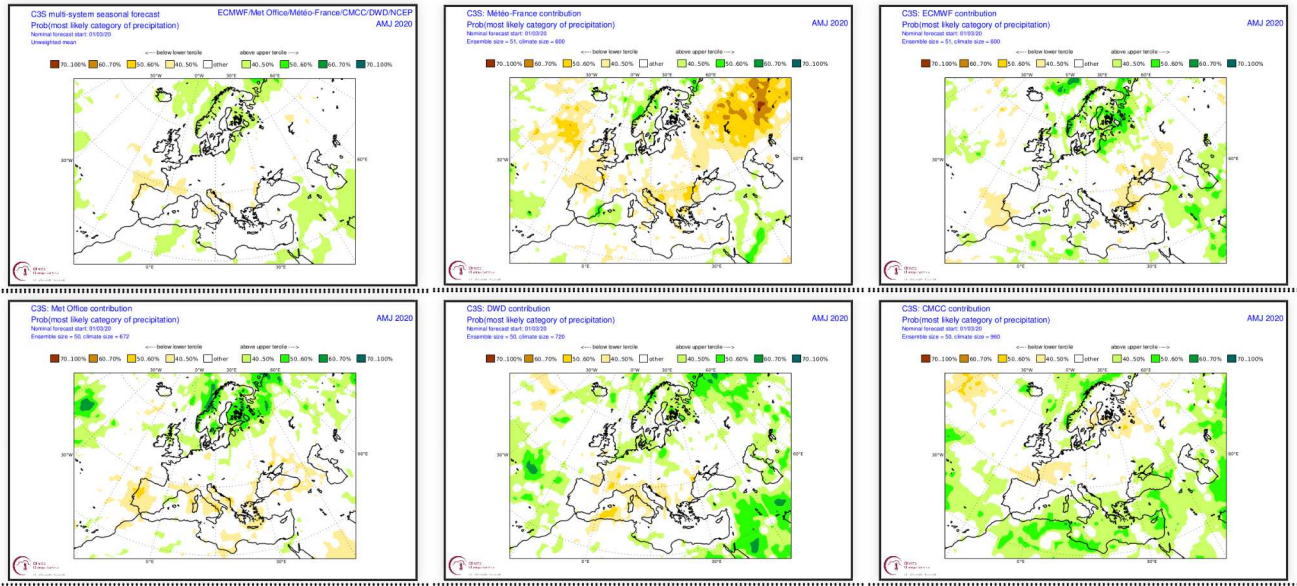
Wet conditions for the high latitudes of the northern hemisphere.



precipitation probability map from MF-S7 (top left), ECMWF-SEAS5 (top right), C3S multi-models (bottom left) and others models of WMO multi-models (bottom right)

Forecast of climatic parameters : Precipitation probabilities over Europe in C3S models

In agreement with Z500 anomaly pattern over North Atlantic, enhanced wet signal for northern Europe. Some patches of dry signal for southern Europe. Over the Mediterranean basin, there isn't any consistency.

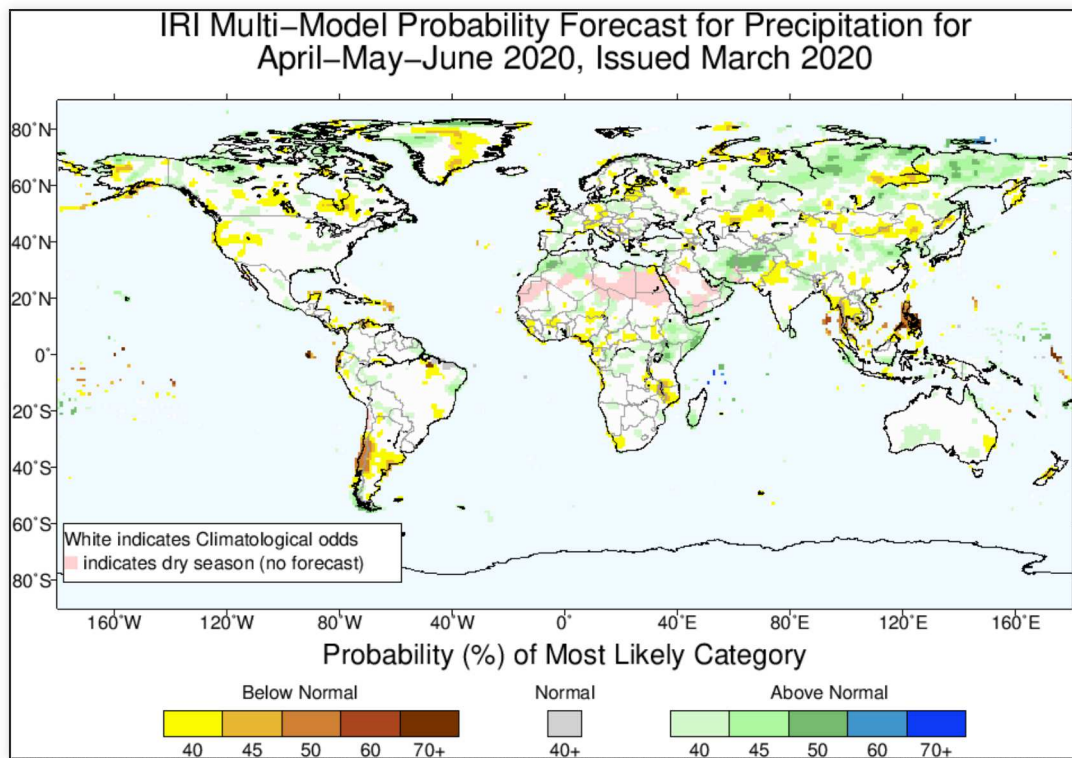


C3S multi-models probability map (top left) and MF-ST, SEAS5, UKMO, DWD, CMCC models.

Forecast of climatic parameters : IRI precipitation synthesis

Very patchy map.

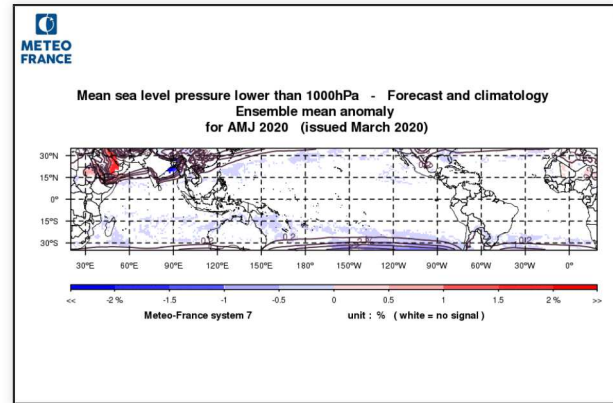
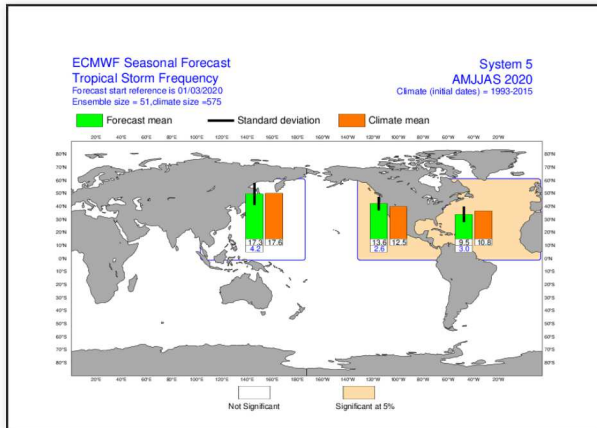
In the tropics, it should be noticed the wet signal over Eastern Africa, consistent with general circulation (see VP200 discussion).



<https://iri.columbia.edu/our-expertise/climate/forecasts/>

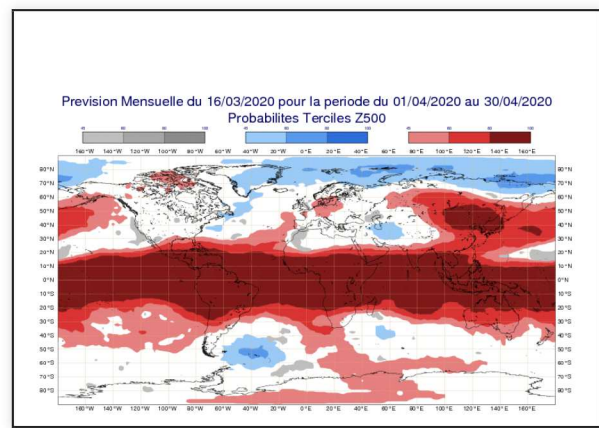
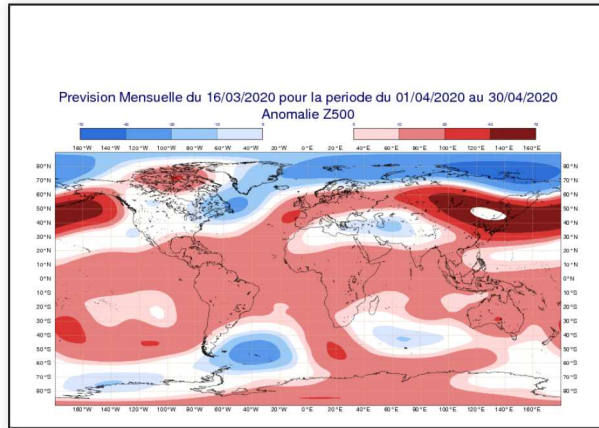
Forecast of climatic parameters : Tropical Storm Frequency

First forecast for the north hemisphere season.



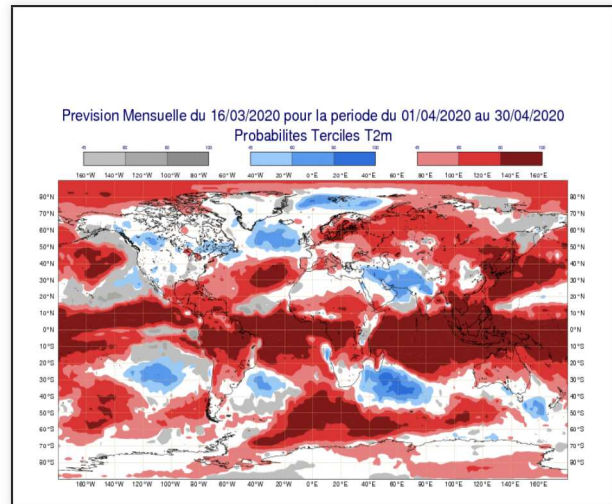
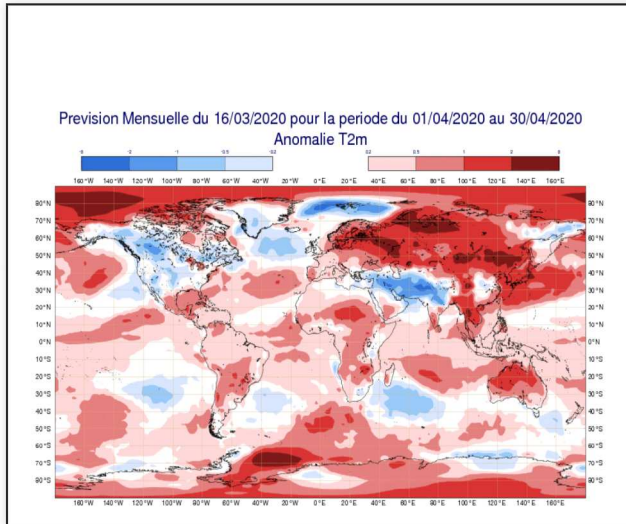
Monthly forecast of 20200316 : Z500

The monthly forecast is similar to seasonal forecast (C3S multi-model for instance), especially for the North Atlantic and Europe.



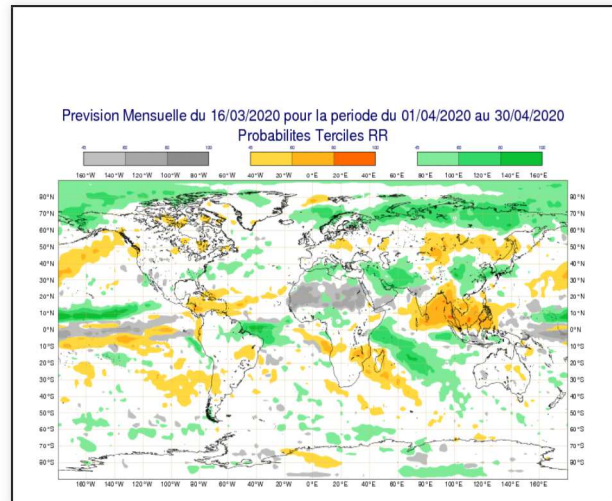
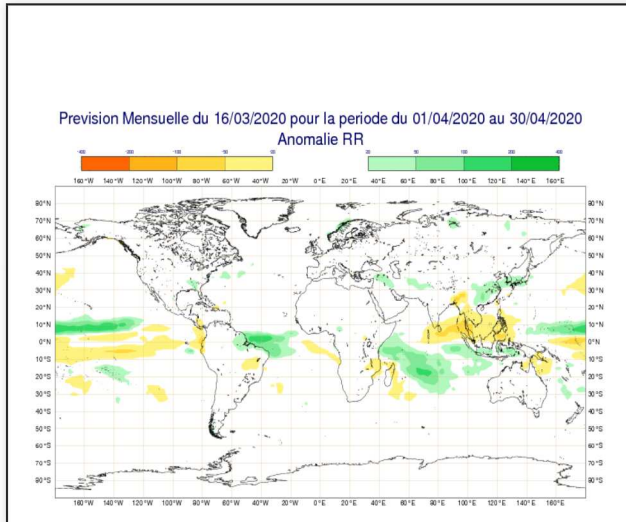
Monthly forecast of 20200316 : temperature

Patterns similar to seasonal forecast over Europe.



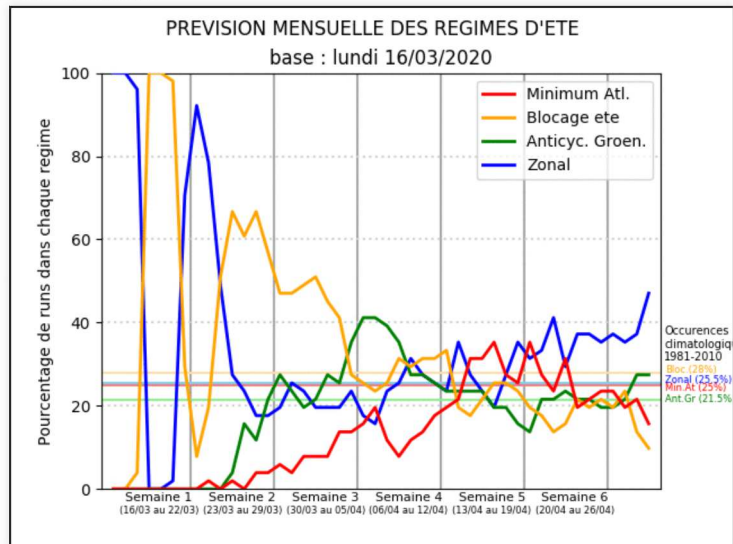
Monthly forecast of 20200316 : precipitation

Weak signal. Over Northern Europe, consistent with seasonal forecast.



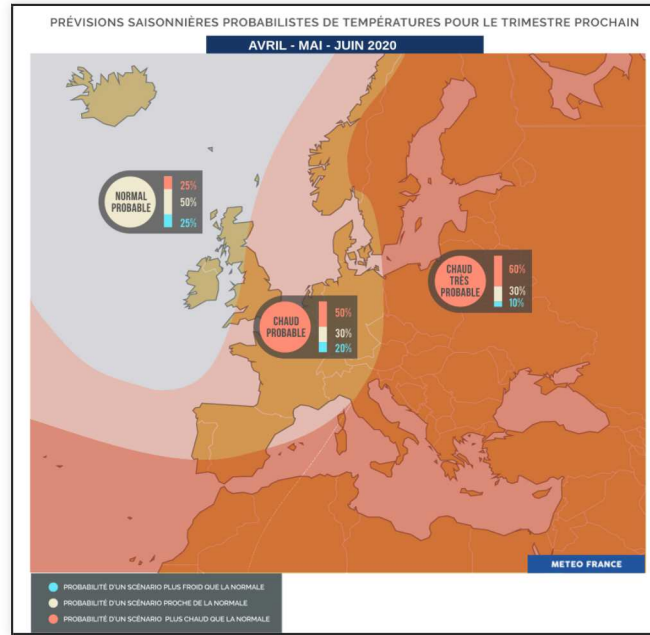
Monthly forecast of 20200316 : summer SLP weather regimes

no dominant weather regime for next month



Synthesis map for Europe : Temperature

The general circulation, dominated by the NOA+/EA+ modes of variability, would lead to a high probability of temperature above normal particularly in Eastern Europe. On the western part, the predominance of westerly anomaly flows would moderate this warm signal.



Synthesis map for Europe : Precipitation

In link with enhanced westerly flows over Northern Europe, foreseen by a large majority of models, the most probable scenario is "wetter than normal" conditions over the north of the continent. Over Southern Europe and the Mediterranean Basin, there is much more uncertainty : the dry scenario we could expect in this kind of circulation is not clearly foreseen by models.

