SWIOCOF - TC

Early seasonal outlook for cyclone activity in SWIO region (2021-2022 season)

Météo France – Regional center for Indian Ocean

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Regional Outlook Forum for South-West Indian Ocean countries

September 21th 2021

- WebConference -

OUTLINE

→ Current & expected situation for global and regional climate drivers

→ Analog approach

→ Outlook on large scale conditions expected over the Southern Indian Ocean during austral summer 2021-2022

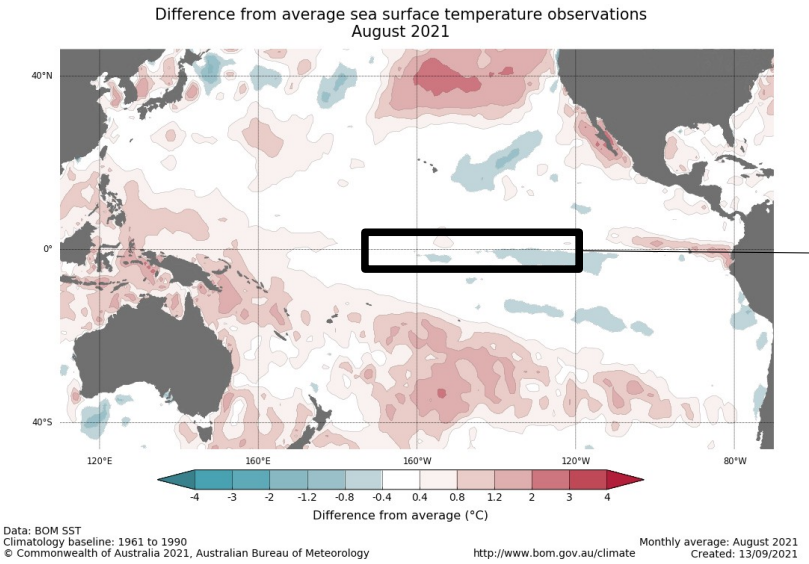
→ Composites and Statistical-dynamical approach (Canonical Correlation Analysis)

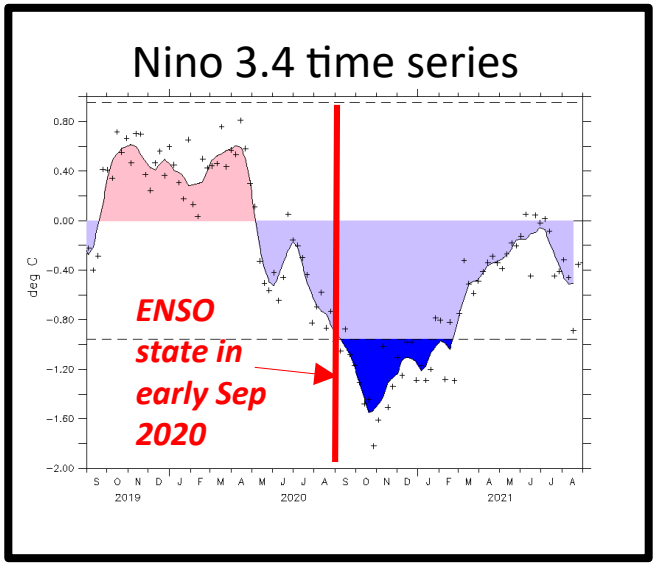
→ ECMWF TC products

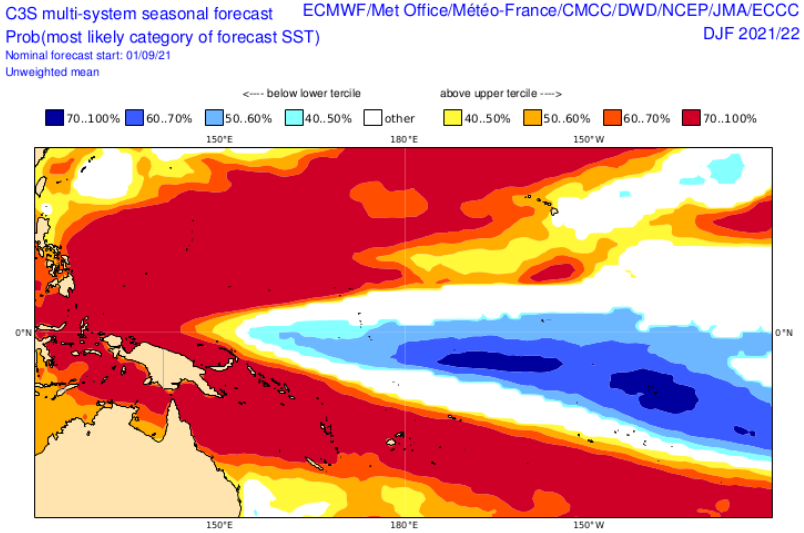
→ Synthesis and conclusion

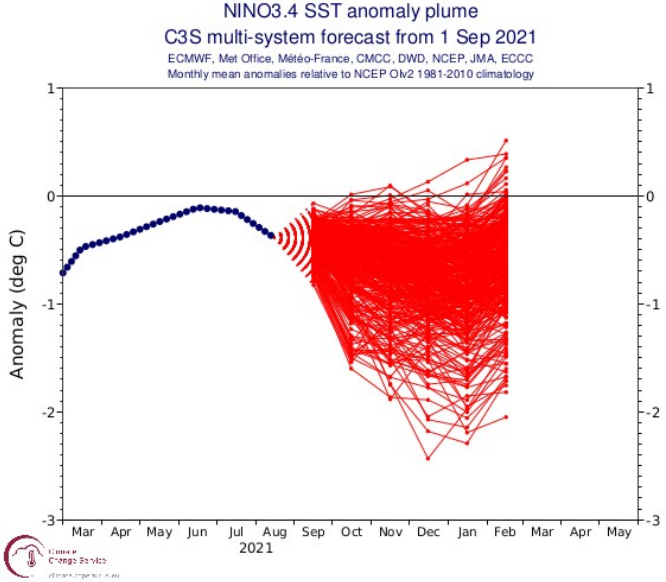
Large scale background (09/19/2021)

Pacific ocean









→ **ENSO currently neutral**

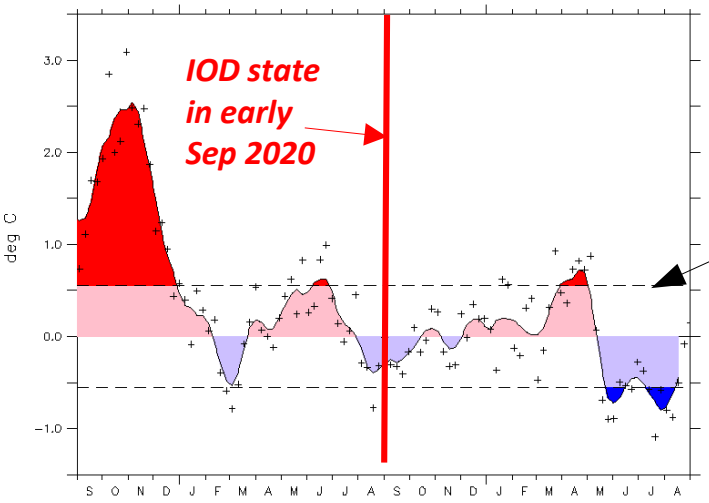
→ **Some cooling expected**

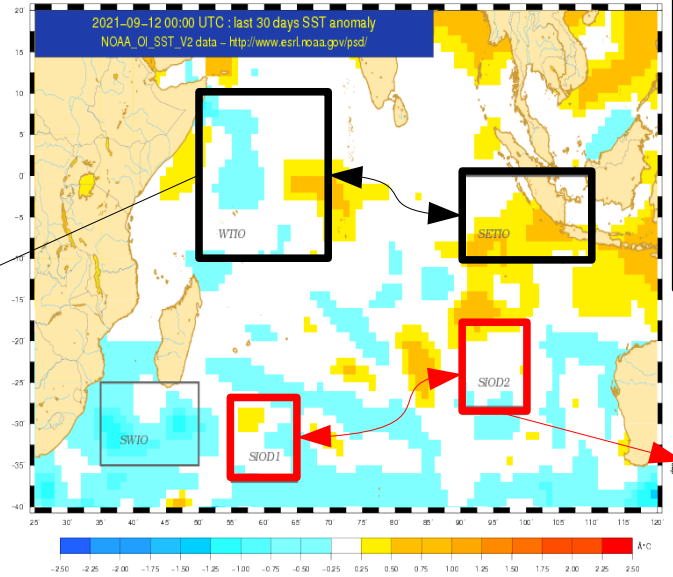
→ **50-70 % chances (blending BoM and NOAA forecasts) of a La Nina event during austral summer.**

Large scale background (09/19/2021)

Indian ocean

IOD time series

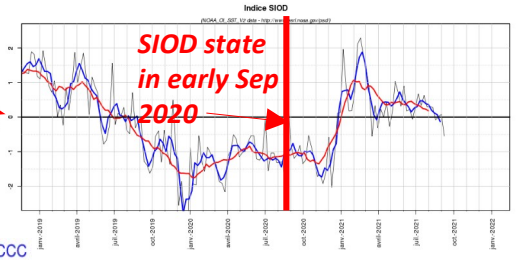




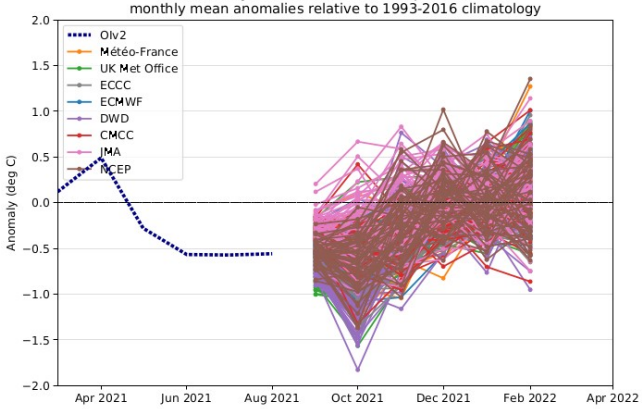
→ Weak IOD – event underway, expected to become neutral by the end of the year

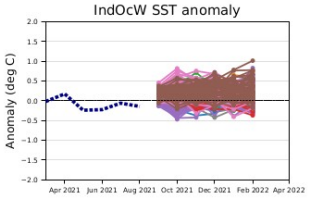
→ SIOD neutral but SIOD+ possible/likely during austral summer

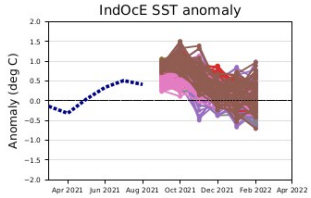
SIOD time series



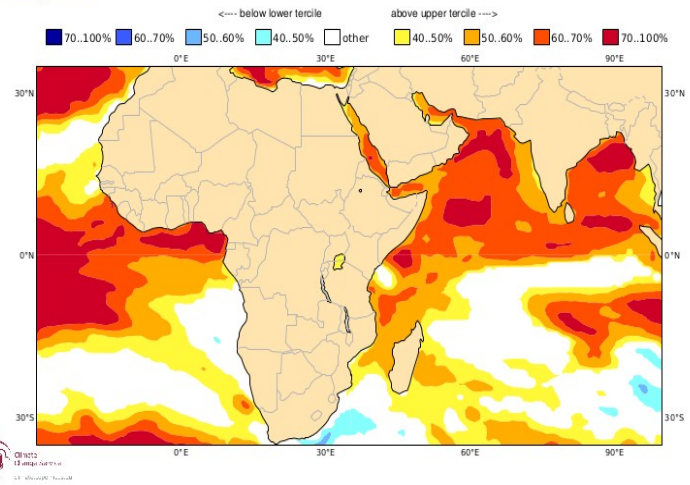
IOD (IndOcW-IndOcE) anomaly
C3S: Multi-system forecast from 1 September 2021
monthly mean anomalies relative to 1993-2016 climatology



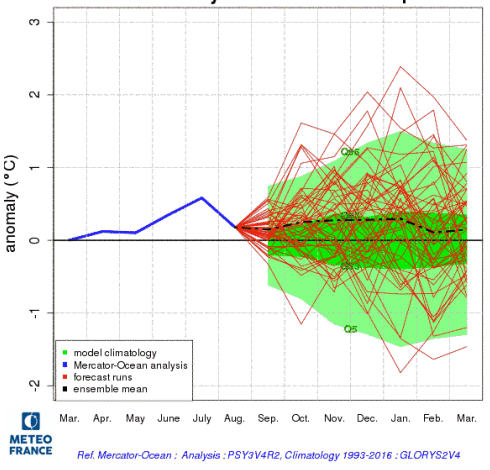




C3S multi-system seasonal forecast — ECMWF/Met Office/Météo-France/CMCC/DWD/NCEP/JMA/ECCC
Prob(most likely category of forecast SST) — DJF 2021/22
Nominal forecast start: 01/09/21
Unweighted mean



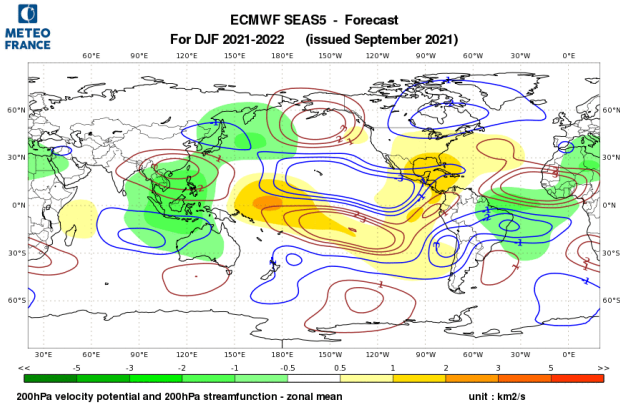
SIOD SST anomaly plume
Meteo-France system 8 - Issued Sep. 2021

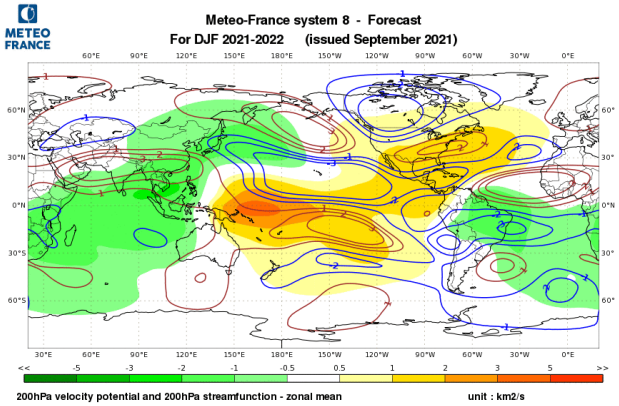


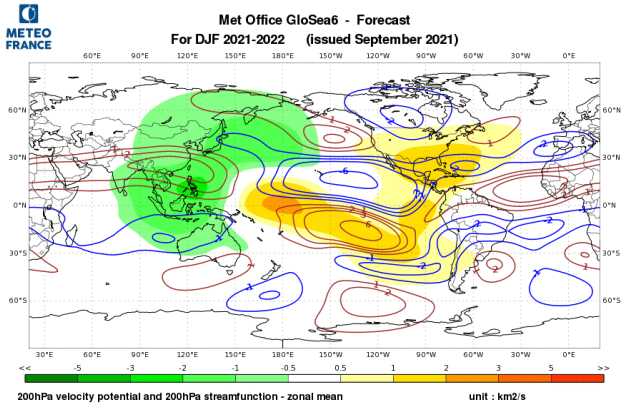
Ref. Mercator-Ocean : Analysis : PSY3V4R2, Climatology 1993-2016 : GLORYS2V4

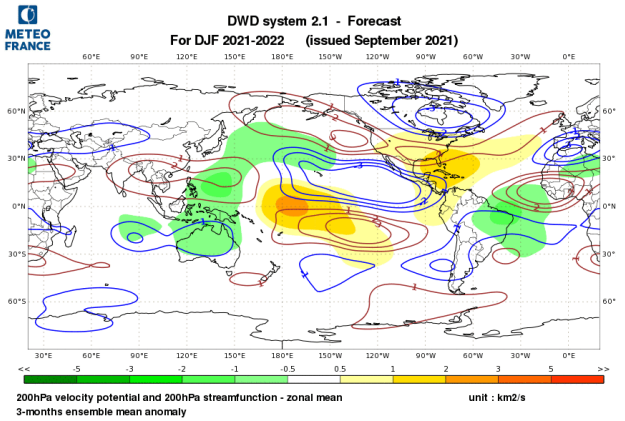
Large scale background (09/19/2021)

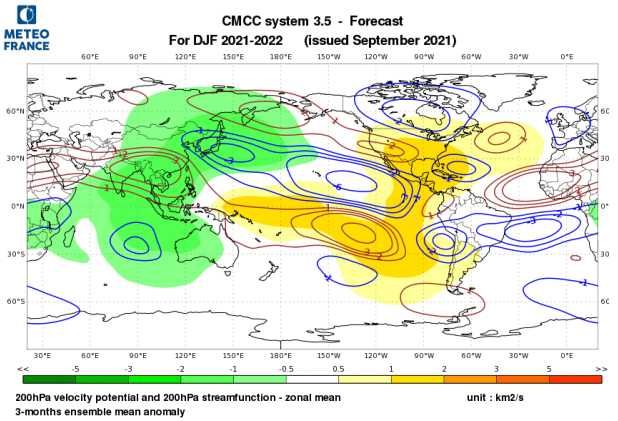
expected global atmospheric patterns

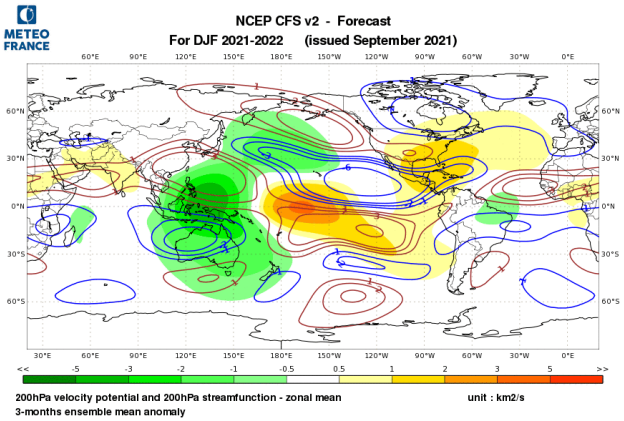








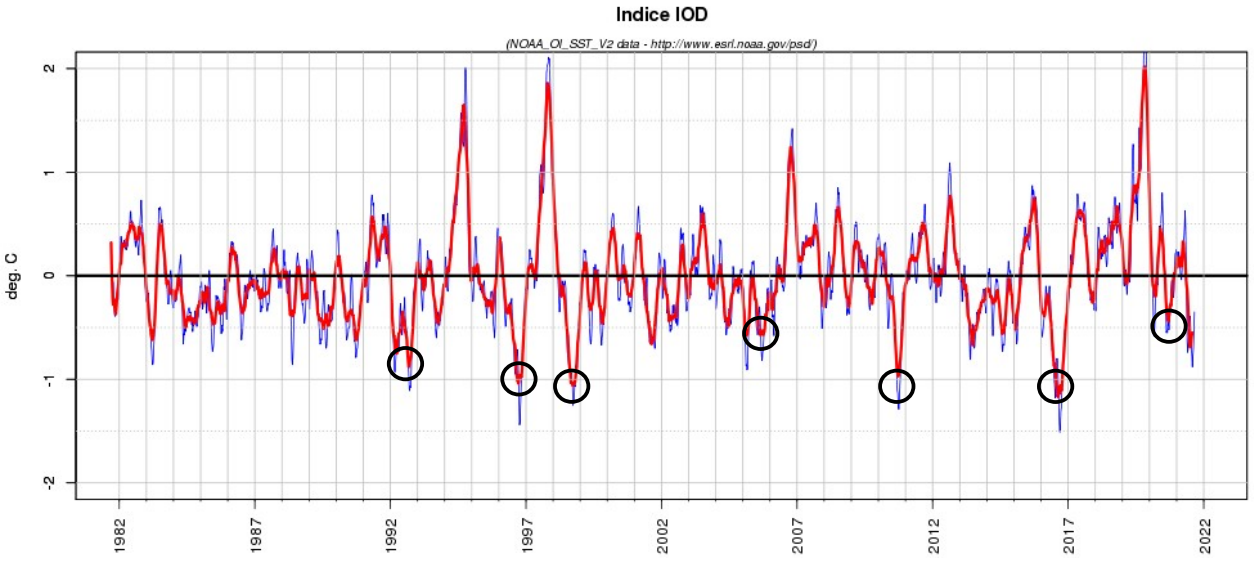


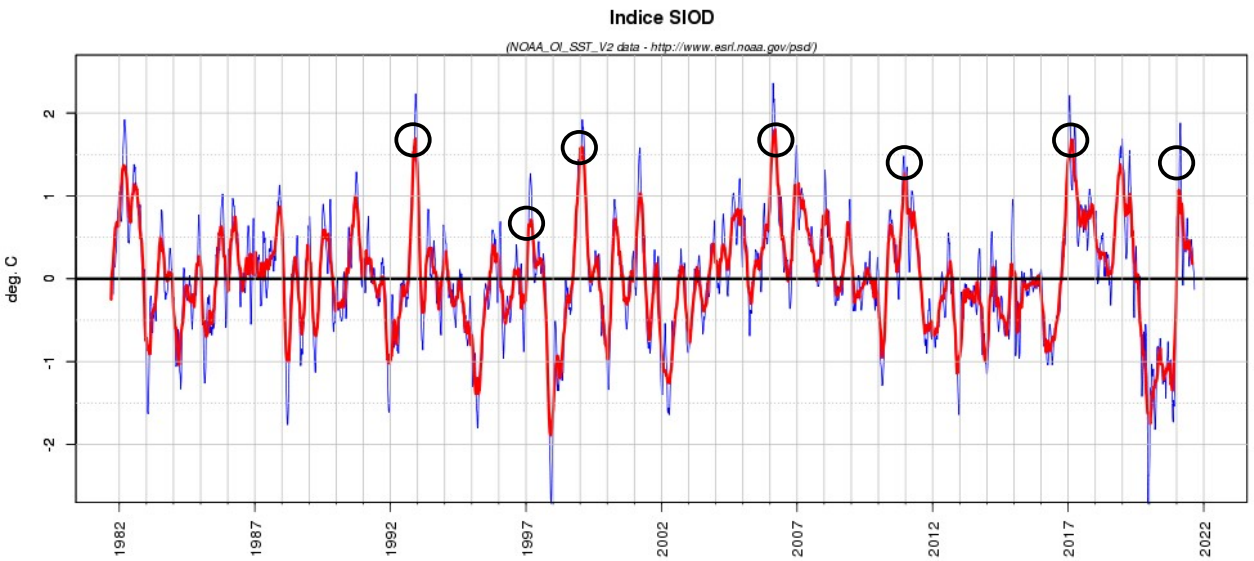


→ **Fairly coherent signal for Walker cells anomalies consistent with La Nina or near La Nina context**

→ **Enhanced convection over the eastern part of the SWIO bassin within the Near Equatorial Trough (Oct-Nov) then the Monsoon Trough (Dec onwards)**

Historical analogs





IOD-/SIOD+ :

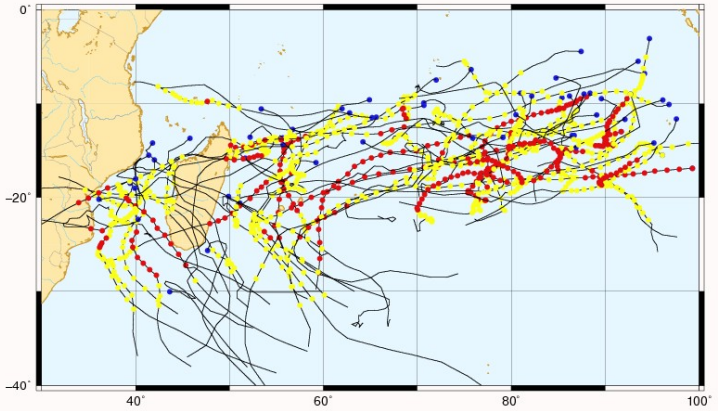
1992/1993
1996/1997
1998/1999 → NINA
2005/2006
2010/2011 → NINA
2016/2017
2020/2021 → NINA

Historical analogs

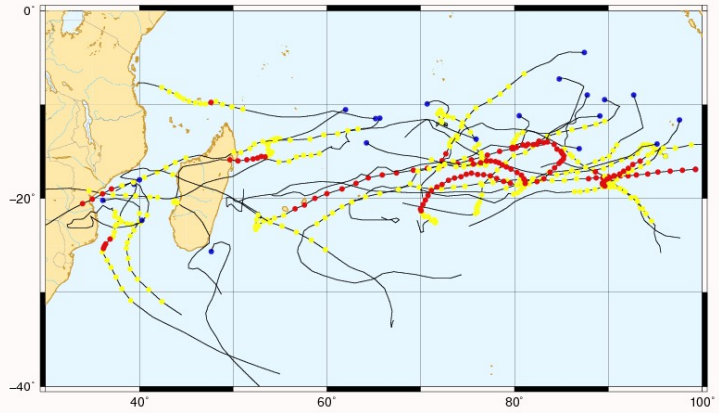
19921993 19961997 **19981999** 20052006 **20102011** 20162017 **20202021**

Yellow dot → TS/ST

Red dot → TC



19981999 20102011 20202021



Mean ACE stand. anomaly : -0,5

(same with TS/TC days and TS/TC numbers)

19921993	-0,4
19961997	1,2
19981999	-1,2
20052006	-0,9
20102011	-1,8
20162017	-1,4
20202021	0,9

La NINA years in blue

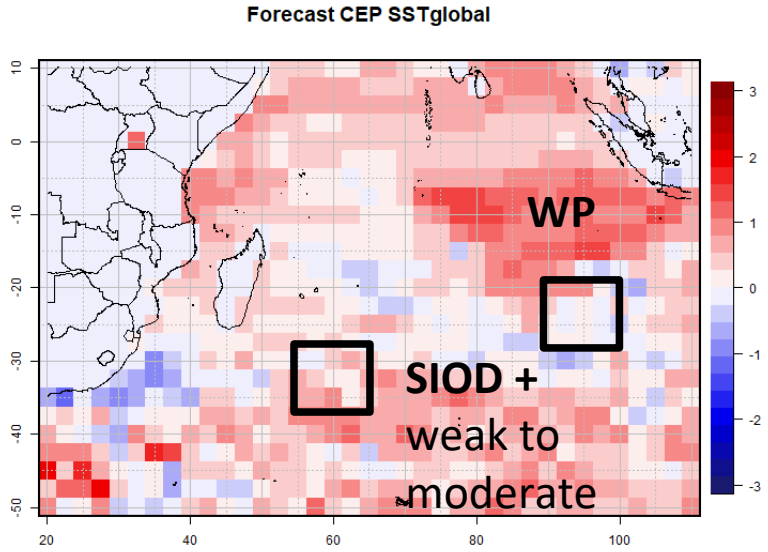
→ Below normal TC activity with the main activity over the eastern part of the basin. Genesis likelihood reduced over northern Moz. channel and to a lesser extend NE of Madagascar

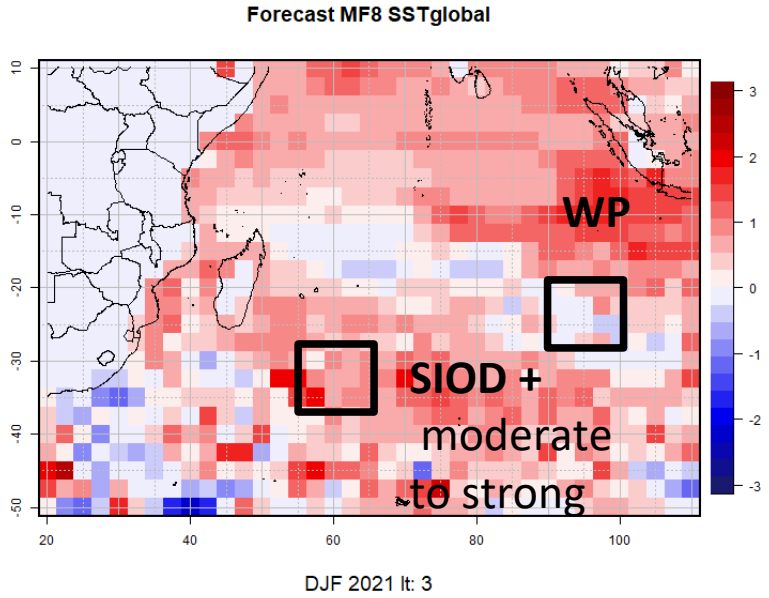
→ Generally zonal/parabolic tracks favored over the Indian ocean and polewards tracks over the Mozambique channel

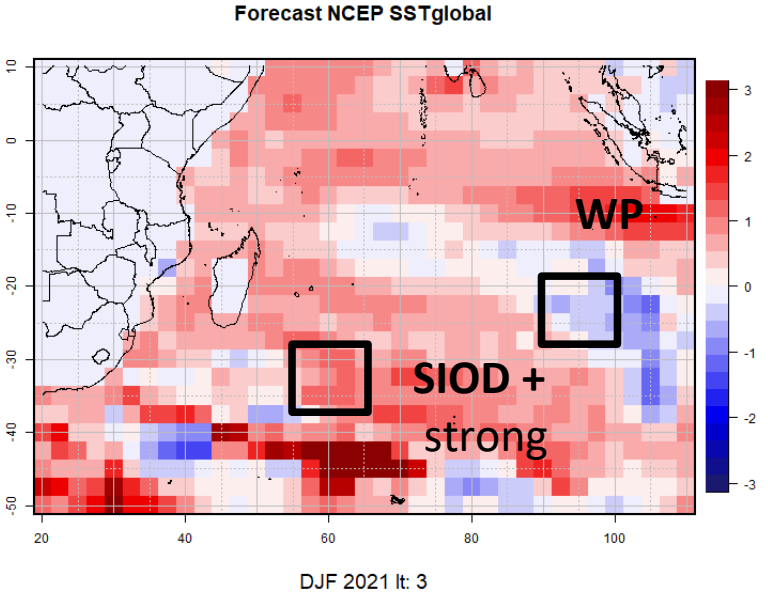
DJF 2021

Seasonal forecast: Large scale pattern – base : 2021/09

SST







→ **« Warm Pool » (WP) over north-eastern bassin**, inherited from IOD- and sustained by the La Nina or near La Nina context

→ **SIOD+ pattern suggested by the 3 guidance**. Some uncertainty in strength that may also be associated with discrepencies on the timing of the event

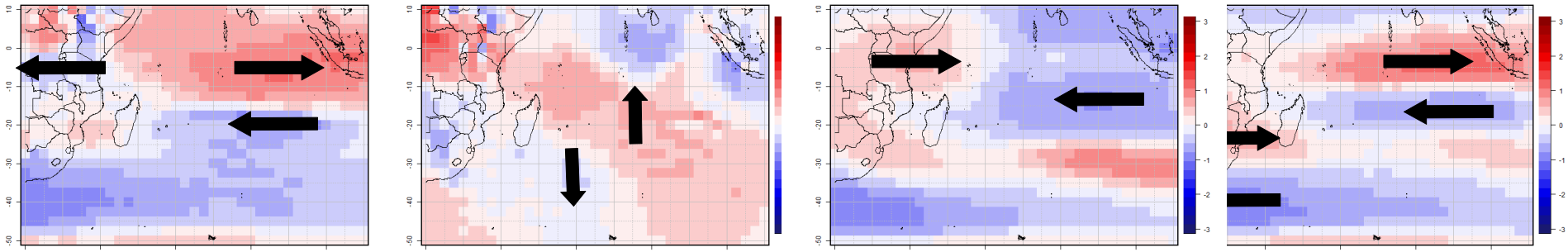
Reminder : skill of seasonal models in predicting SST in the subtropics is lower than in the tropics !

DJF 2021

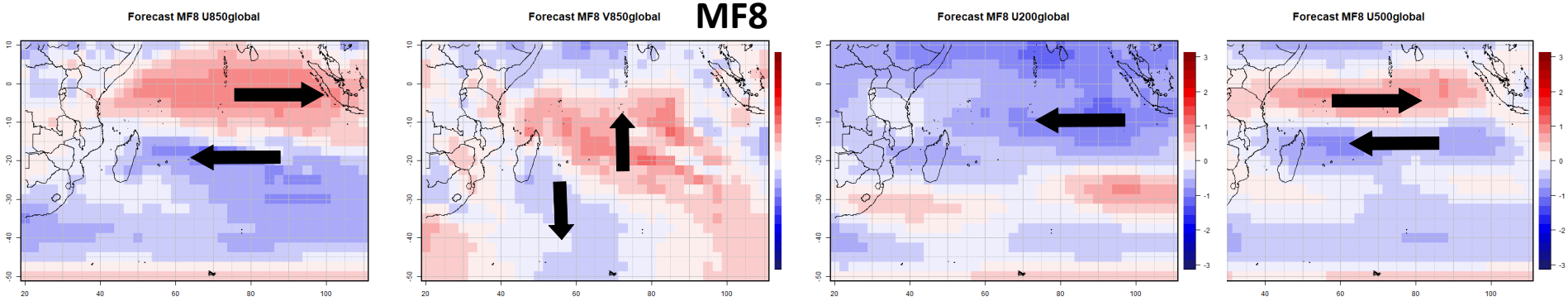
Seasonal forecast: Large scale pattern – base : 2021/09

U850 V850 U200 U500

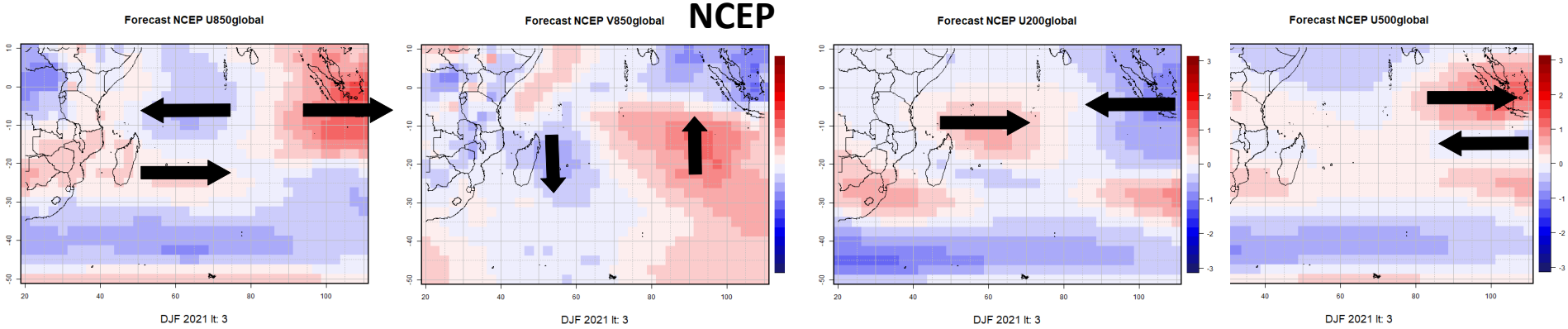
SEAS5



MF8

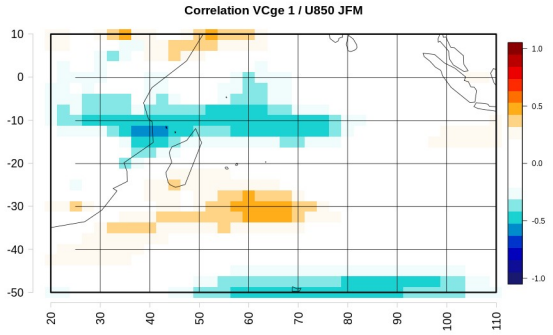


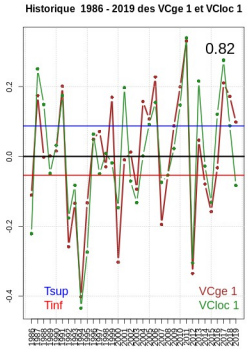
NCEP

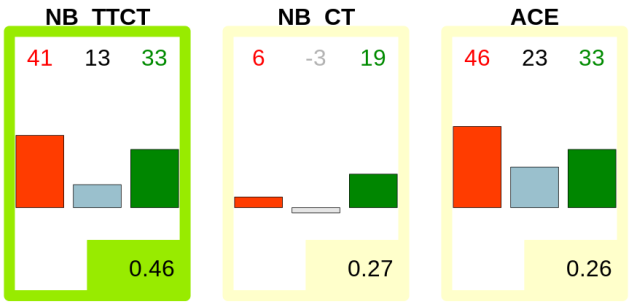


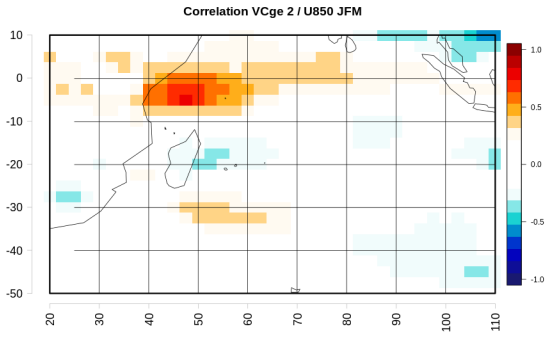
Seasonal forecast: Canonical Correlation Analysis – base : 2021/09

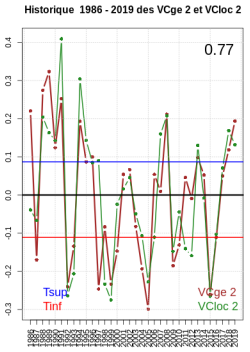
U850

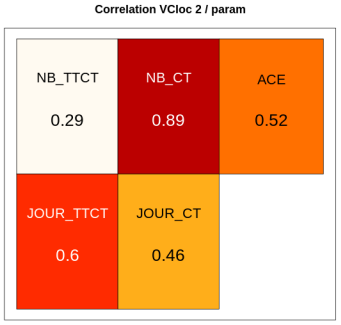


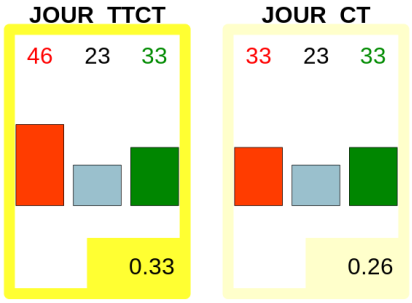










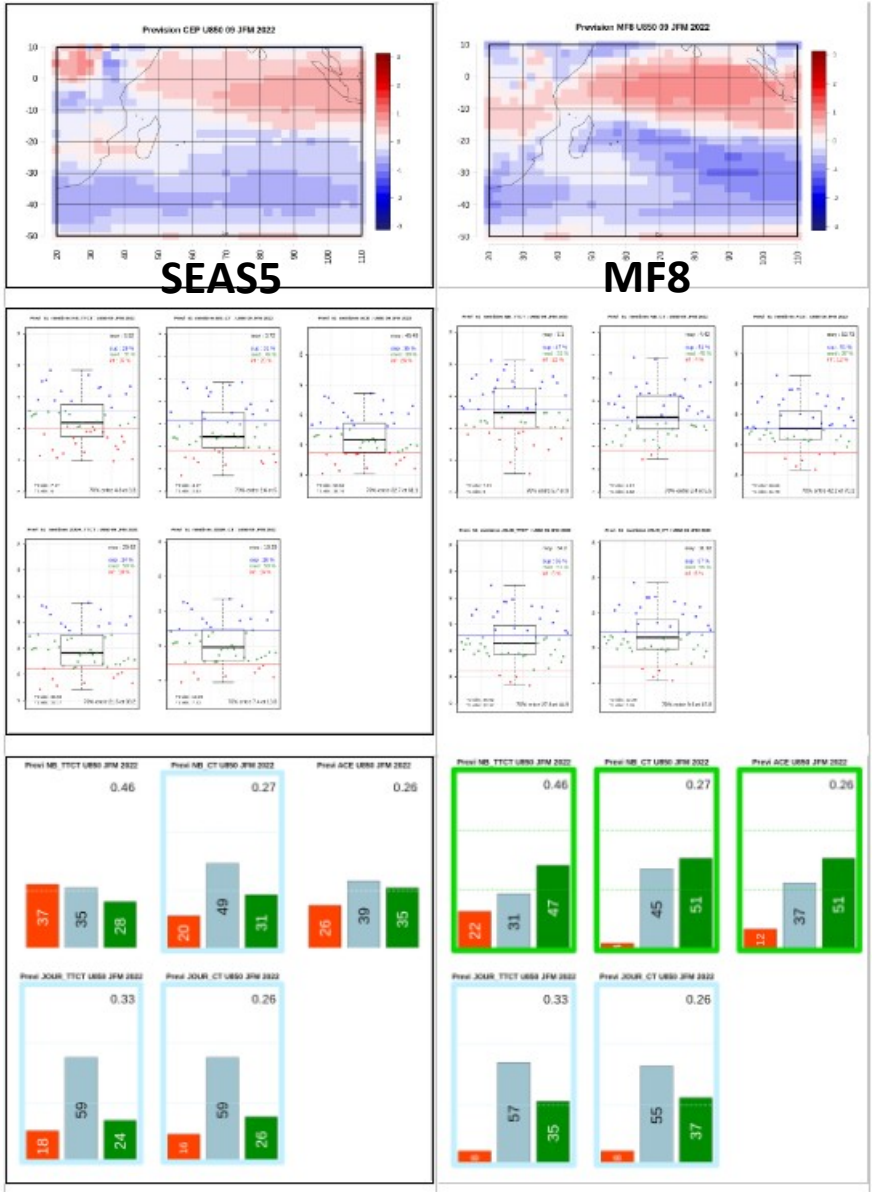


→ Reminder : Statistical approach to link the interannual variability of some of the large scale parameters to key features of a TC season

→ Used with U850, U500, U200 for JFM 2022 (LT4) from SEAS5 and MF8 to forecast 5 parameters describing TC activity (ACE, TS/TC days, TS/TC number, TC days, TC number)

Seasonal forecast: Canonical Correlation analysis – base : 2021/09

U850



→ **disagreement** : CCA with MF8 suggest above average TC season while with SEAS5 suggest near normal TC season.

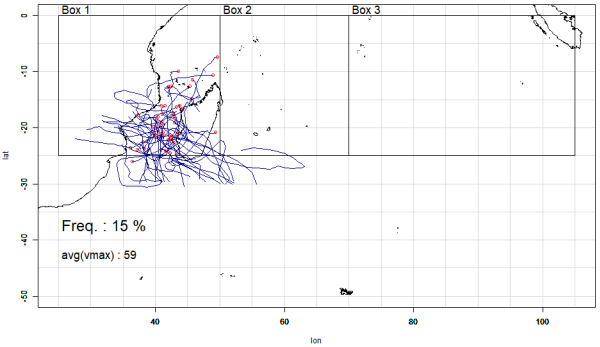
→ 70 % members :

- 8 to 12 TS/TC (SEAS5)

- 9 to 13 TS/TC (MF8)

SWIO : TC tracks clustering

CLUSTER 111



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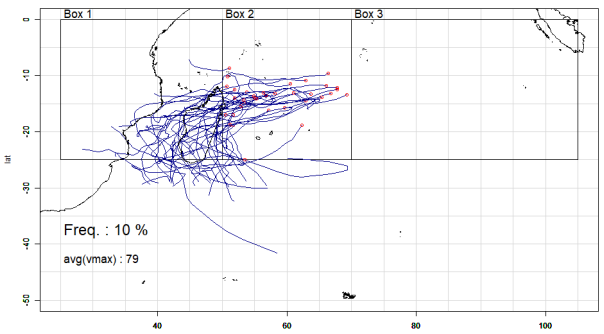
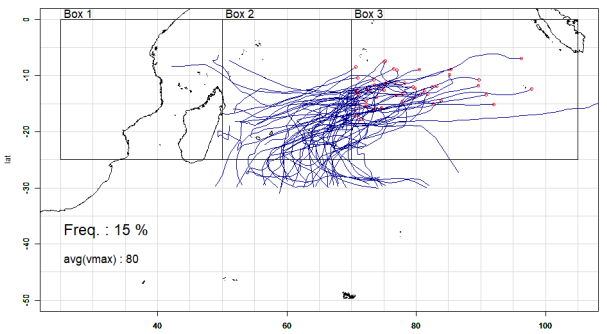
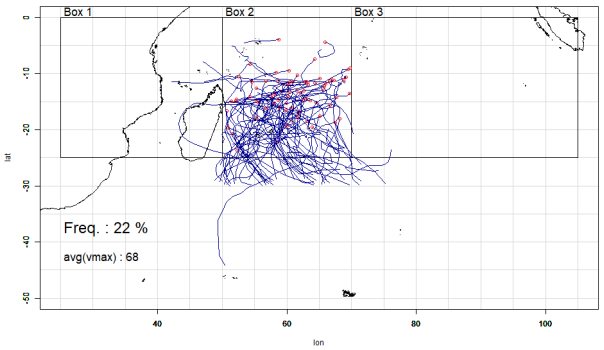


CLUSTER 323



CLUSTER 222



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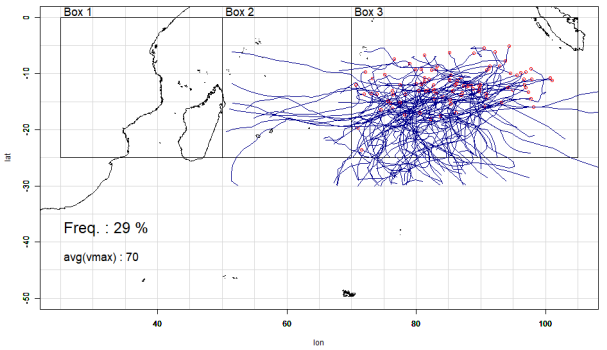


Classification of tracks with respect to :

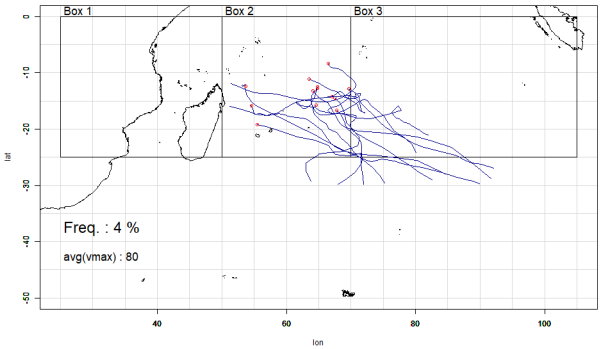
- start longitude (box 1,2,3)
- min longitude (box 1,2,3)
- max longitude (box 1,2,3)

with

Vmax ≥ 34kt (10 minutes avg wind)

25°S ≤ latitude ≤ 0°

CLUSTER 223



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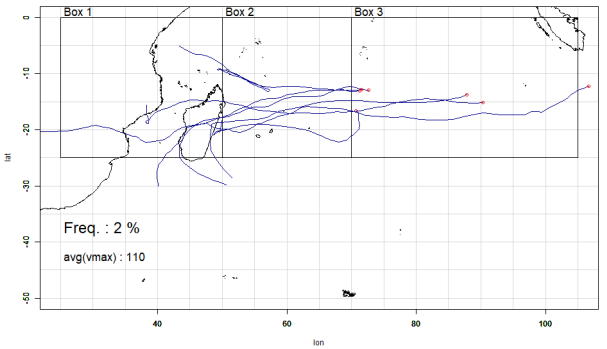
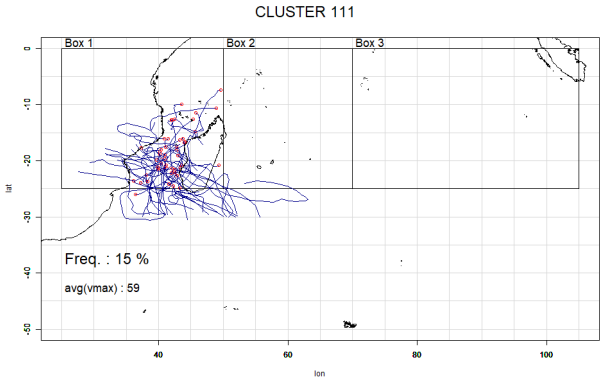
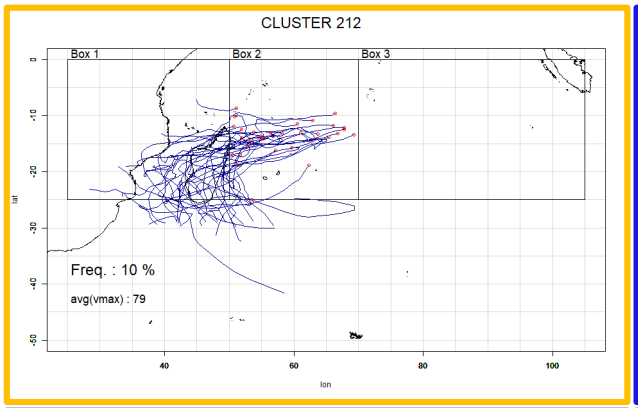
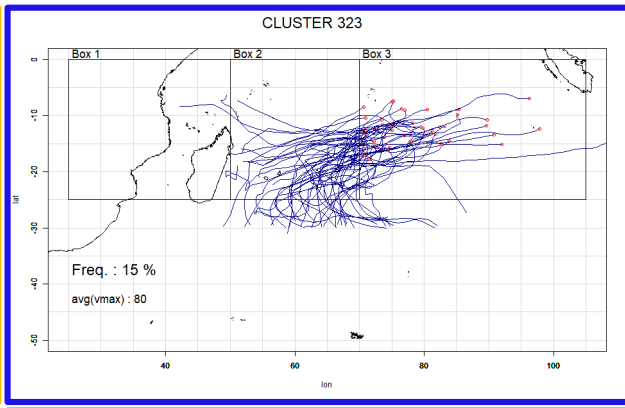
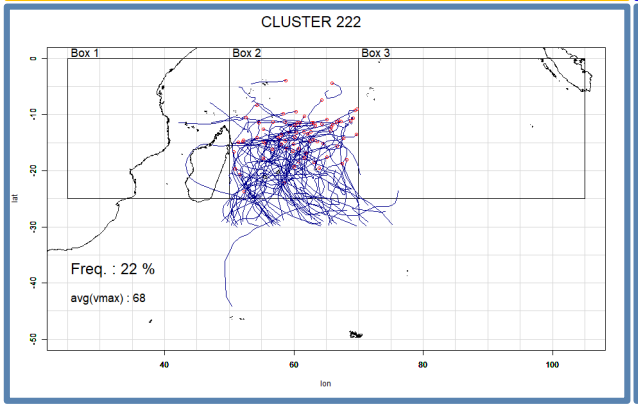


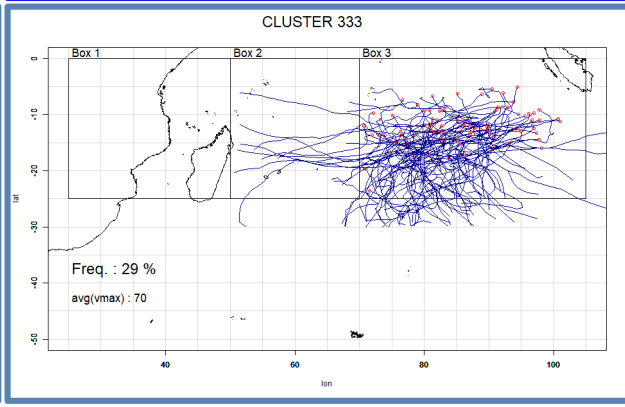
SWIO : Composites on TC tracks clustering

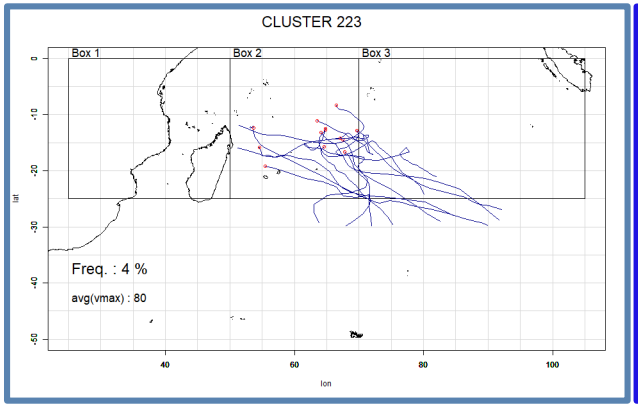


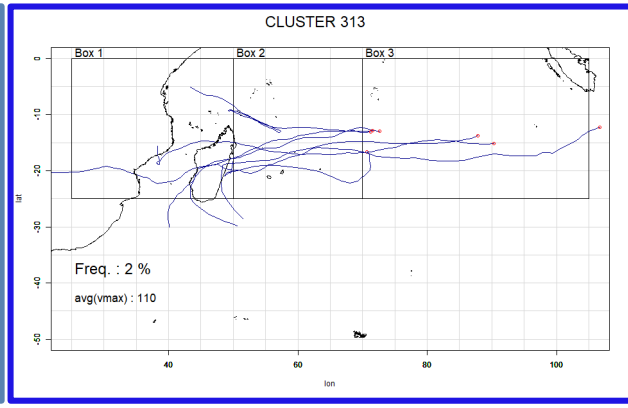










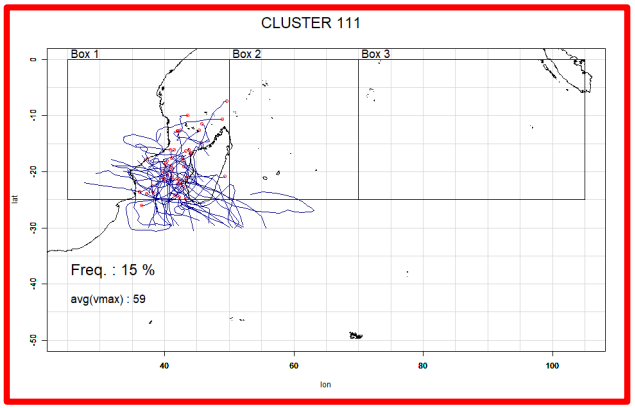


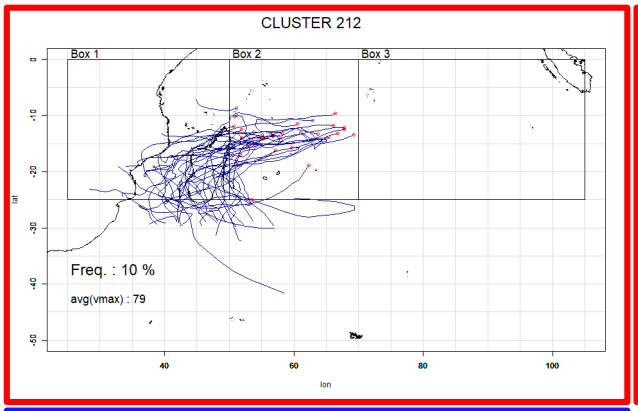
Composite
IOD-/SIOD+
ENSO neutral

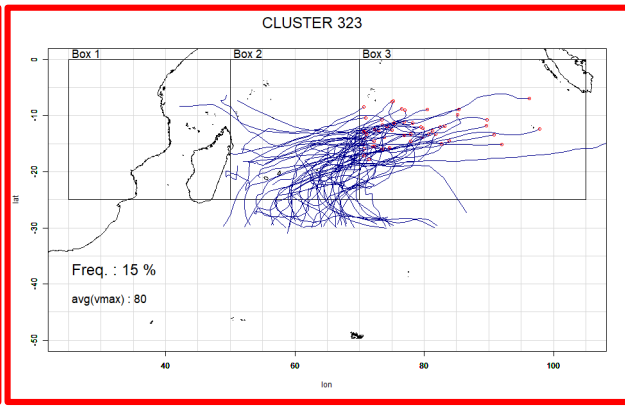
1992/1993
1996/1997
2005/2006
2016/2017

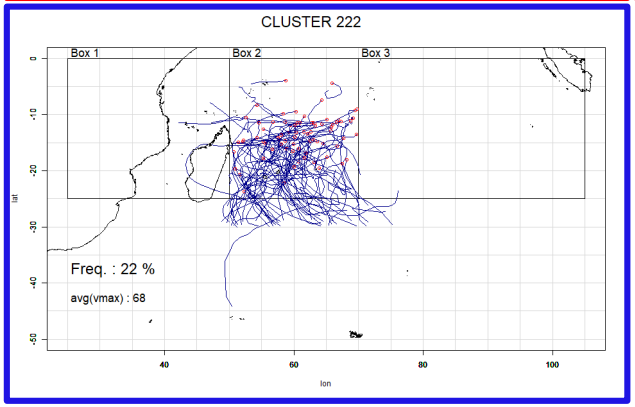
Normal to bellow normal activity

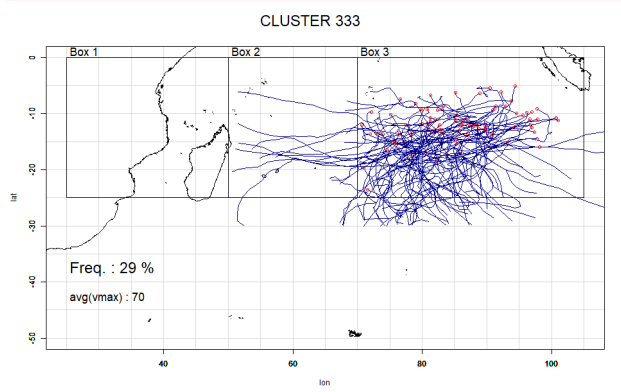
SWIO : Composites on TC tracks clustering

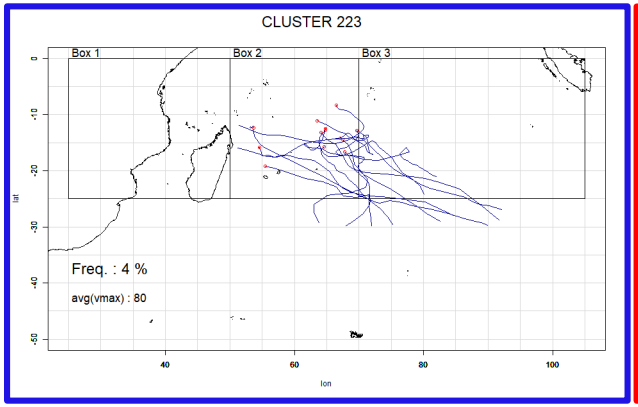


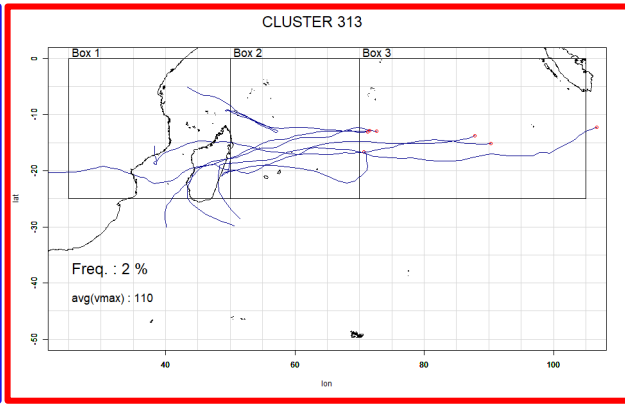










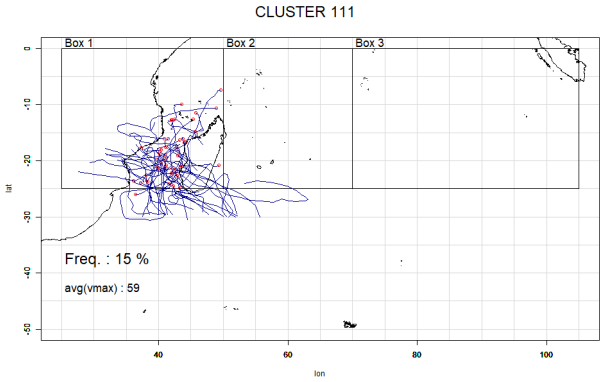


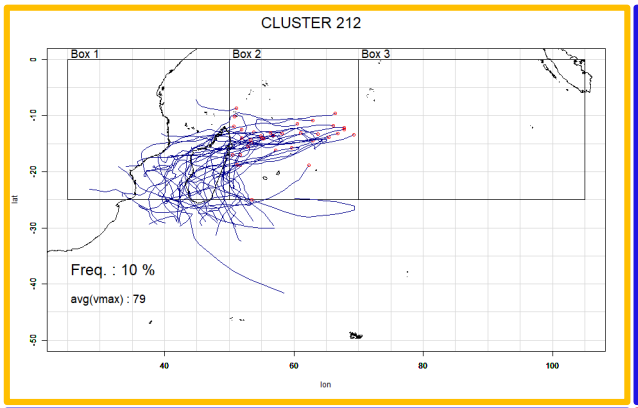
Composite
NINA
SIOD neutral

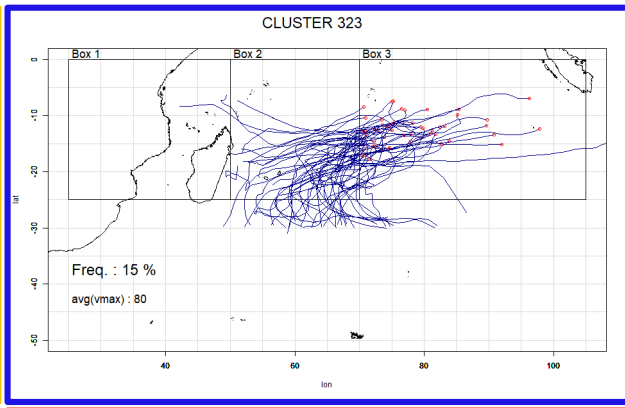
1988/1989
1999/2000
2007/2008
2011/2012

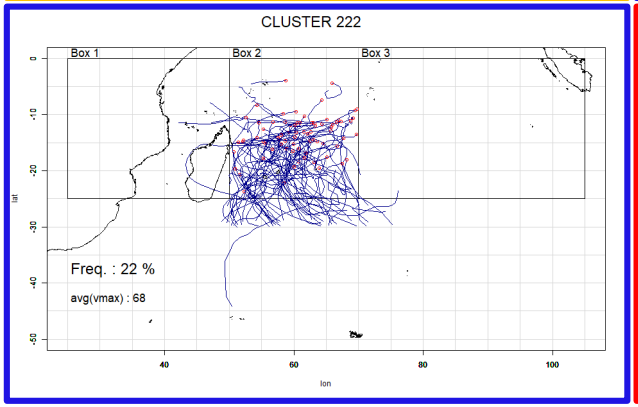
Normal to above normal activity
Zonal tracks favored

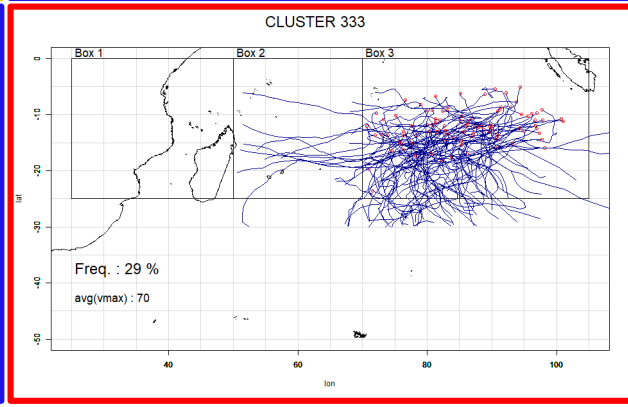
SWIO : Composites on TC tracks clustering

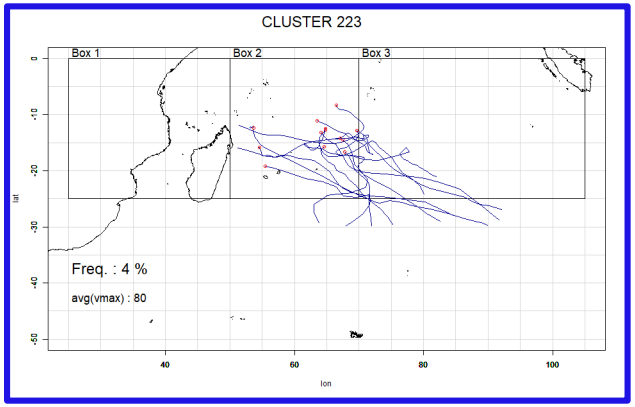


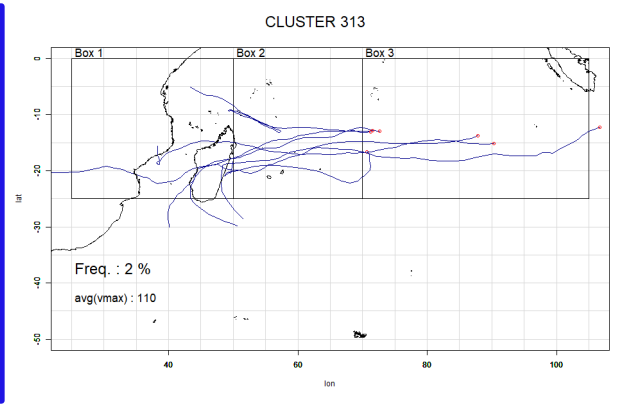












Composite
NINA/IOD-/SIOD+

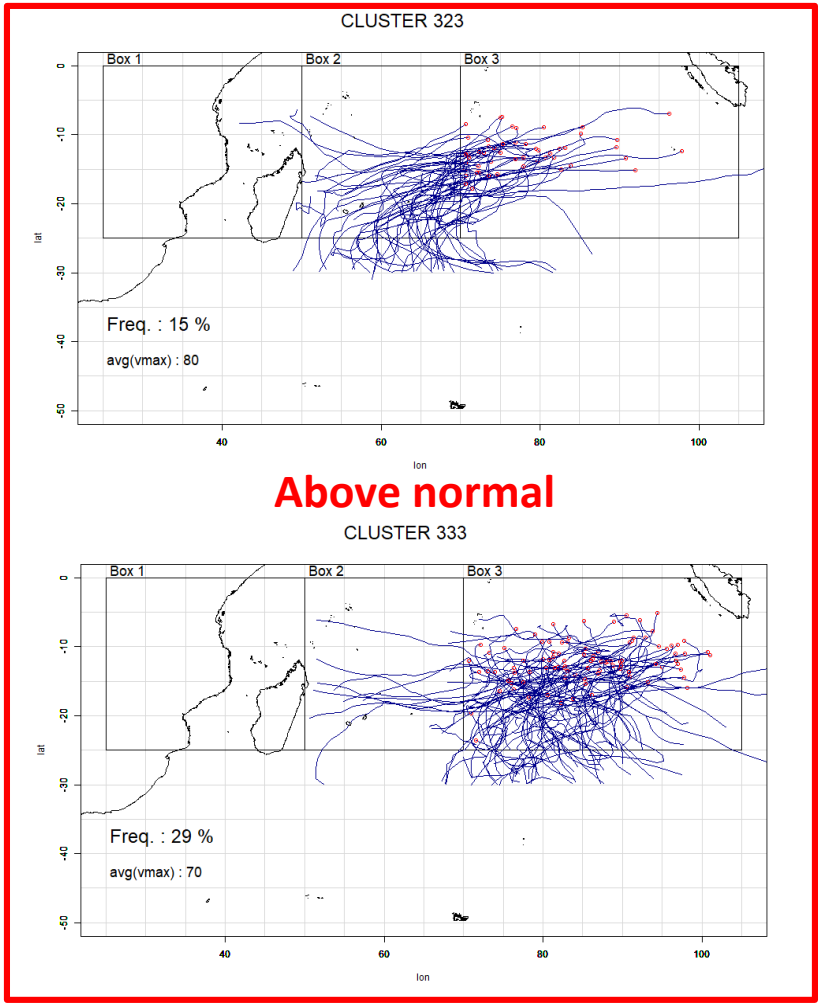
1998/1999
2010/2011
2020/2021

Normal to bellow normal activity
Classe 333 favored

SWIO : CCA on TC tracks clustering

→ CCA on TC tracks clusters with JFM forecast of SST, PMER, U850, V850, U500, U200

→ Fairly good agreement for enhancement of cluster 333 and 323. Based on composites, 323 cluster depends on La Nina.

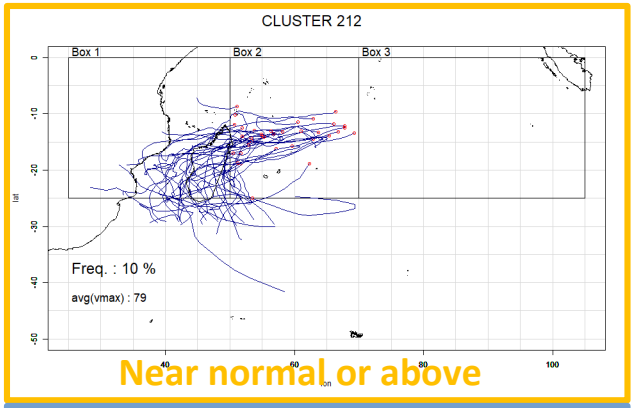


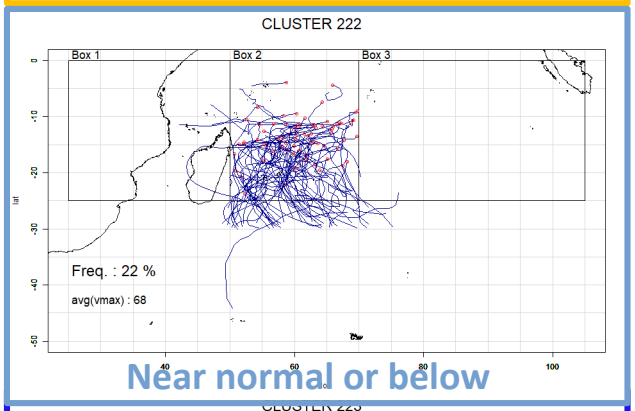
METEO FRANCE

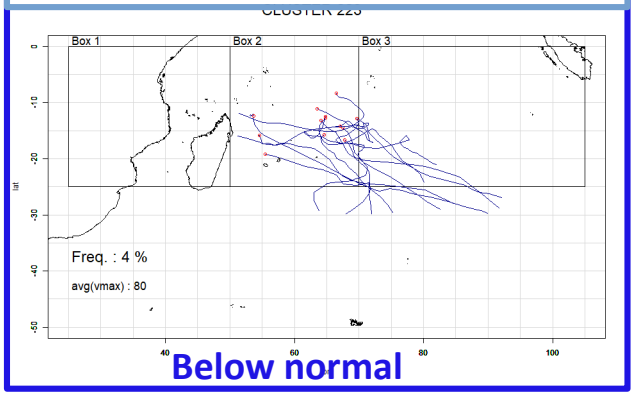
SWIO : CCA on TC tracks clustering

→ CCA on TC tracks clusters with JFM forecast of SST, PMER, U850, V850, U500, U200

→ Clusters 2xx: Near normal or below frequency. Note : below frequency is likely associated with lower than usual cyclogenesis in box2. Frequency of 212 seems to be associated with the occurrence of La Nina.



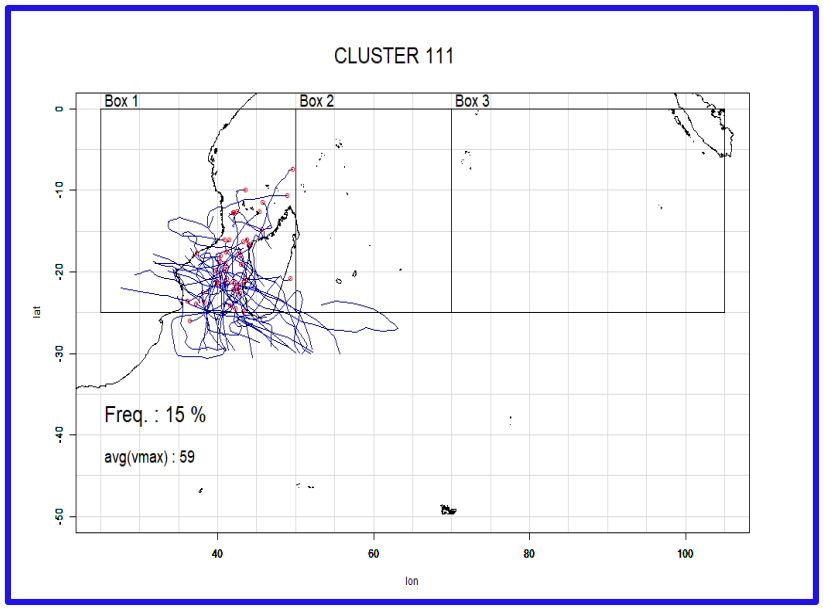




SWIO : CCA on TC tracks clustering

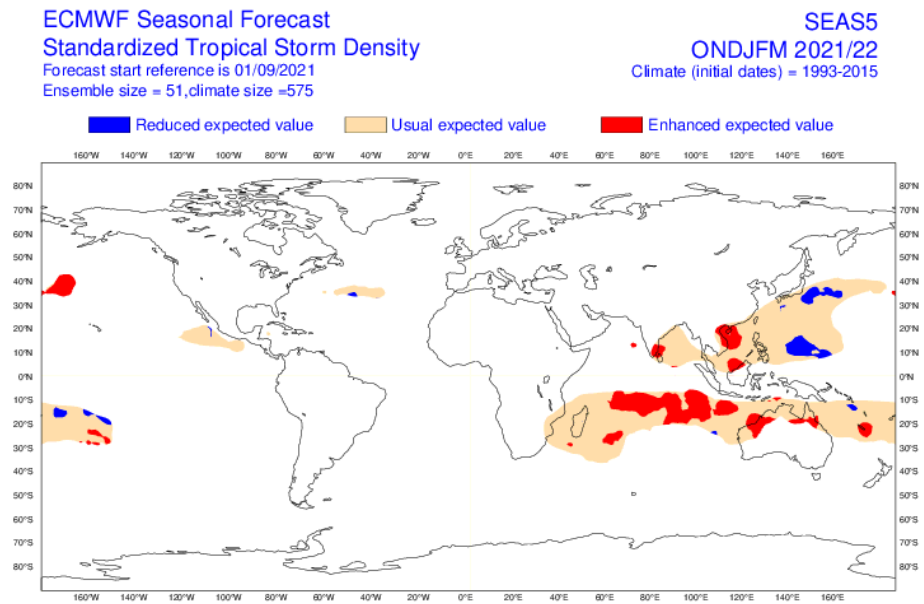
→ CCA on TC tracks clusters with JFM forecast of SST, PMER, U850, V850, U500, U200

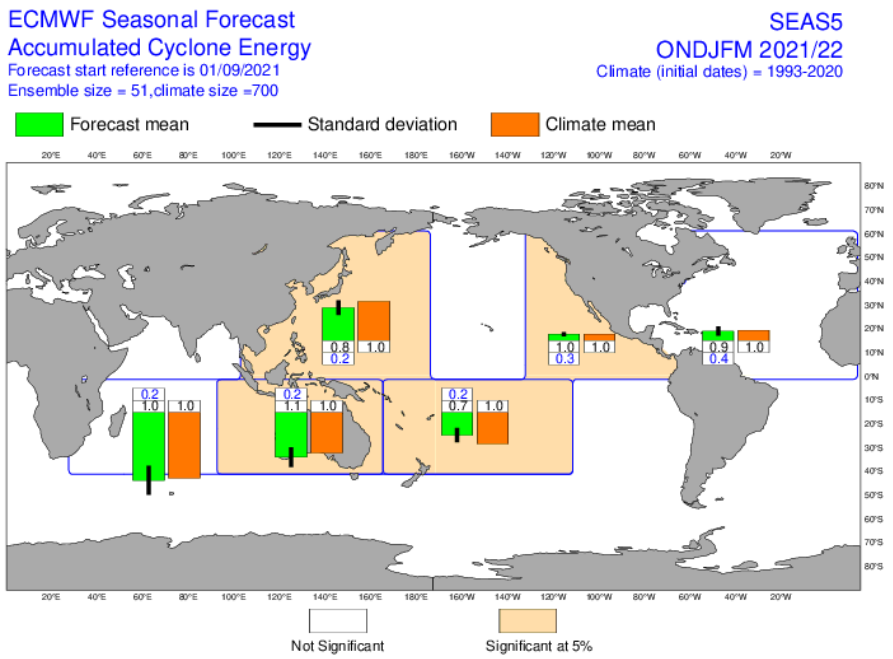
→ Clusters 111 : below normal frequency is at odd with the composite NINA/SIOD+.
So results here are uncertain.



Below normal

Seasonal forecast: Tropical Cyclones activity – ECMWF products





2021-2022 Seasonal forecast: Synthesis for Tropical Cyclones activity

→ Large scale : **La Nina possible – IOD return to neutral – a likely SIOD+** event over the Southern Indian Ocean (uncertainty in strength and timing)

→ **Analog** : 7 TC season with IOD- → SIOD+ transition, 3 of them La Nina (moderate to strong). **Below normal TC activity generally associated** – Most activity located over the eastern bassin but some zonal/parabolic tracks brought some systems close to inhabited areas. Genesis more likely over southern Moz. Channel with southwards to southeastwards track.

→ **Composites / Canonical Correlation Analysis** :
- **Near normal activity (SEAS5)** or **above normal activity (MF8)**
- **Tracks with first TS point east of 70°E and a zonal or parabolic shape favored**
- **Lower than usual genesis likely between 50E and 70E**. But IF some development occurs, slight trend to favor tracks towards Madagascar specially if La Nina develops.

→ ECMWF TC products :
- Average TC season
- Enhanced density of tracks over the eastern bassin, usual values elsewhere

2021-2022 Seasonal forecast: CONCLUSION (blending)

→ **Near or below average TC season (7 to 11 systems) overall**

→ For the first part of the season (up to Jan), TC activity expected mainly over the eastern bassin

→ Zonal or parabolic tracks favored : Most of them should remain far from land but parabolic tracks over the Mascarene islands are not ruled out

→ For the second part of the season (Feb and beyond) : Activity may develop further west and closer to land over the southern Moz channel or North-East of Madagascar but will largely depends on how SIOD+/La Nina develop.


Thank you for your attention