

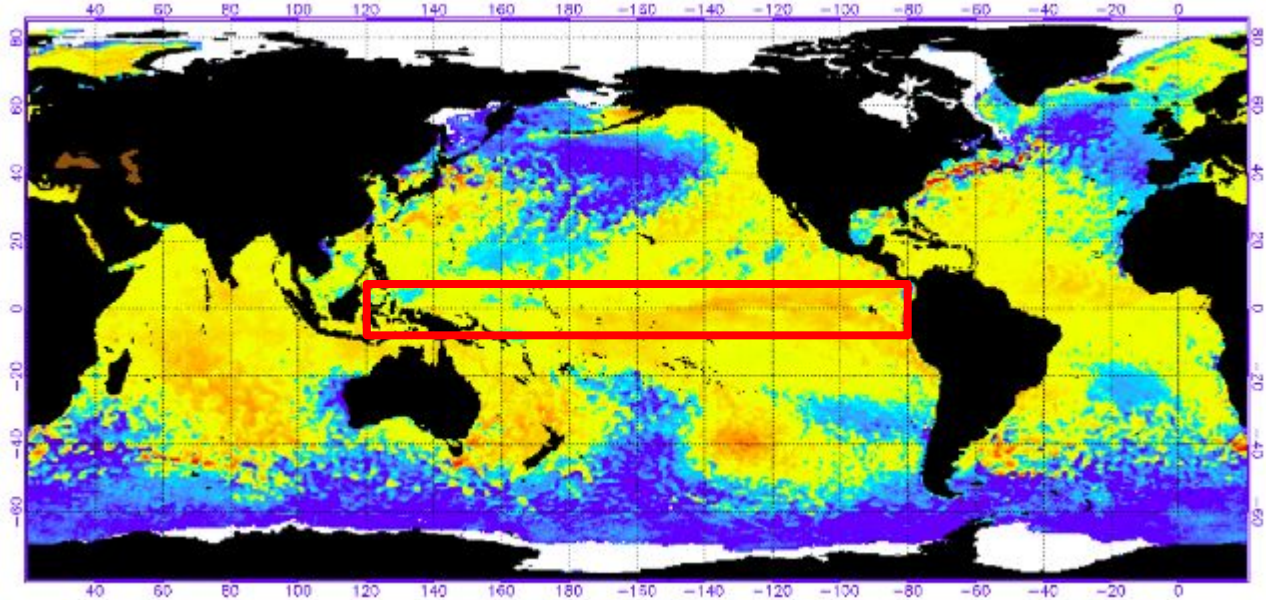
Tropical Pacific 850 hPa Wind, SST, and RSST Anomalies during Nuclear War Scenarios

Joshua Coupe

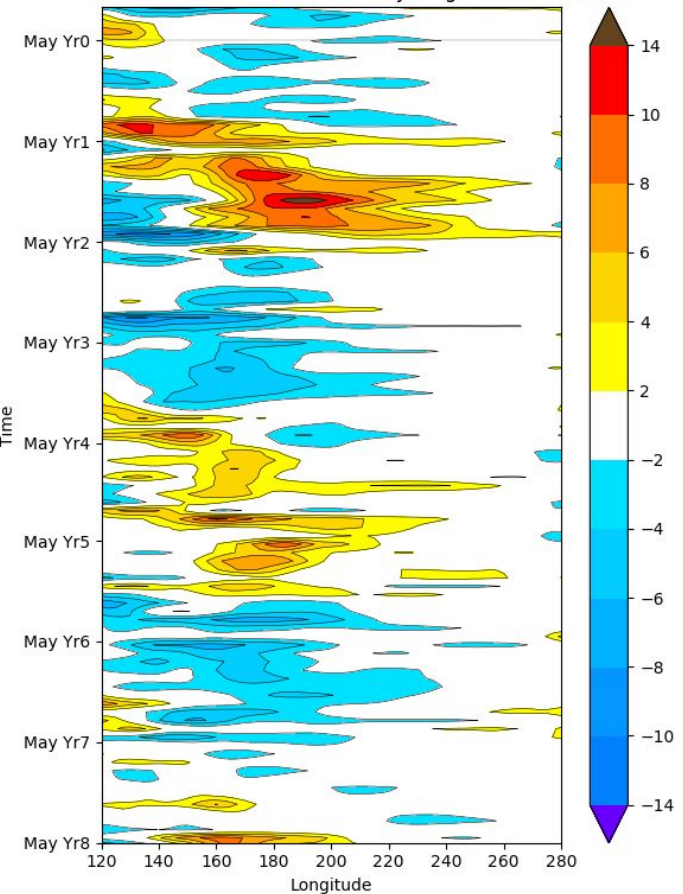
Zonal 850 hPa Wind Anomalies /// SST Anomalies

Using the default region used in NOAA CPC reports on the status of El Nino

120E to 80W



5S-5N Pacific Zonal Wind Anomaly 0 Tg Control Ens 1

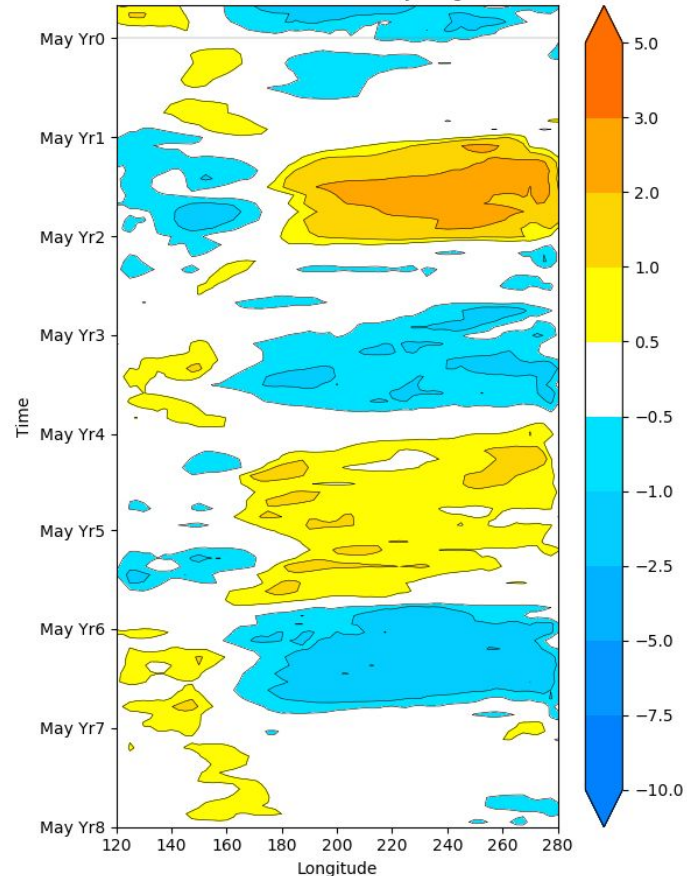


Even without a soot injection, a moderate El Nino develops in the Summer of Yr 6 in the control run

followed by a steady La Nina → El Nino oscillation...

maybe too steady?

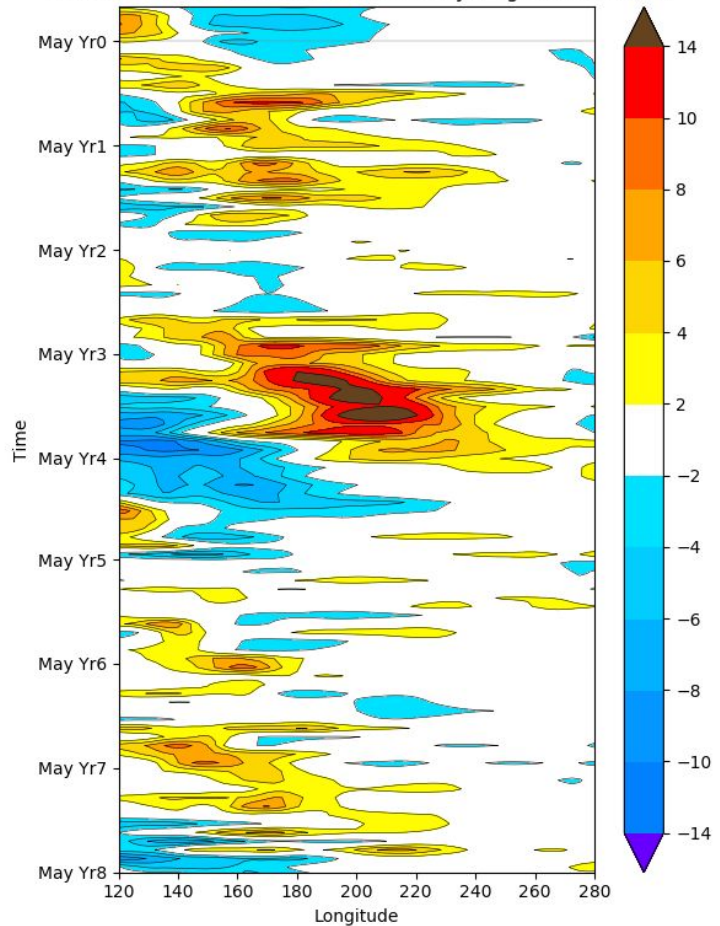
5S-5N Pacific Ocean RSST Anomaly 0 Tg Control Ens 1



Ocean response to atmospheric wind forcing (and vice versa, of course, but initial trigger appears to be westerly wind forcing.)

Red = westerly anomaly (Nino forcing)
Blue = easterly anomaly (Nina forcing)

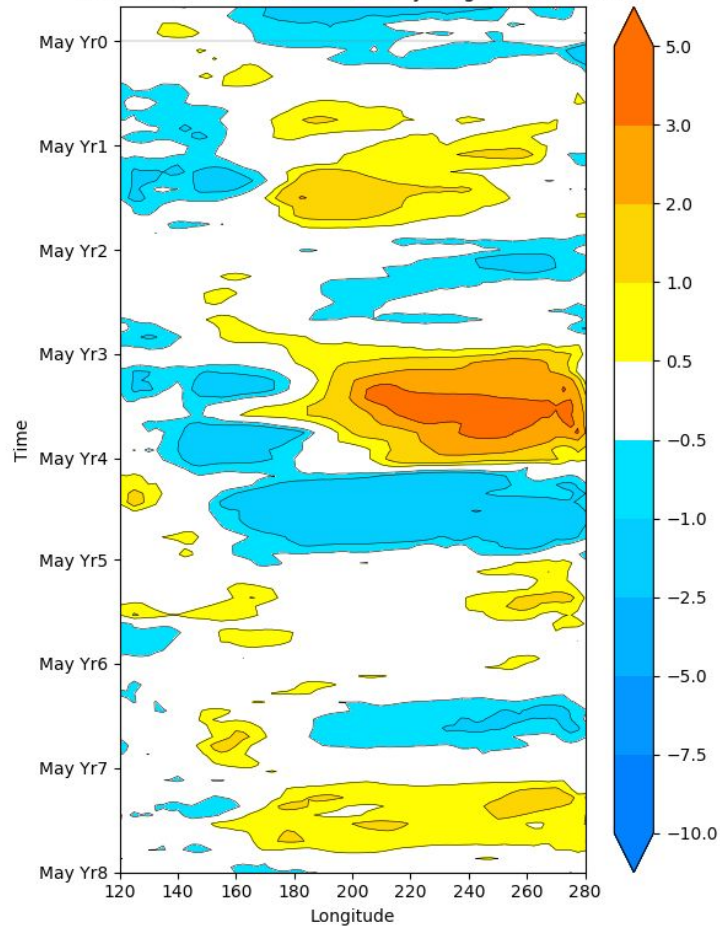
5S-5N Pacific Ocean Zonal Wind Anomaly 5 Tg India-Pakistan



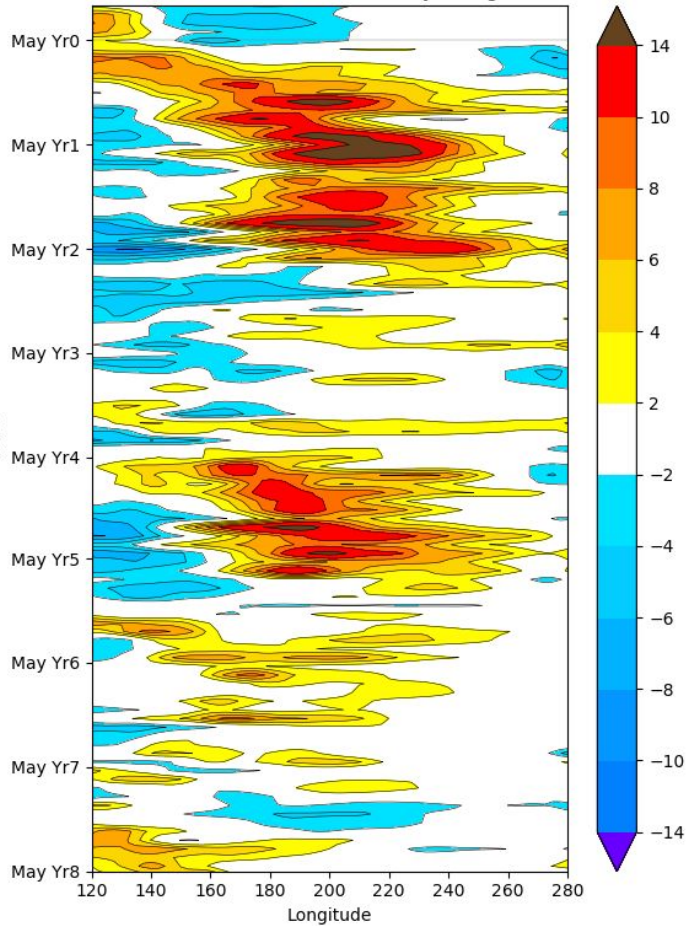
In the first 5 Tg IP ensemble, El Nino ... based on SSTs alone (which is flawed) ... is muted compared to in the control run. However: a strong El Nino develops during FallYr3, impressive despite cooling.

Westerly wind anomalies are weaker but continue for far longer in 5 Tg case compared to the control.

5S-5N Pacific Ocean SST Anomaly 5 Tg India-Pakistan



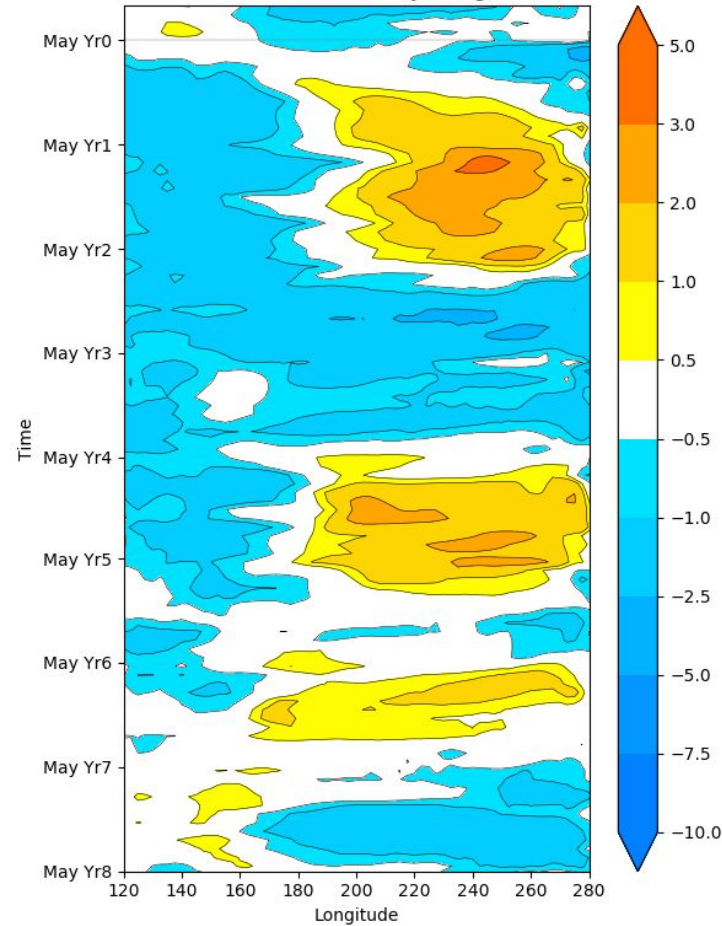
5S-5N Pacific Ocean Zonal Wind Anomaly 16 Tg India-Pakistan



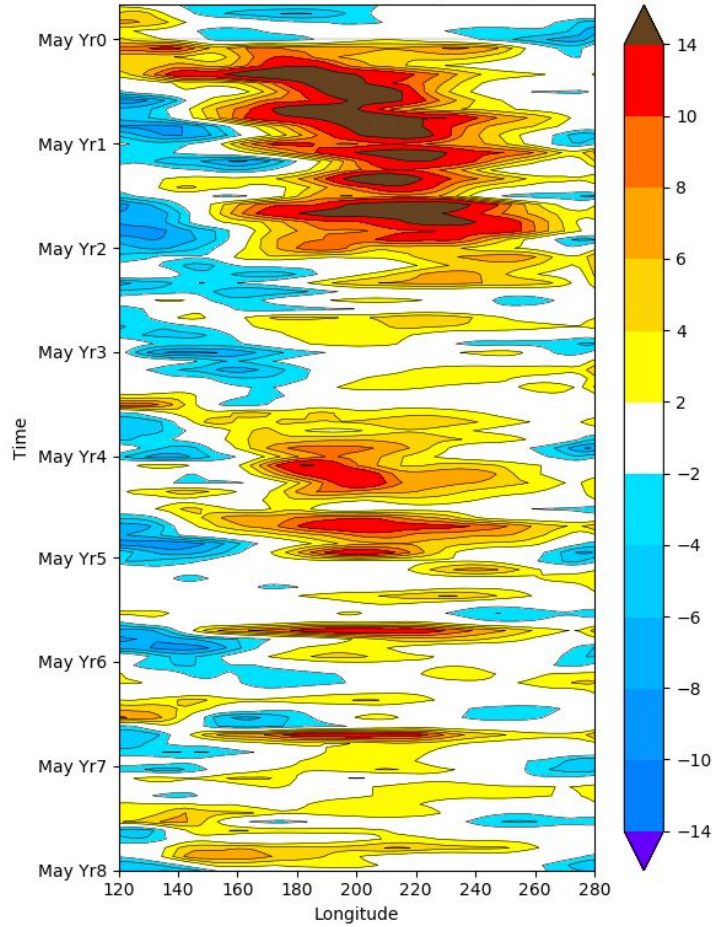
You can start to see that the zonal wind anomaly strength and spatial coverage scales pretty well with the amount of initial black carbon...

SST changes are a little more variable (due to global cooling signal increasing with more BC)

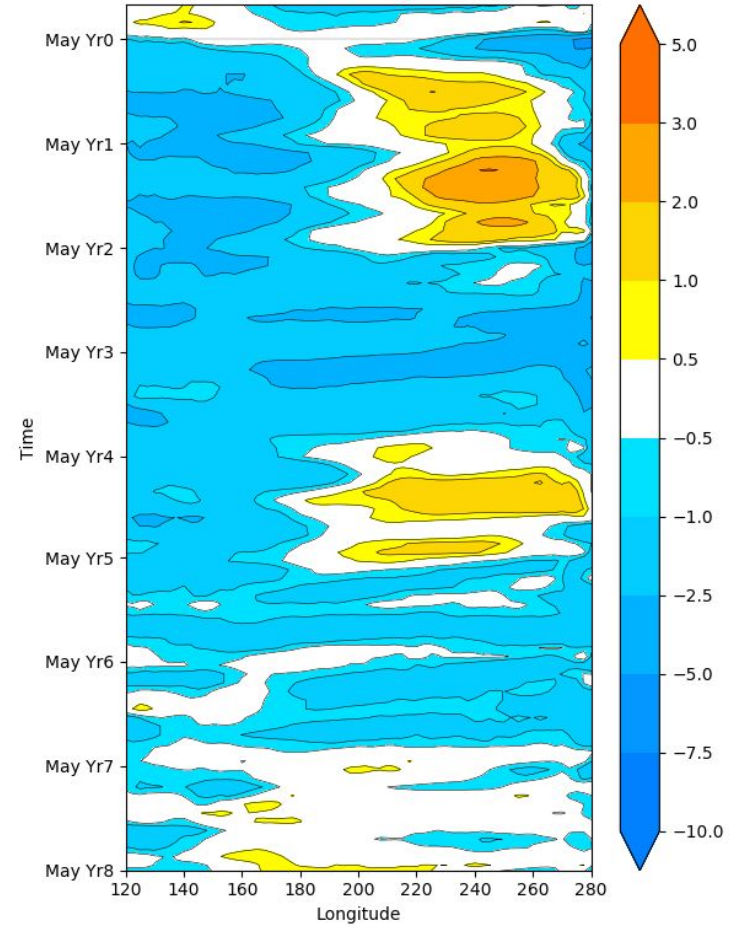
5S-5N Pacific Ocean SST Anomaly 16 Tg India-Pakistan



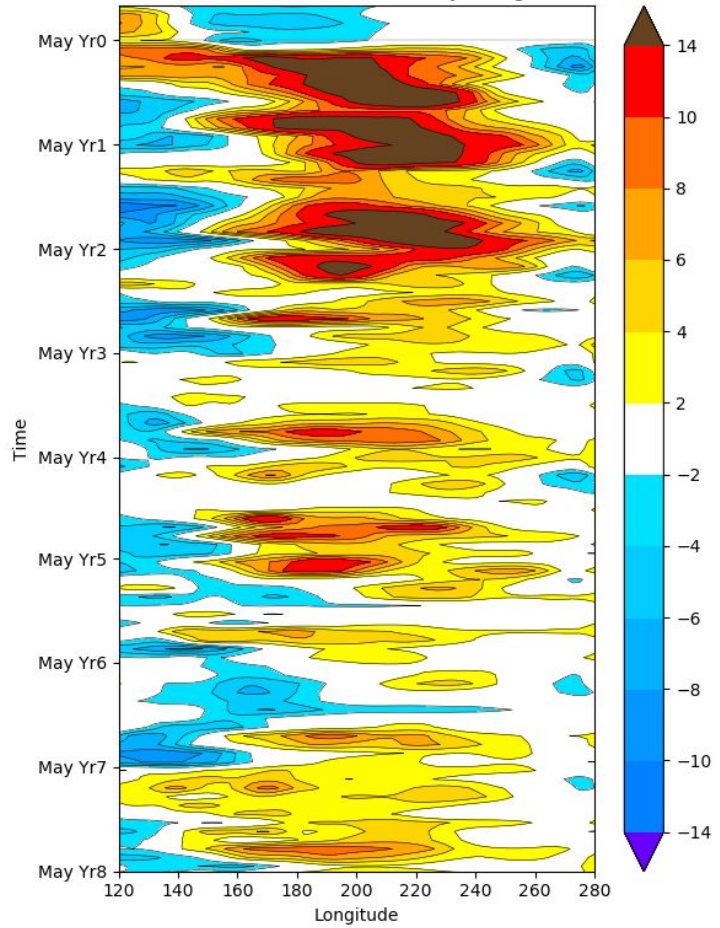
5S-5N Pacific Ocean Zonal Wind Anomaly 27.3 Tg India-Pakistan



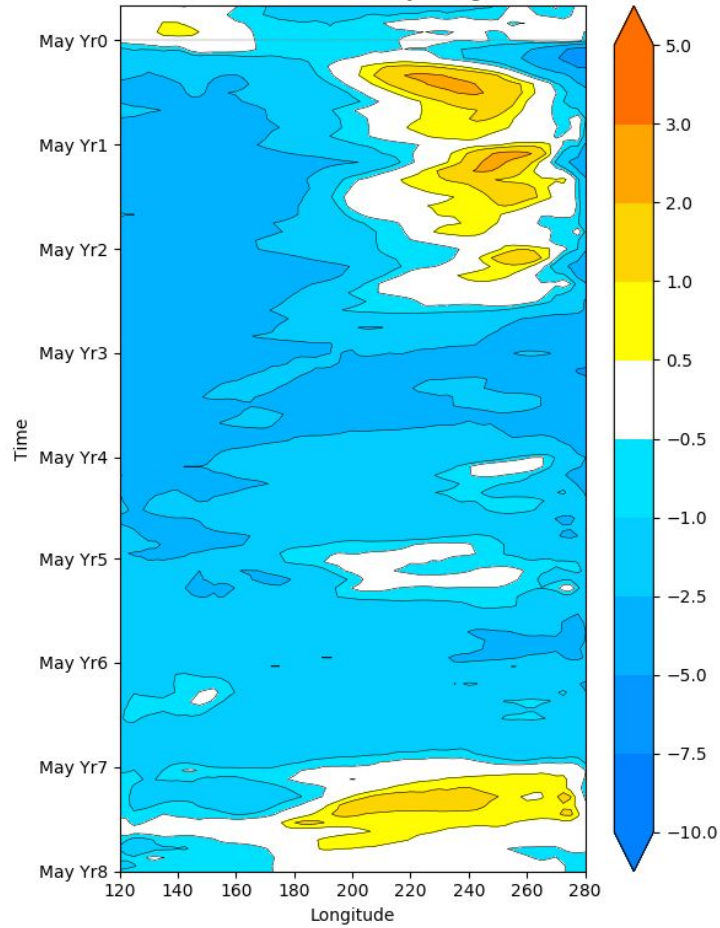
5S-5N Pacific Ocean SST Anomaly 27.3 Tg India-Pakistan



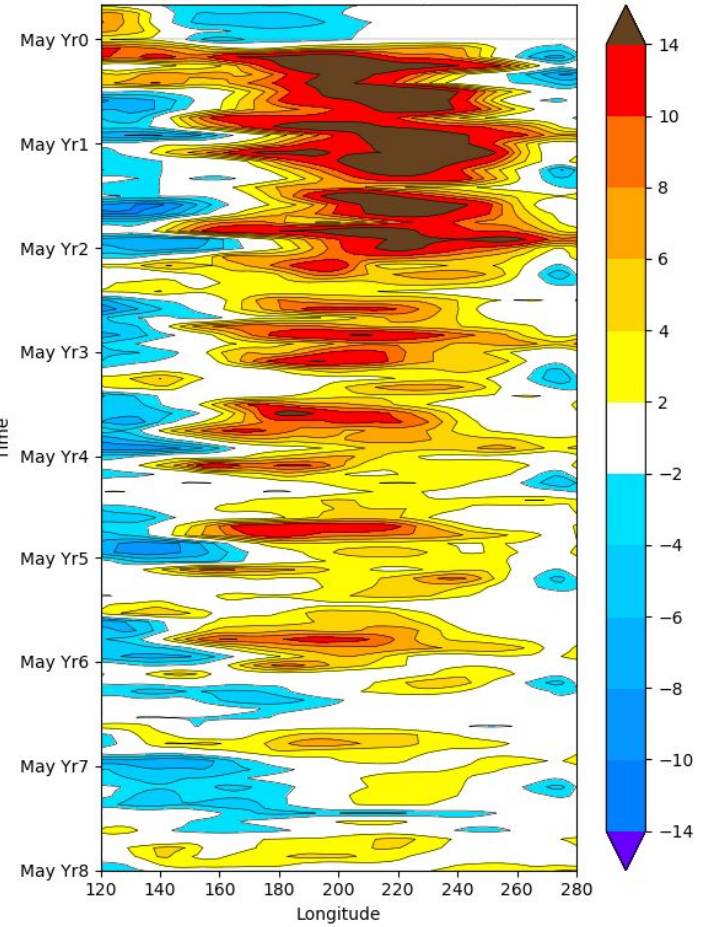
5S-5N Pacific Ocean Zonal Wind Anomaly 37 Tg India-Pakistan



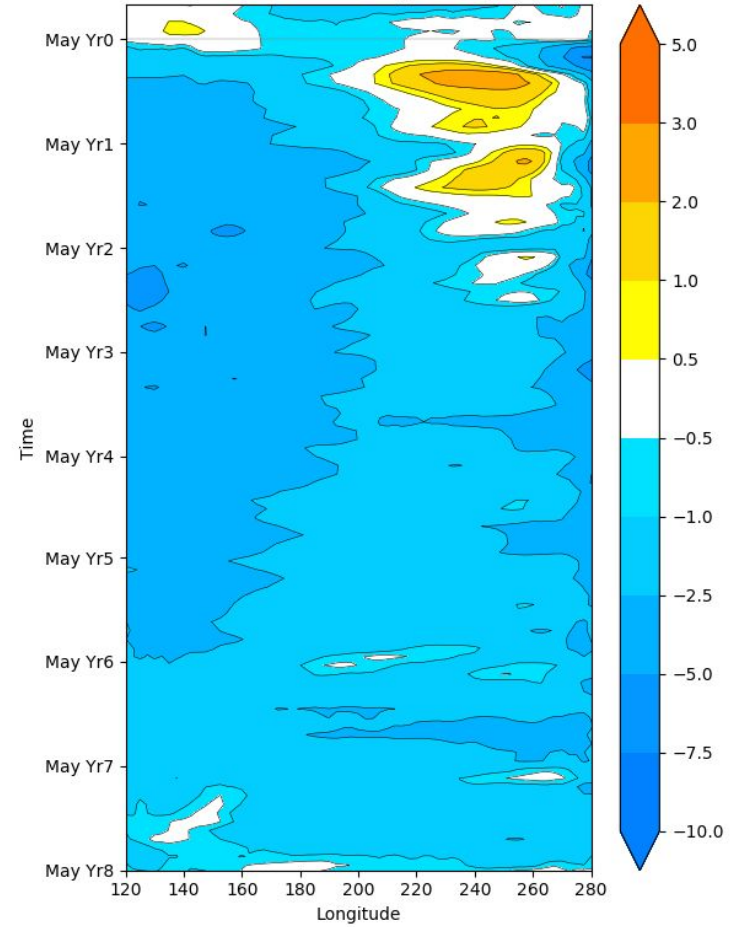
5S-5N Pacific Ocean SST Anomaly 37 Tg India-Pakistan



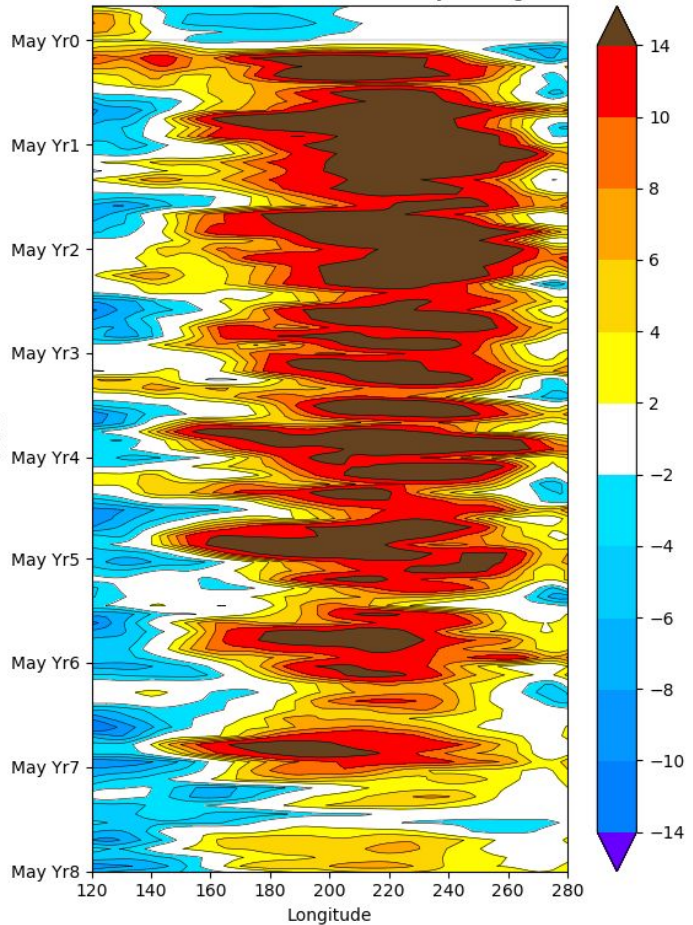
5S-5N Pacific Ocean Zonal Wind Anomaly 46.8 Tg India-Pakistan



5S-5N Pacific Ocean SST Anomaly 46.8 Tg India-Pakistan



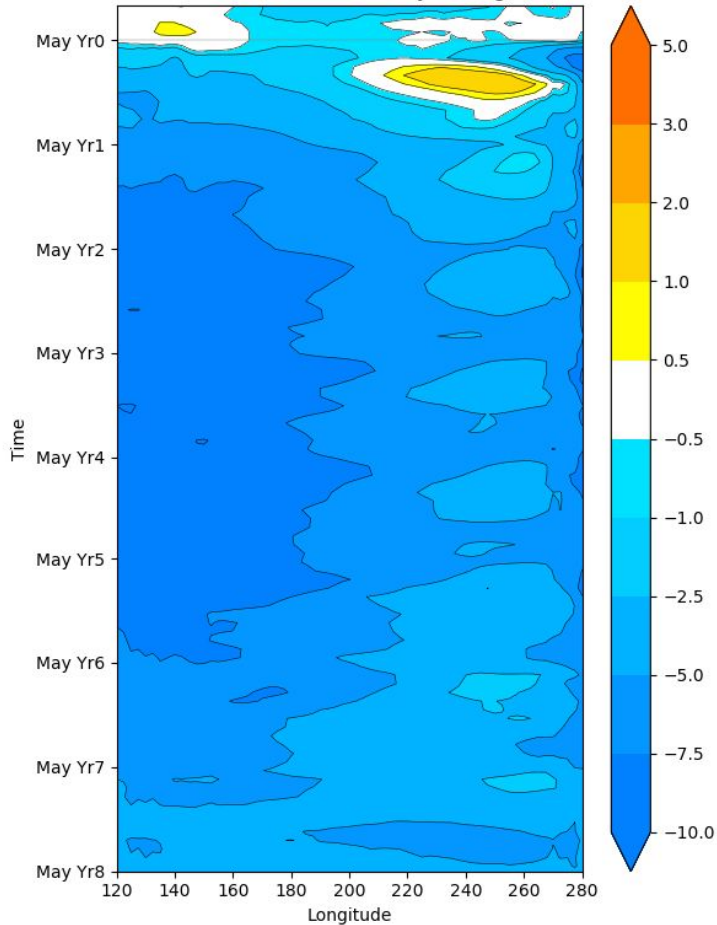
5S-5N Pacific Ocean Zonal Wind Anomaly 150 Tg US-Russia



Incredibly strong zonal wind anomalies, muted SST response because global cooling is so great.

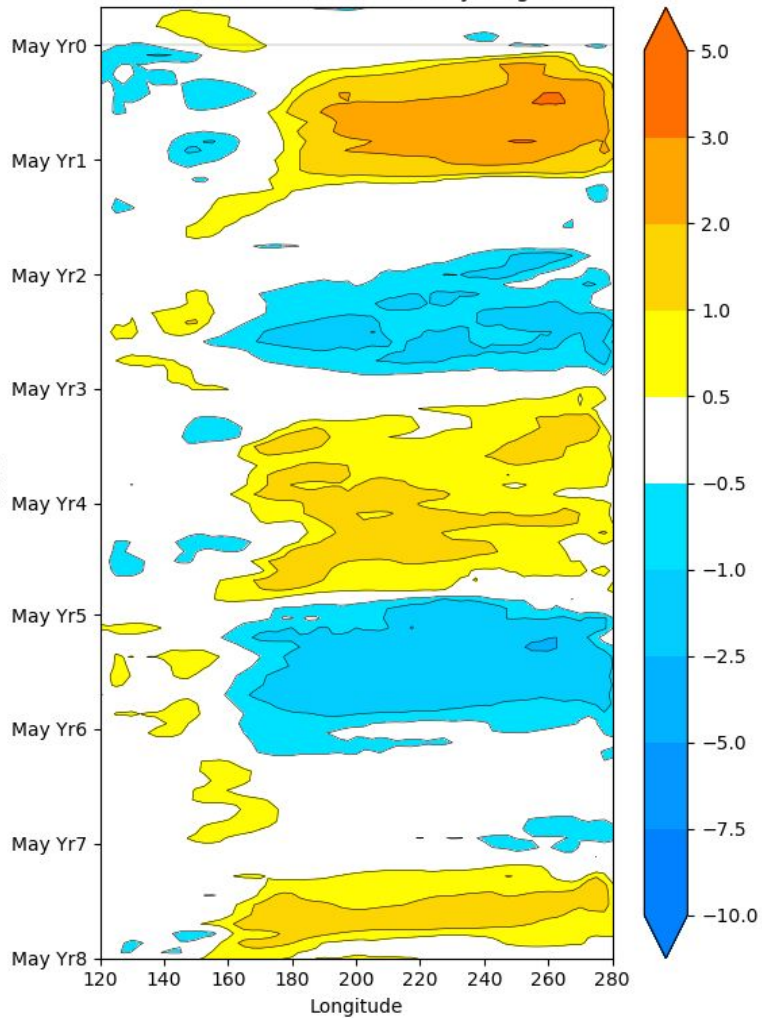
RSSTs will reveal how truly anomalously warm the Pacific is compared to the tropical mean temperatures.

5S-5N Pacific Ocean SST Anomaly 150 Tg US-Russia



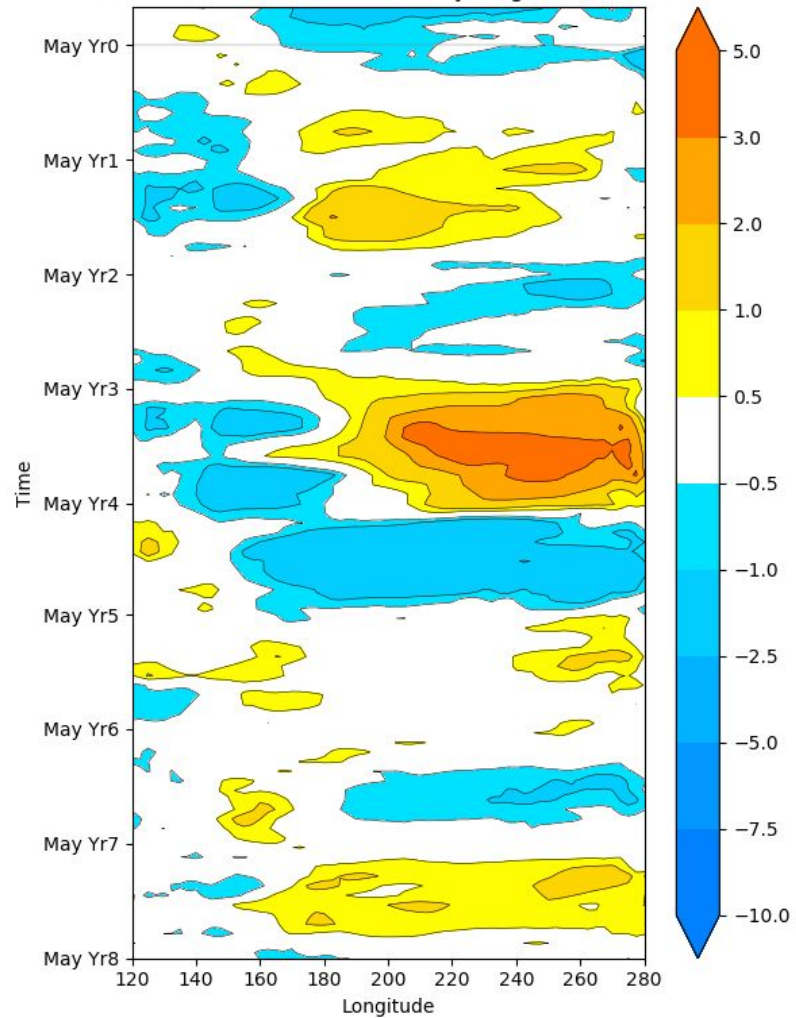
Comparison of 3 ensembles of 5 Tg India-Pakistan
SST Anomalies, zonal wind anomalies

5S-5N Pacific Ocean SST Anomaly 0 Tg Control

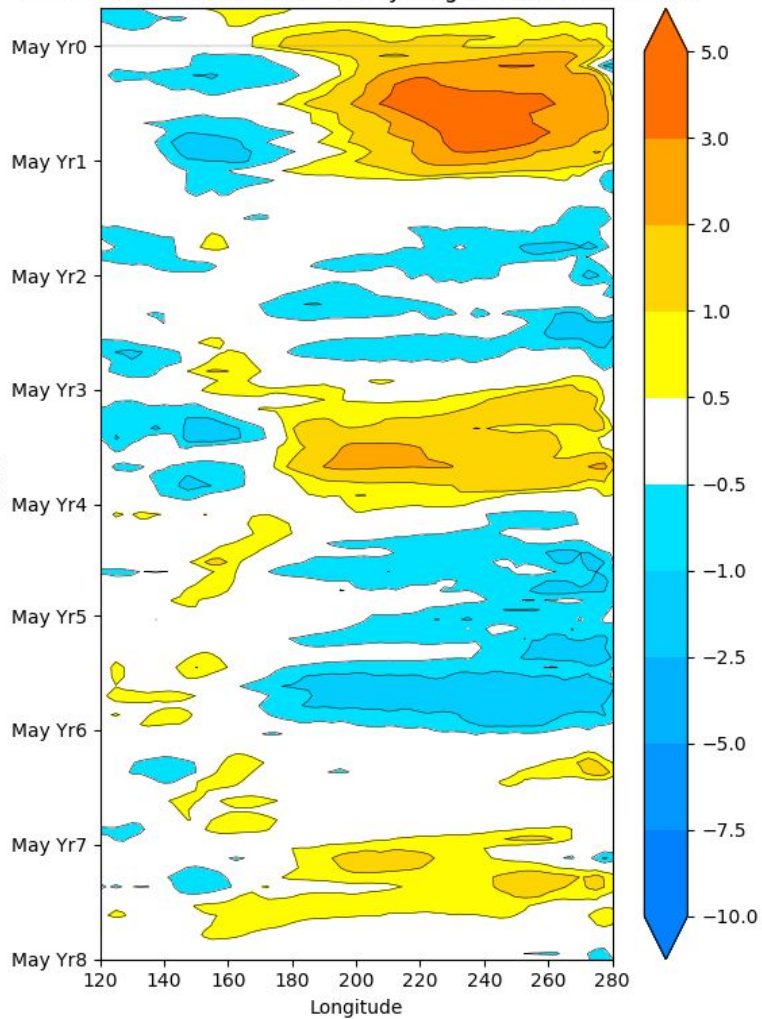


control
vs ens1
SSTs

5S-5N Pacific Ocean SST Anomaly 5 Tg India-Pakistan



5S-5N Pacific Ocean SST Anomaly 5 Tg India-Pakistan Ens 2

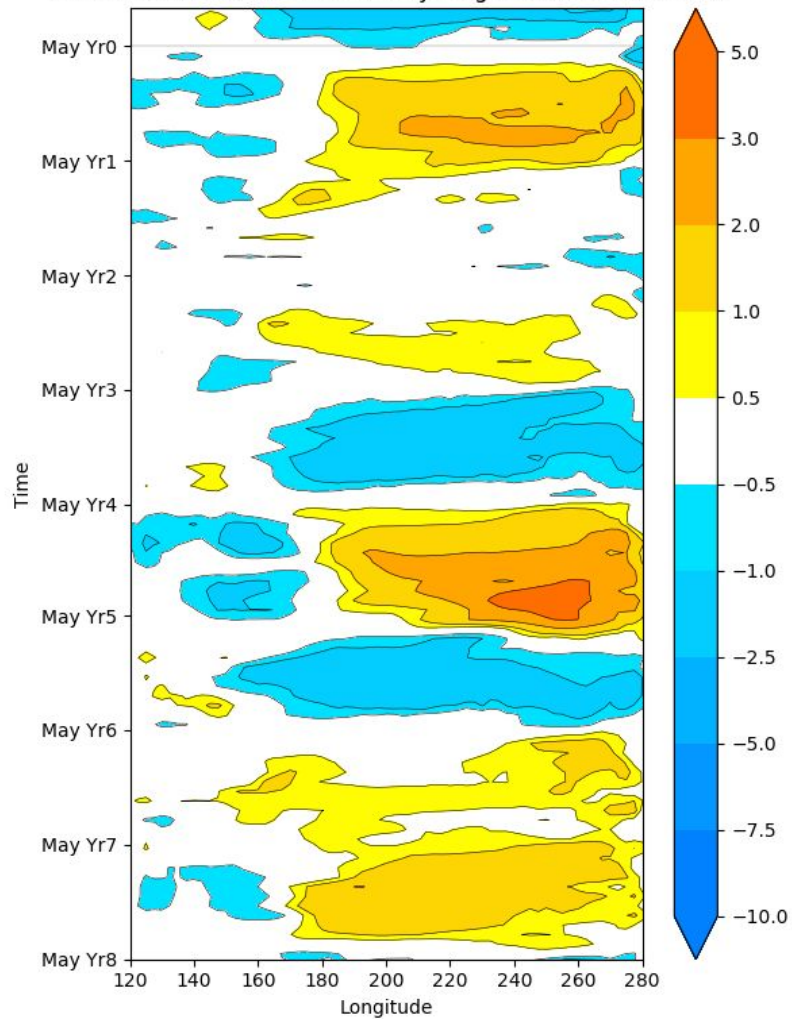


Ens2

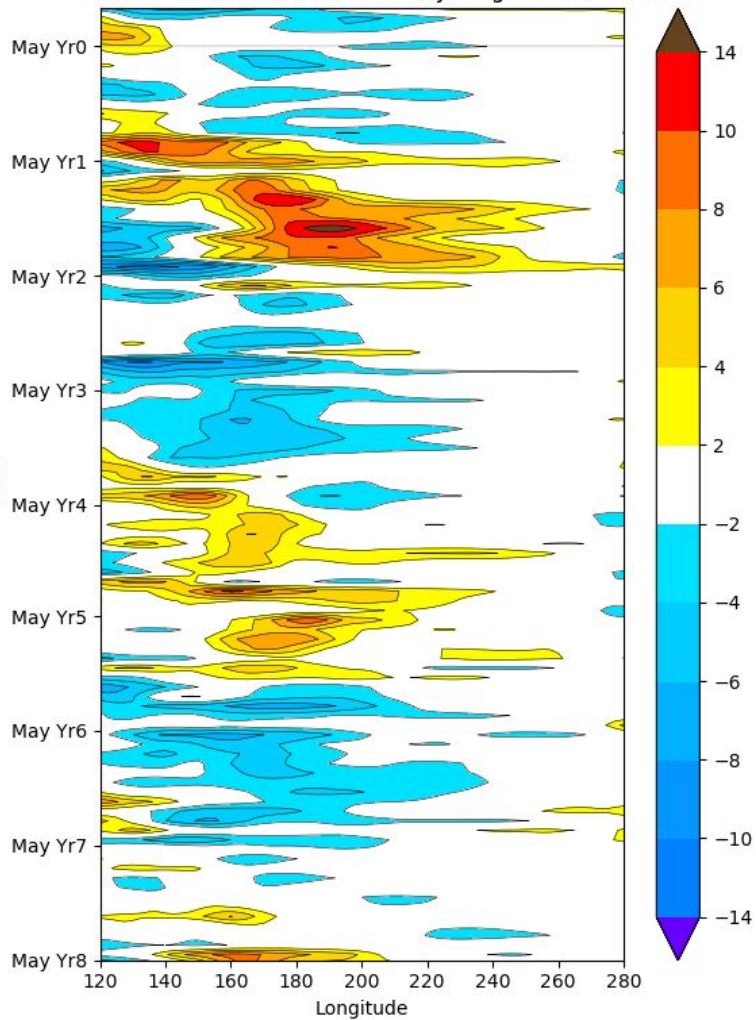
Vs

Ens3
SSTs

5S-5N Pacific Ocean SST Anomaly 5 Tg India-Pakistan Ens 3

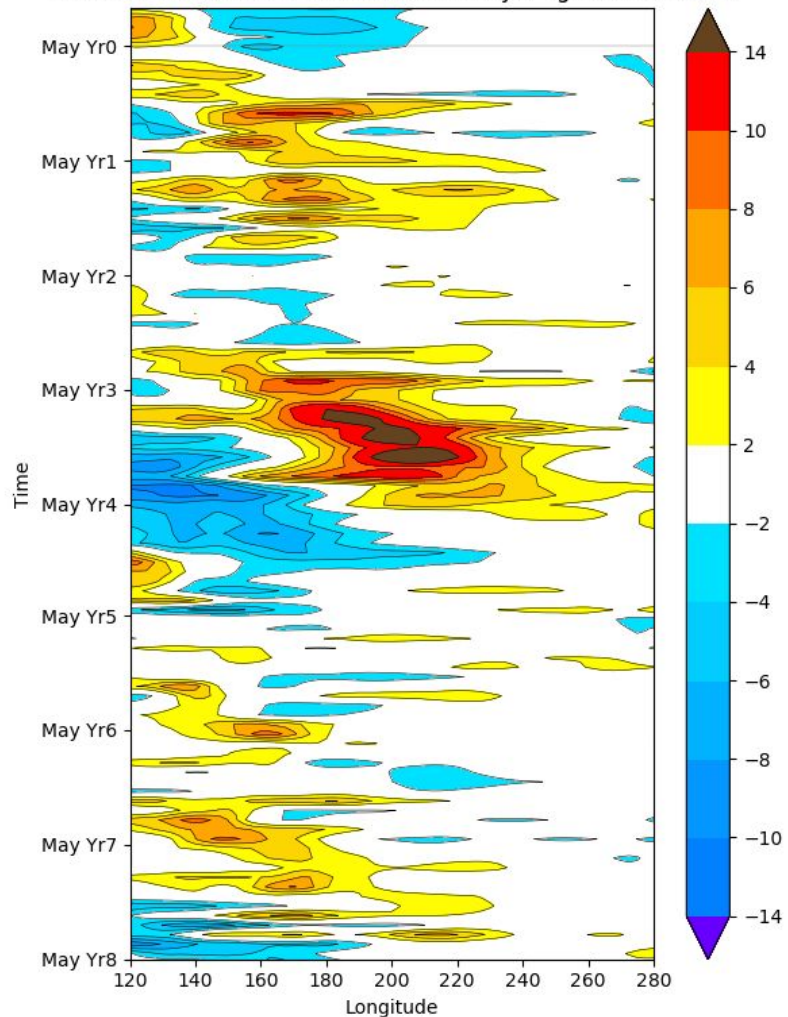


5S-5N Pacific Zonal Wind Anomaly 0 Tg Control Ens 1

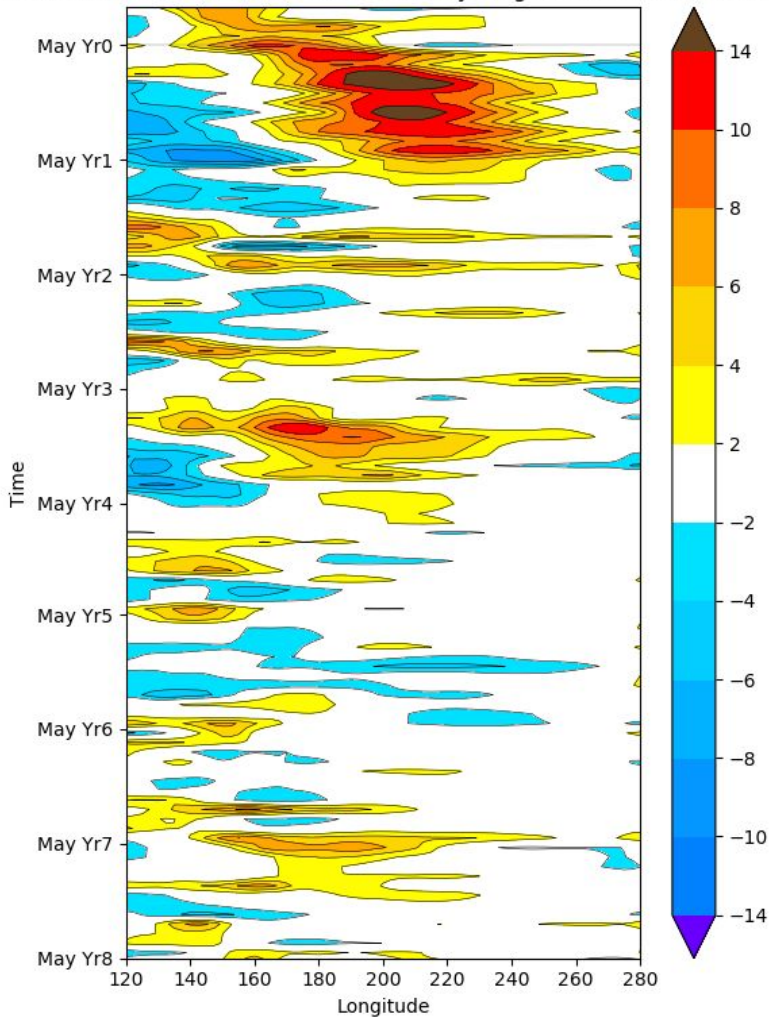


Control
vs
Ens 1
Zonal Wind
Anomaly

5S-5N Pacific Ocean Zonal Wind Anomaly 5 Tg India-Pakistan

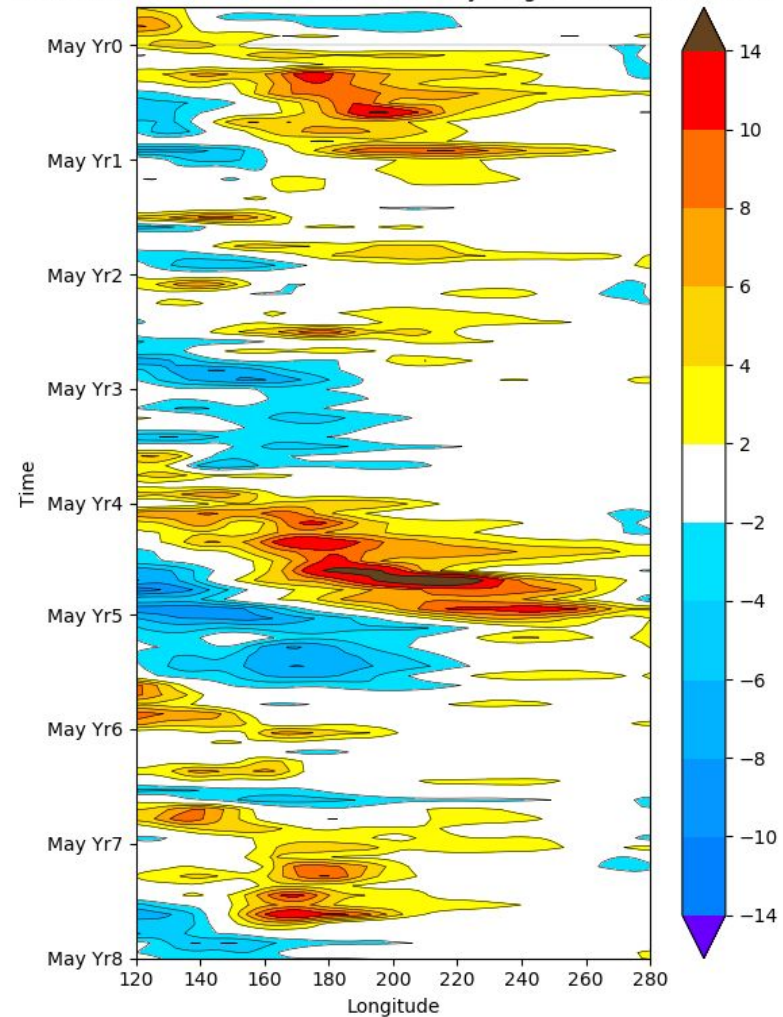


5S-5N Pacific Ocean Zonal Wind Anomaly 5 Tg India-Pakistan Ens 2

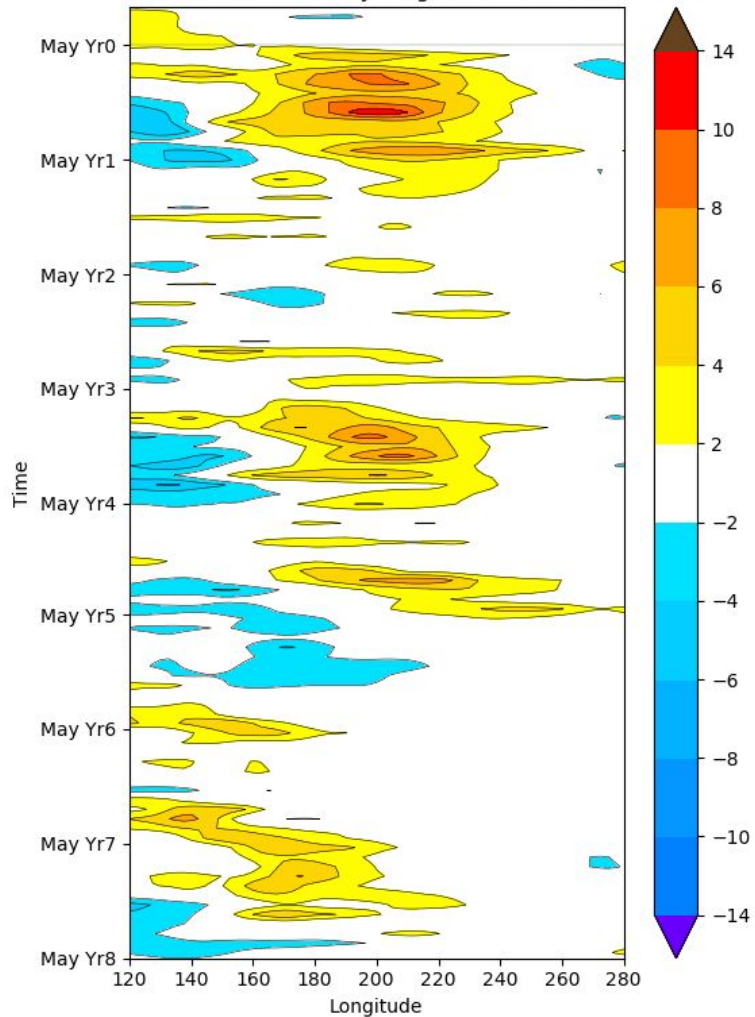


Ens2
vs
Ens 3
Zonal Wind
Anomaly

5S-5N Pacific Ocean Zonal Wind Anomaly 5 Tg India-Pakistan Ens 3

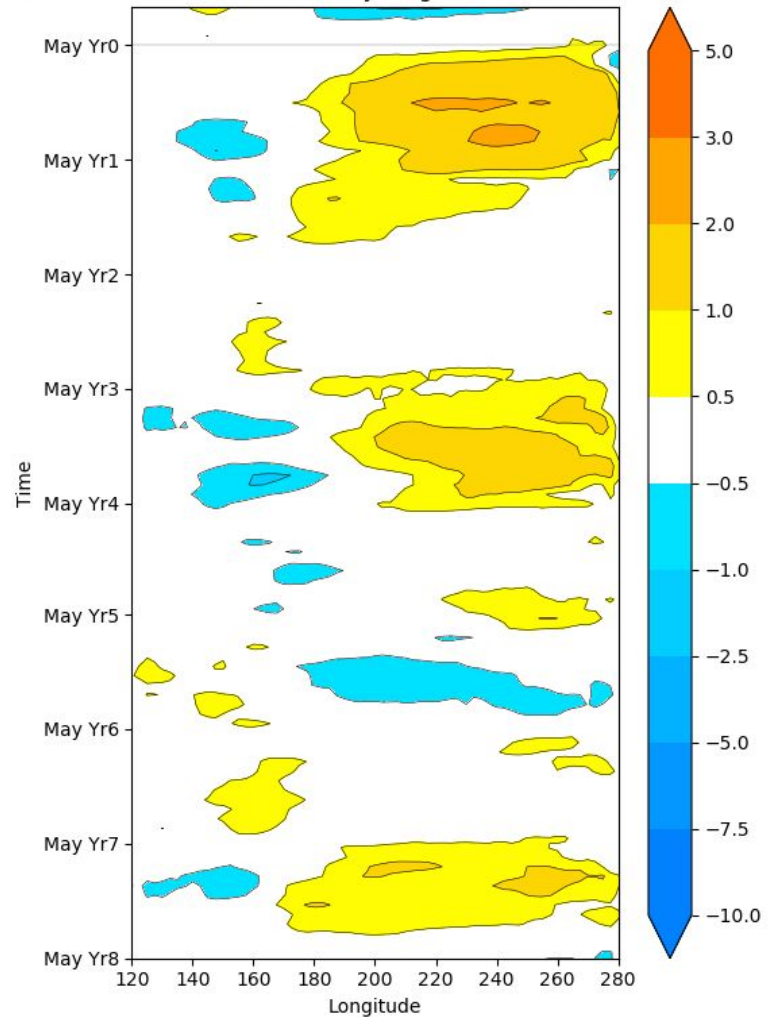


5S-5N Pacific Zonal Wind Anomaly 5 Tg India-Pakistan AVG ENS 1,2,3

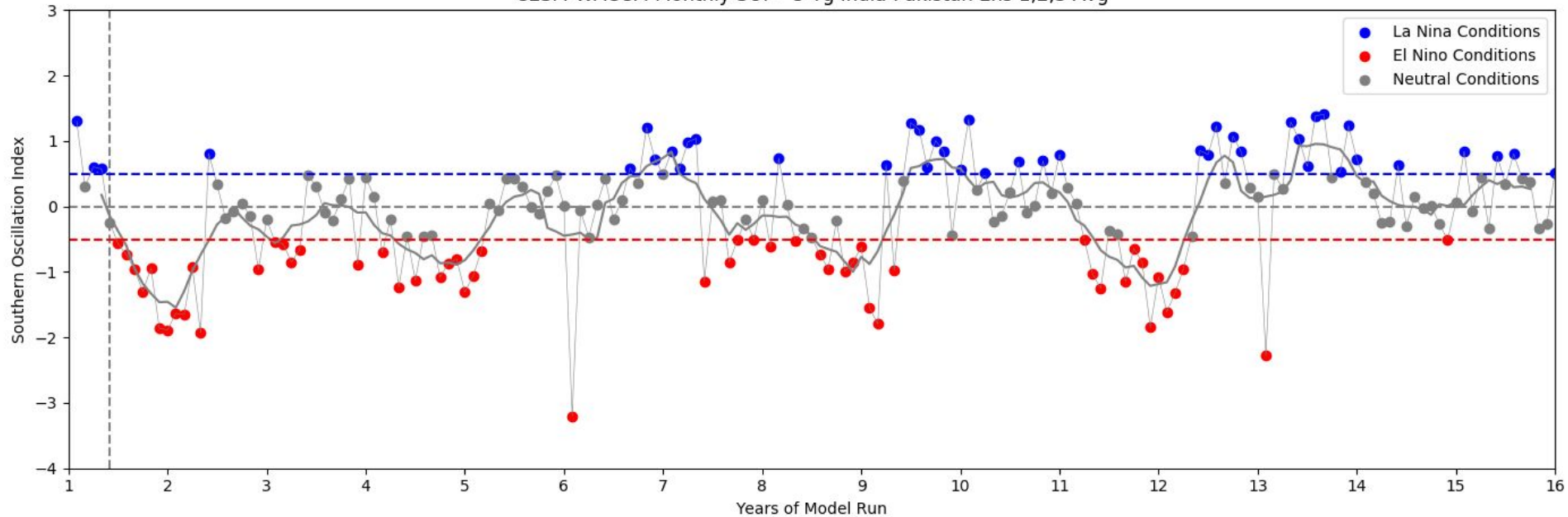


5 Tg ensemble
averages for
Wind / RSST

5S-5N Pacific Ocean RSST Anomaly 5 Tg India-Pakistan AVG ENS 1,2,3



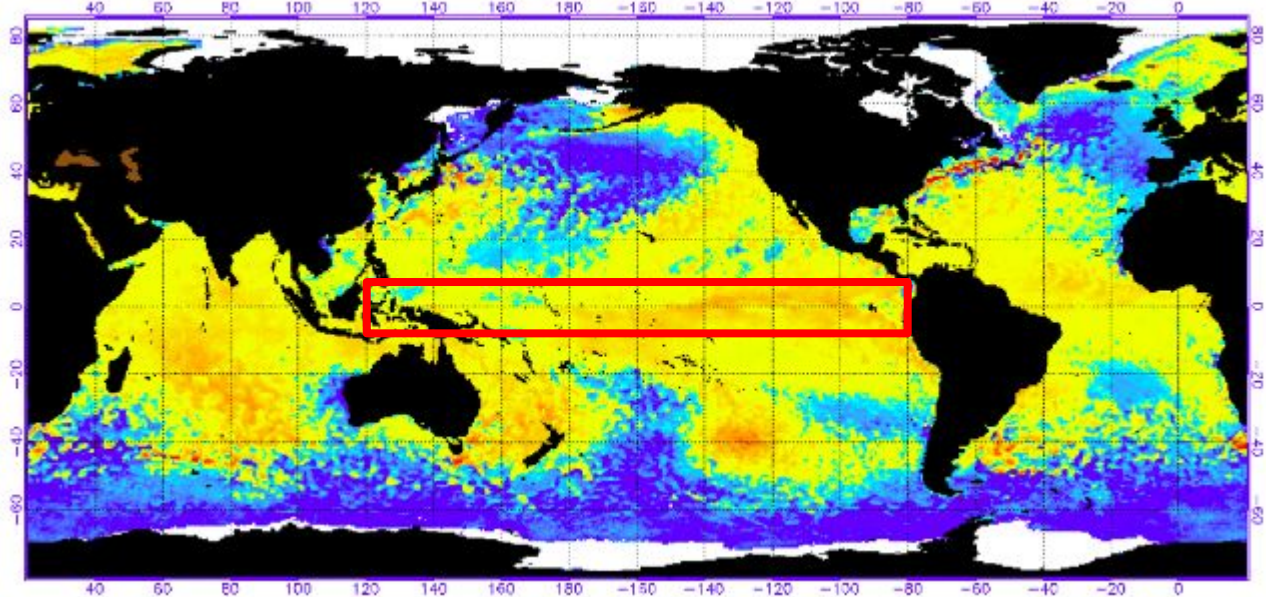
CESM-WACCM Monthly SOI - 5 Tg India-Pakistan Ens 1,2,3 Avg



Zonal 850 hPa Wind Anomalies /// RSST Anomalies

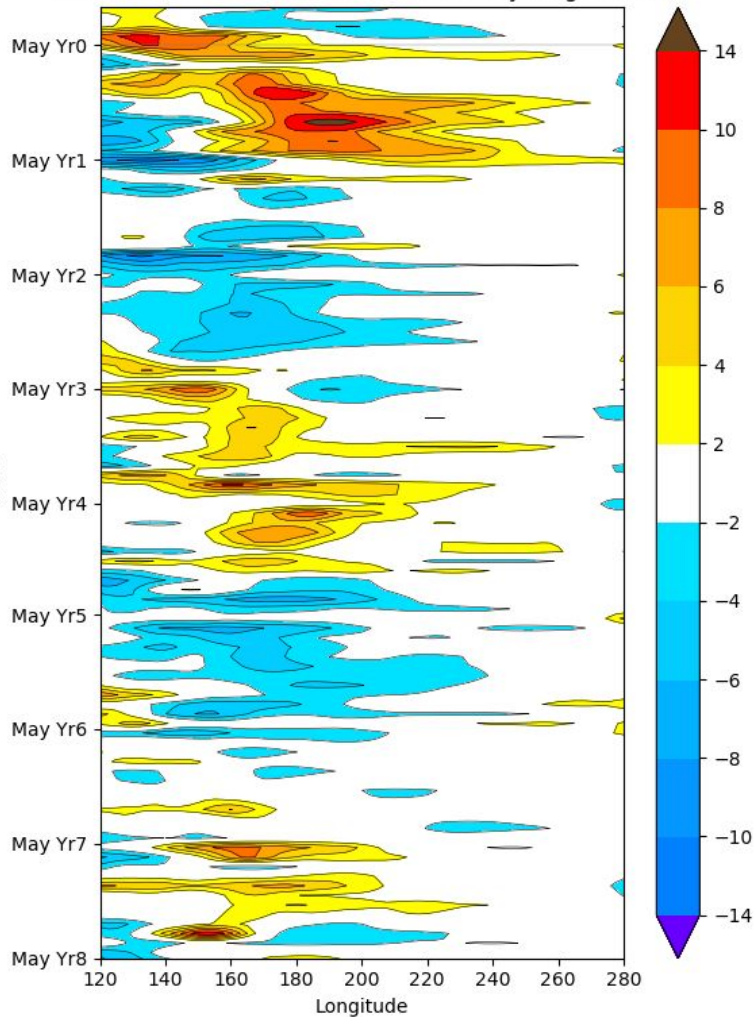
Using the default region used in NOAA CPC reports on the status of El Nino

120E to 80W



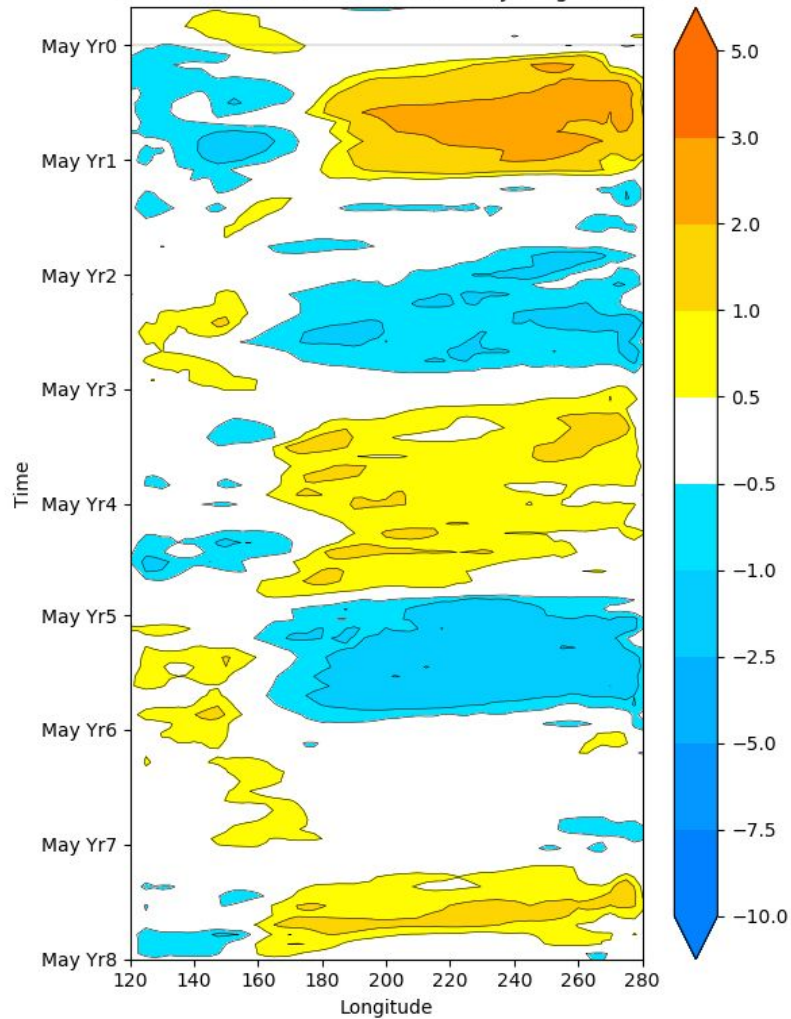
RSSTs are used by Khodri et al (2017) to filter the signal of global cooling. The mean SST from 20S to 20N is subtracted from the SSTs to get the RSSTs:

5S-5N Pacific Ocean Zonal Wind Anomaly 0 Tg Control

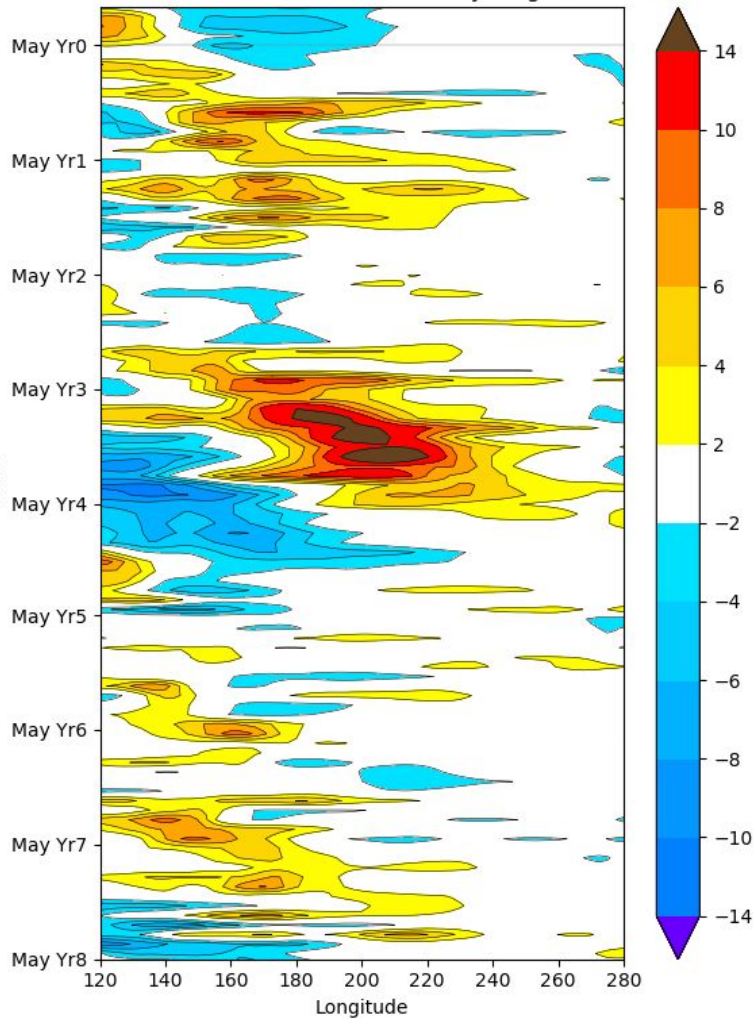


Virtually no
change between
control SSTs and
RSSTs.

5S-5N Pacific Ocean RSST Anomaly 0 Tg Control

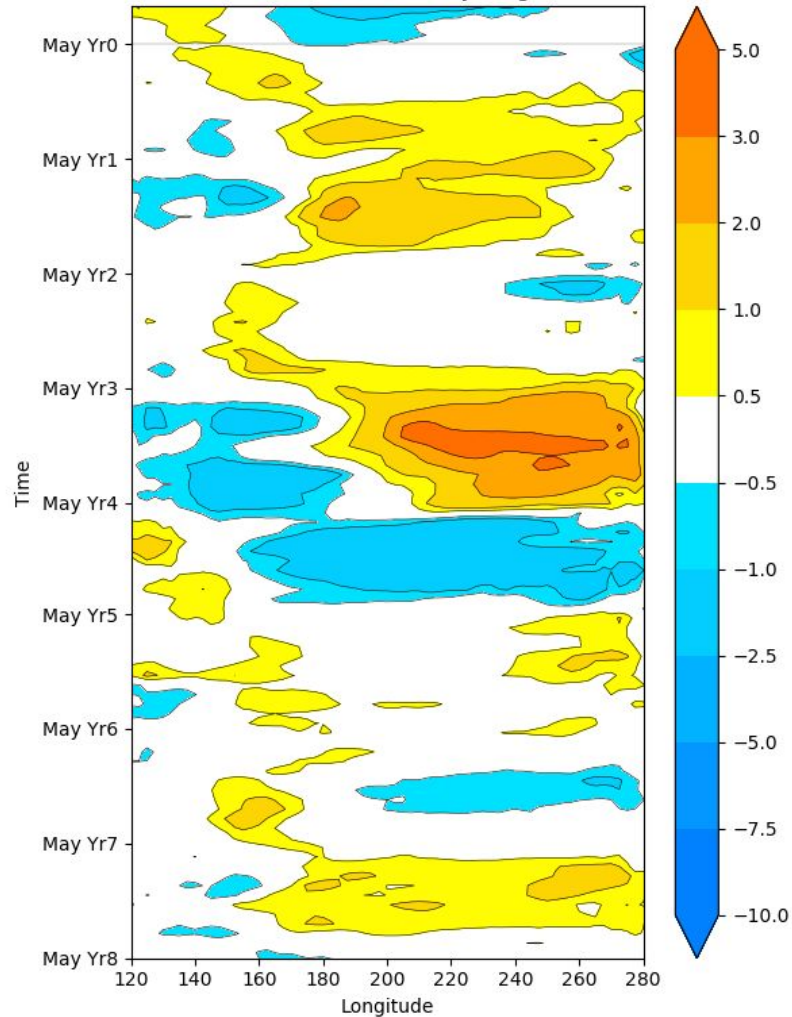


5S-5N Pacific Ocean Zonal Wind Anomaly 5 Tg India-Pakistan

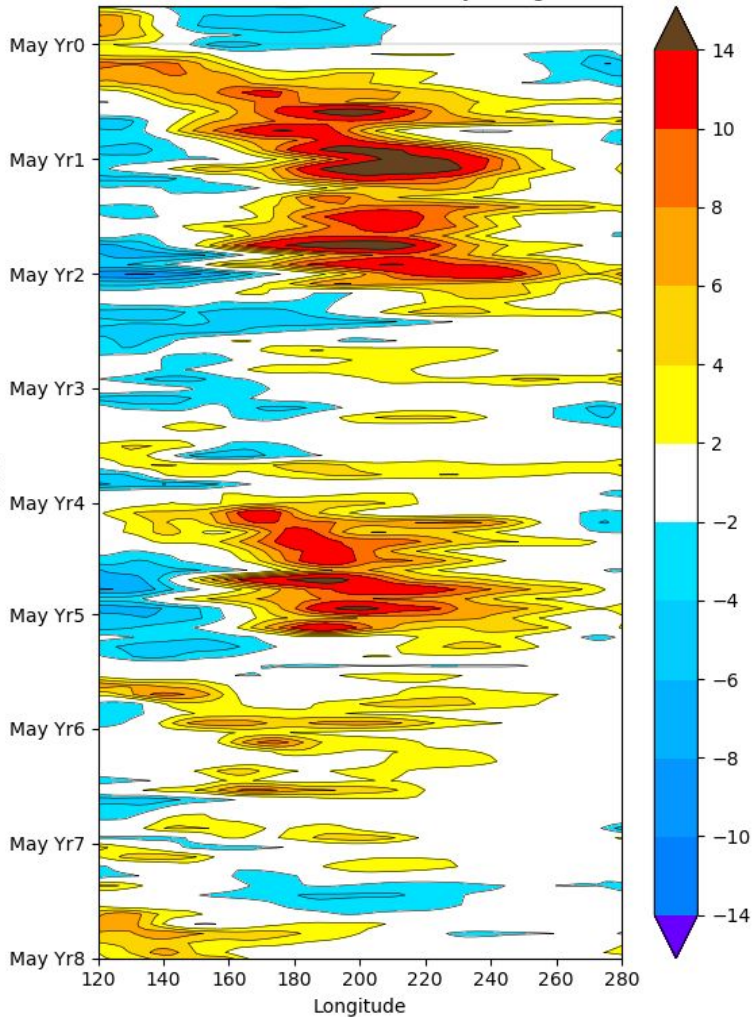


Eq. Pacific warming becomes more impressive in 5 Tg case when examining RSSTs.

5S-5N Pacific Ocean RSST Anomaly 5 Tg India-Pakistan

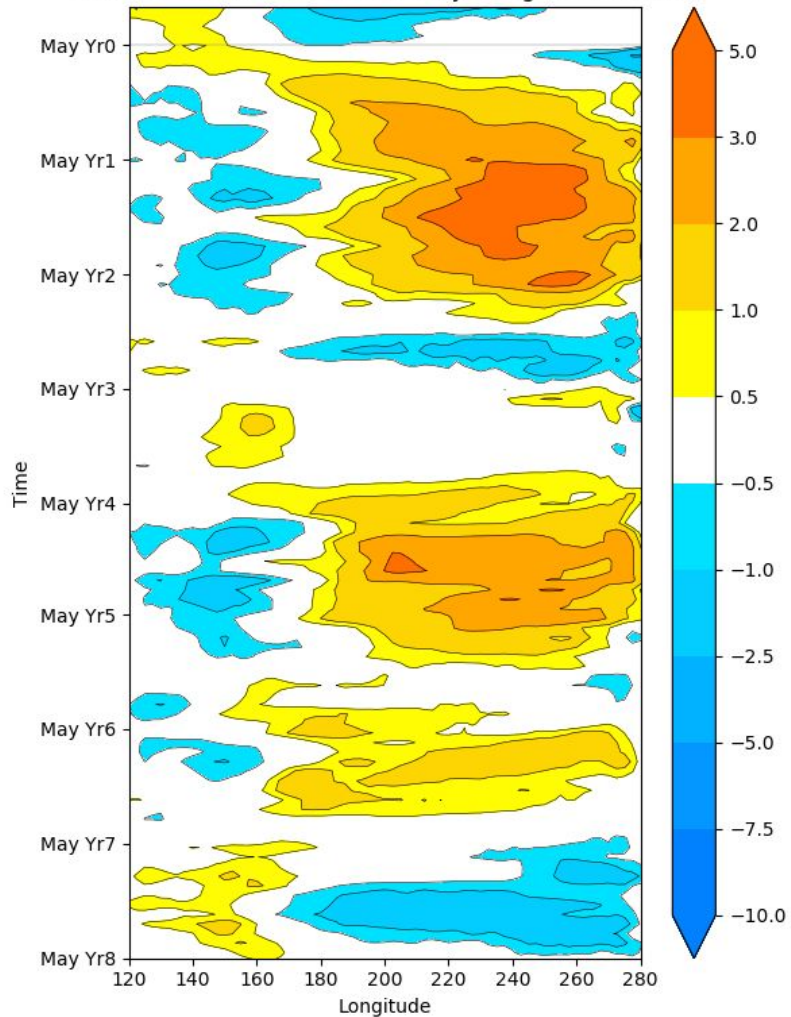


5S-5N Pacific Ocean Zonal Wind Anomaly 16 Tg India-Pakistan

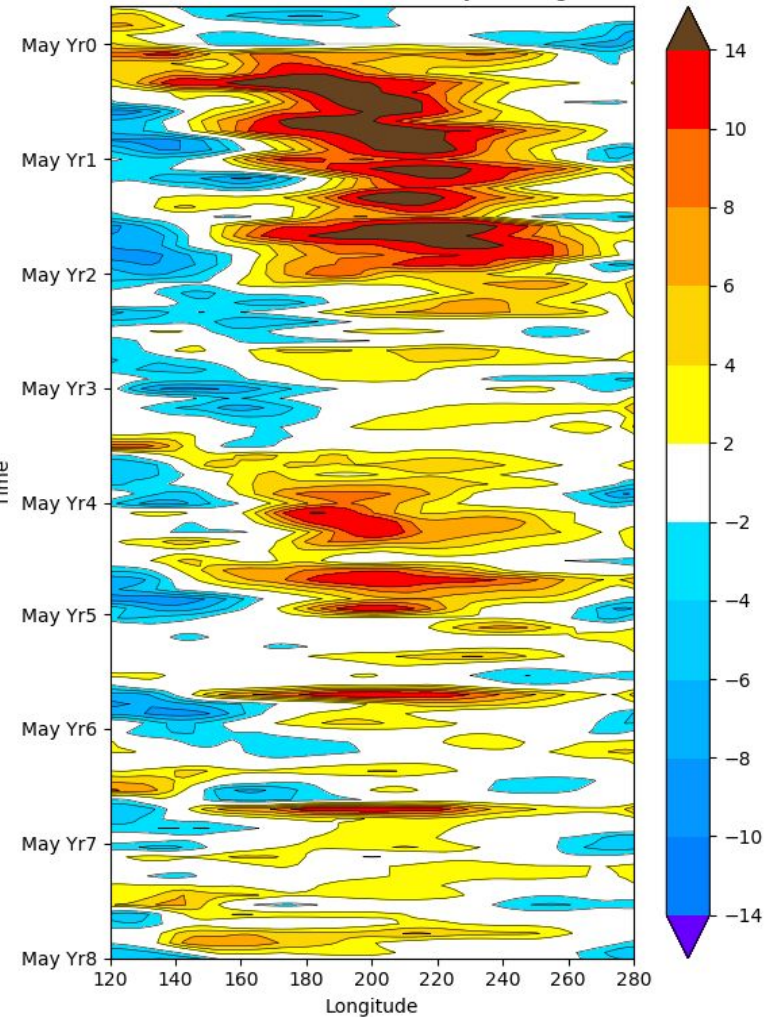


Far stronger and more expansive warming, and this becomes clearer and clearer with the more BC you get.

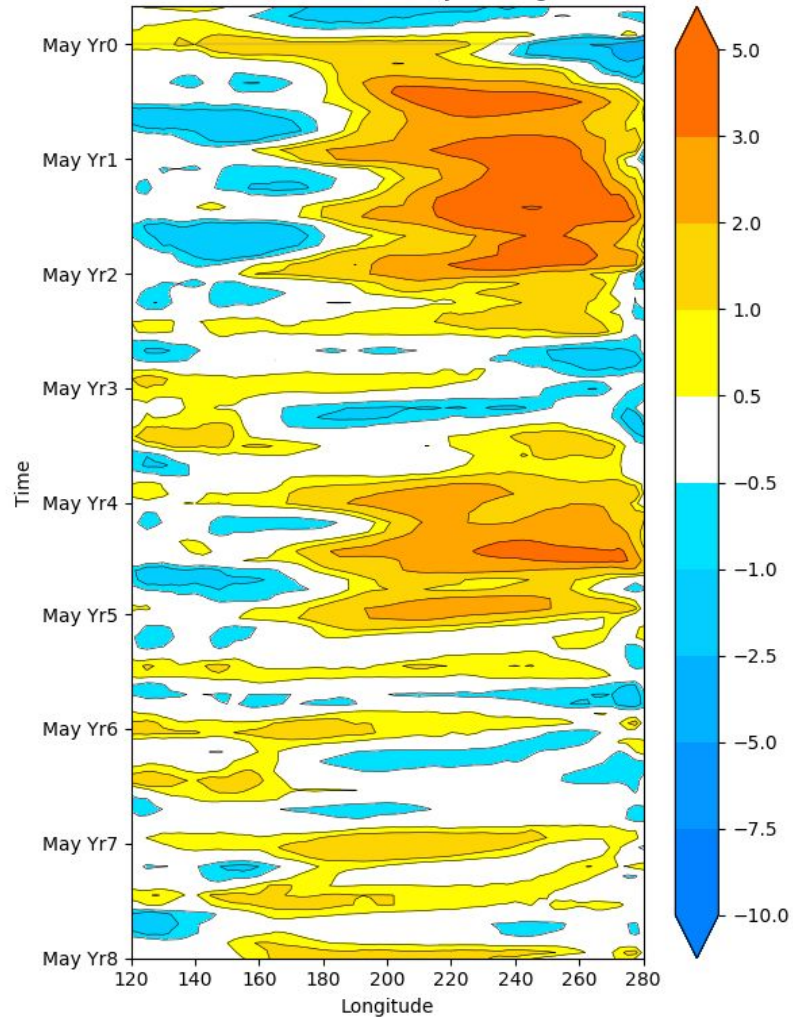
5S-5N Pacific Ocean RSST Anomaly 16 Tg India-Pakistan



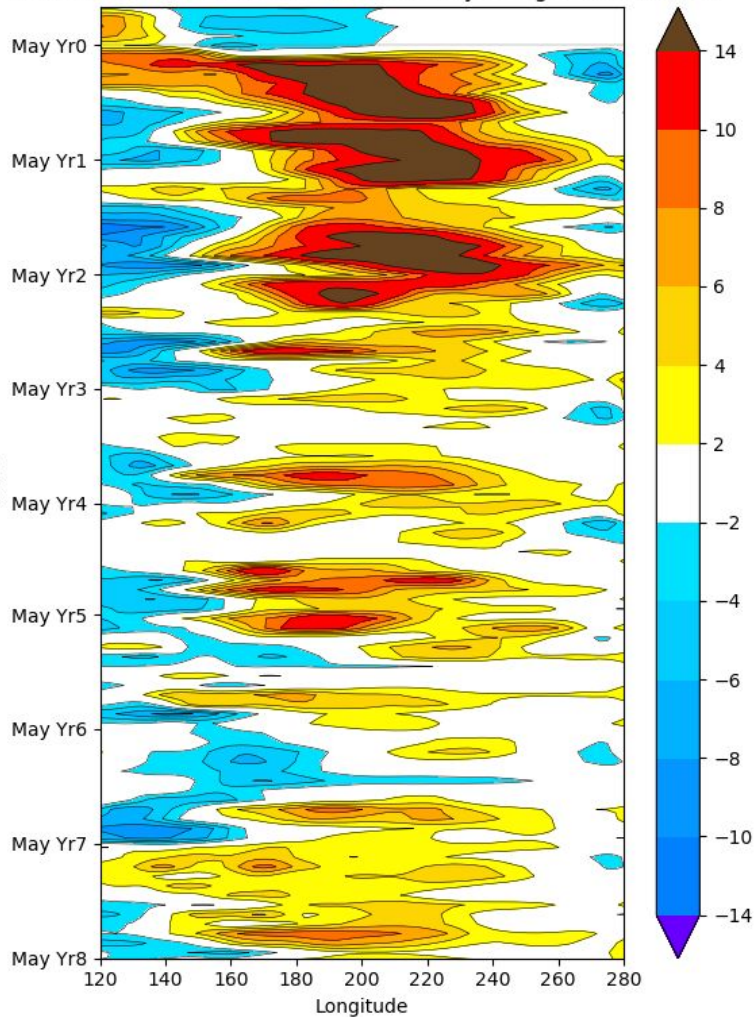
5S-5N Pacific Ocean Zonal Wind Anomaly 27.3 Tg India-Pakistan



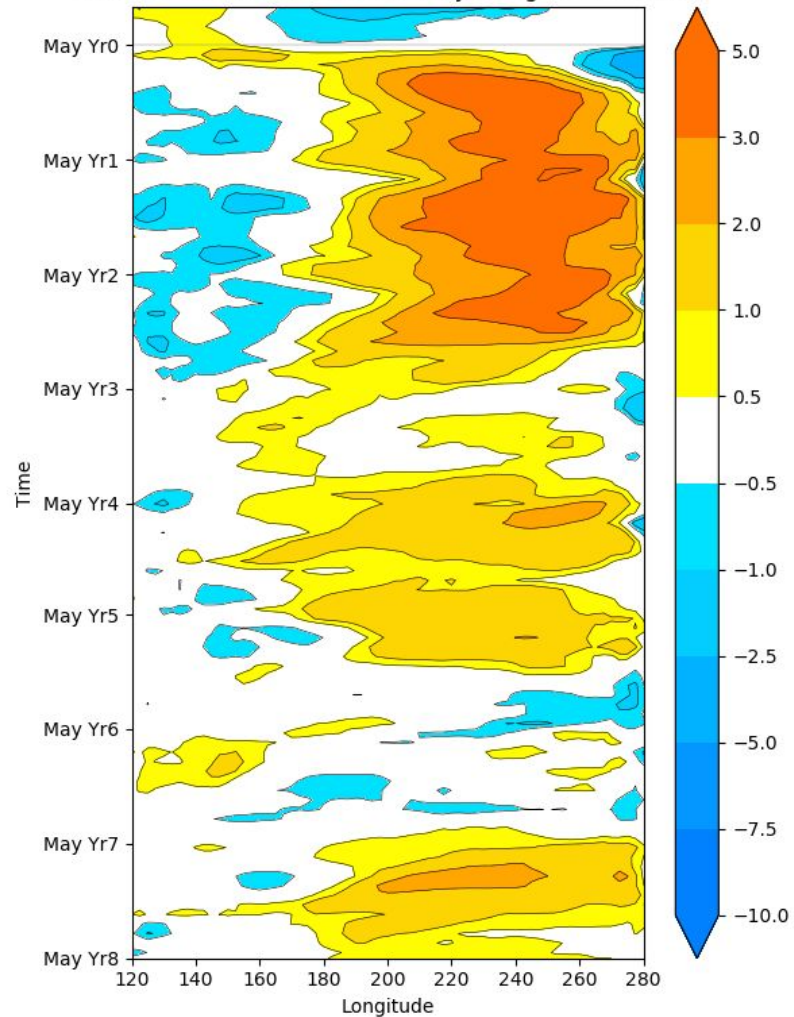
5S-5N Pacific Ocean RSST Anomaly 27.3 Tg India-Pakistan



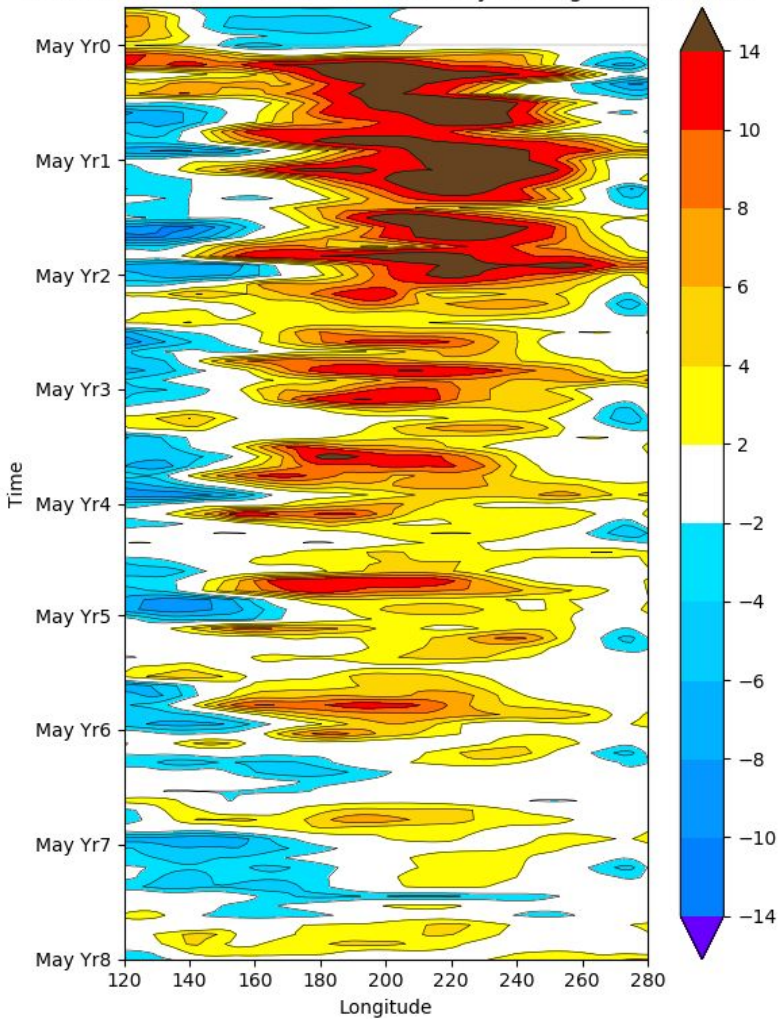
5S-5N Pacific Ocean Zonal Wind Anomaly 37 Tg India-Pakistan



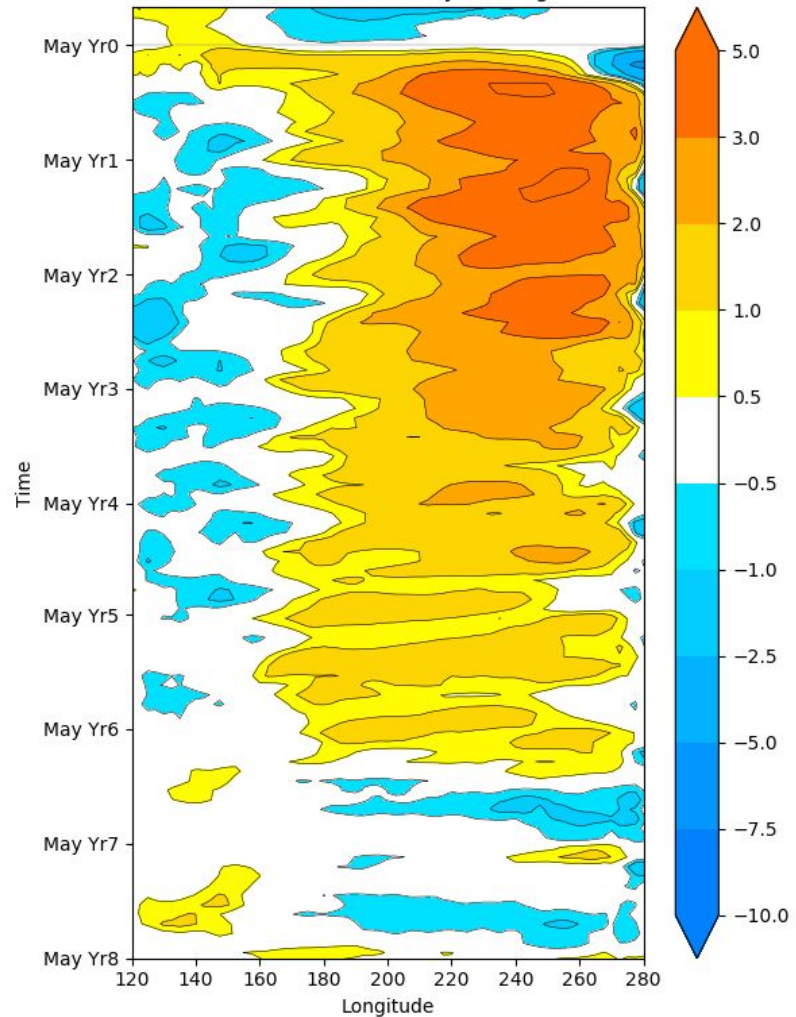
5S-5N Pacific Ocean RSST Anomaly 37 Tg India-Pakistan



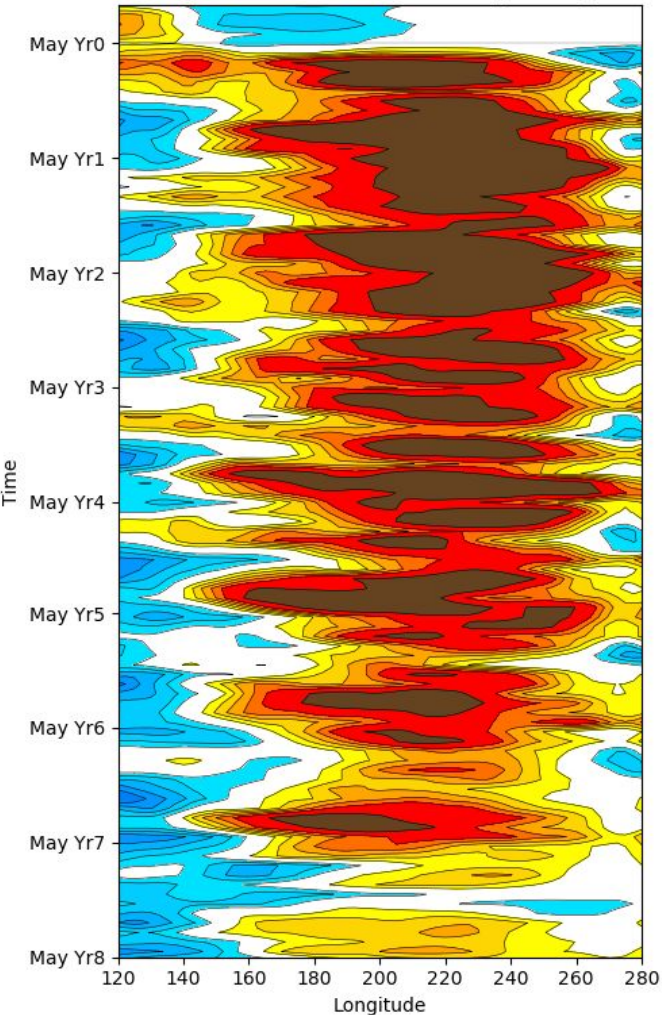
5S-5N Pacific Ocean Zonal Wind Anomaly 46.8 Tg India-Pakistan



5S-5N Pacific Ocean RSST Anomaly 46.8 Tg India-Pakistan



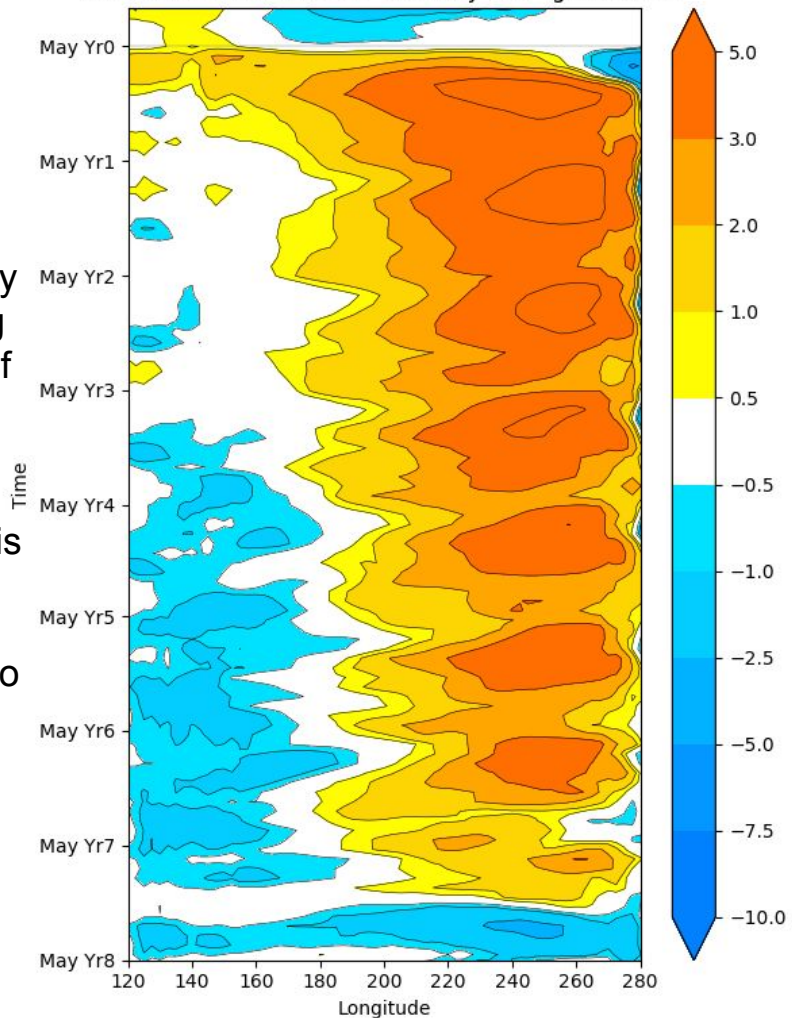
5S-5N Pacific Ocean Zonal Wind Anomaly 150 Tg US-Russia



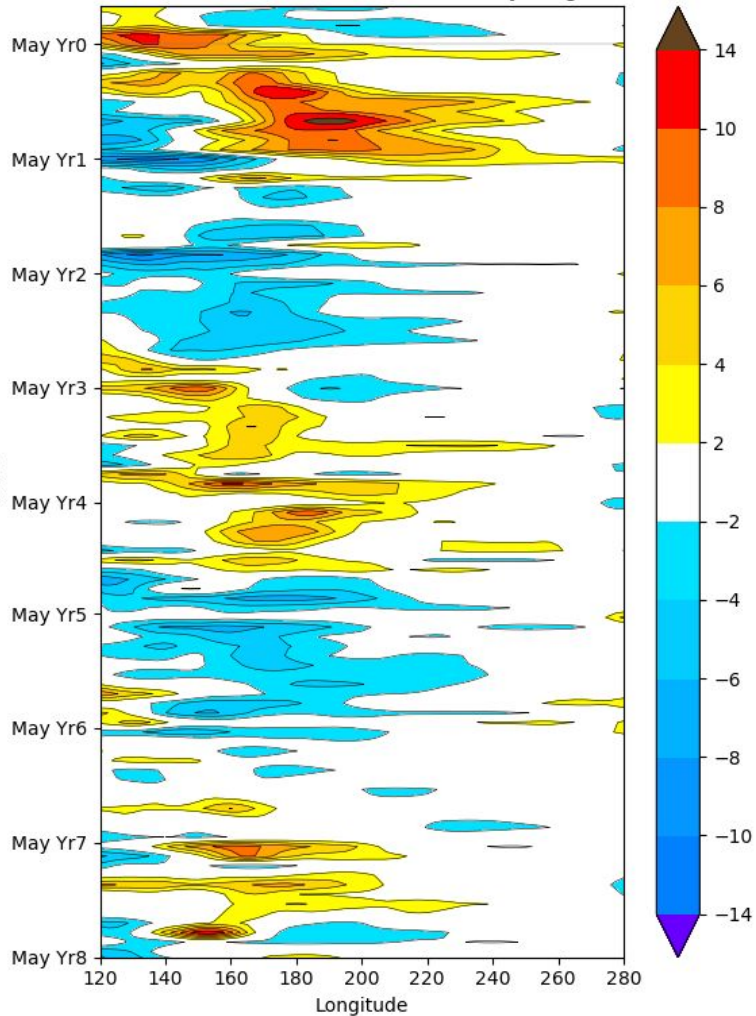
The 150 Tg case demonstrates just how strong the Nino forcing can be.

You can see westerly anomalies beginning in the western part of the basin and accelerating in the central and eastern part of the basin. This occurs each June-August, which kickstarts strong Nino conditions for the Fall. Implies the westerly momentum comes from outside of the Pacific.

5S-5N Pacific Ocean RSST Anomaly 150 Tg US-Russia

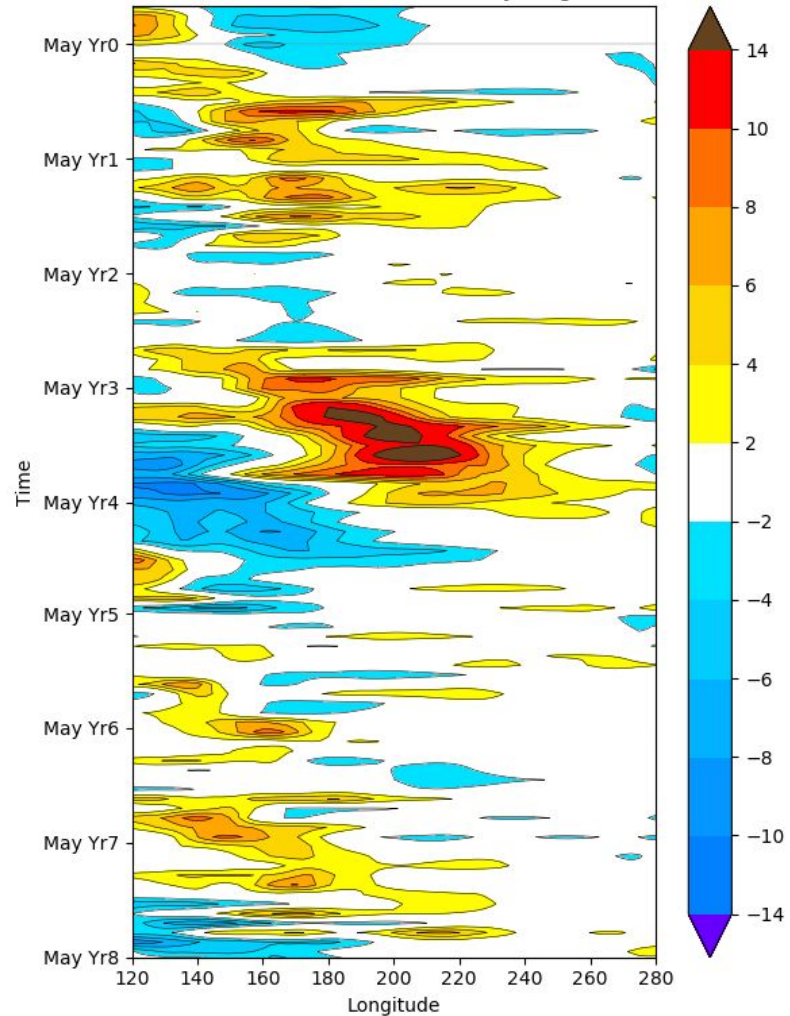


5S-5N Pacific Ocean Zonal Wind Anomaly 0 Tg Control

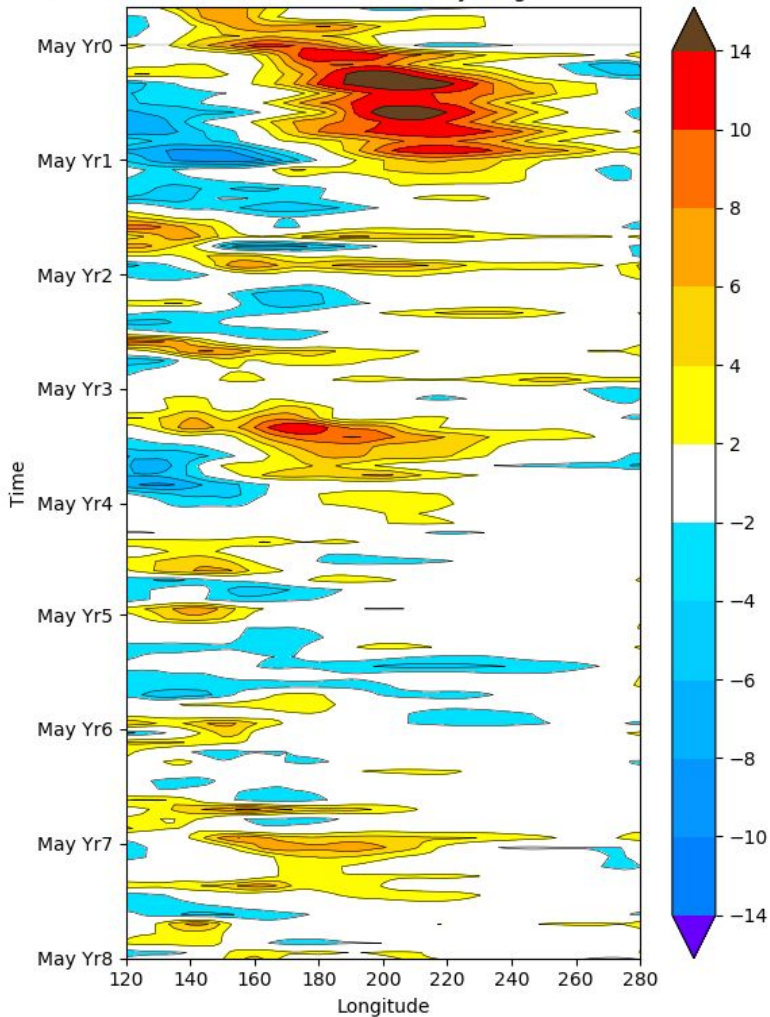


Control
vs
Ens 1
Zonal Wind
Anomaly

5S-5N Pacific Ocean Zonal Wind Anomaly 5 Tg India-Pakistan

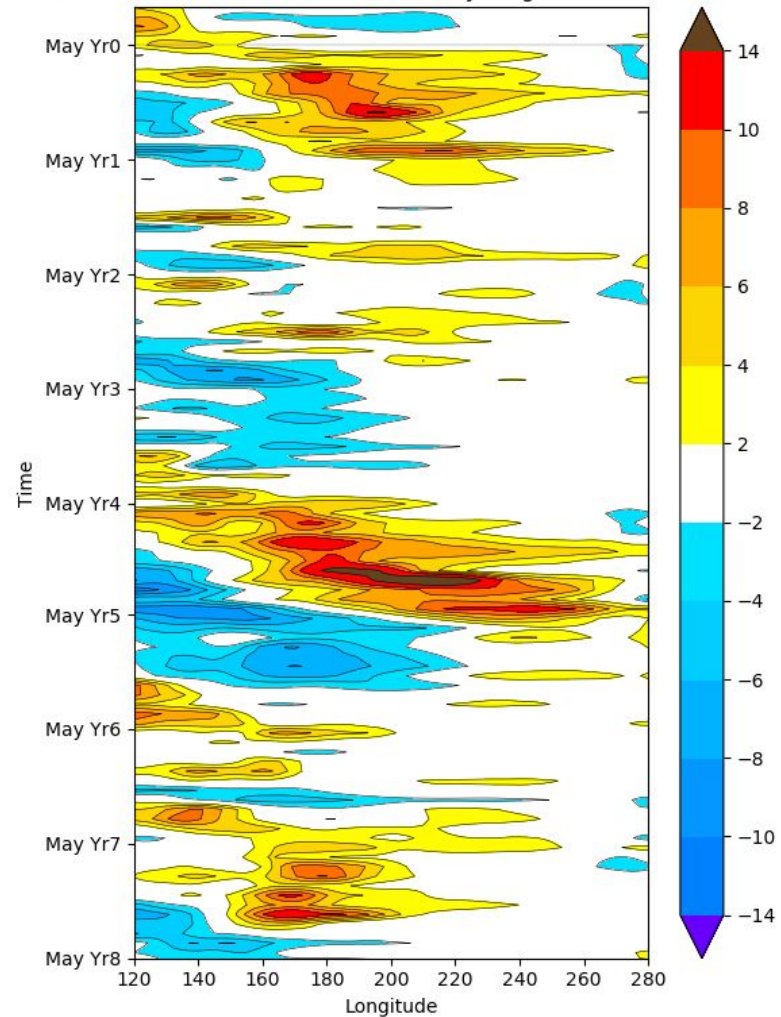


5S-5N Pacific Ocean Zonal Wind Anomaly 5 Tg India-Pakistan Ens 2



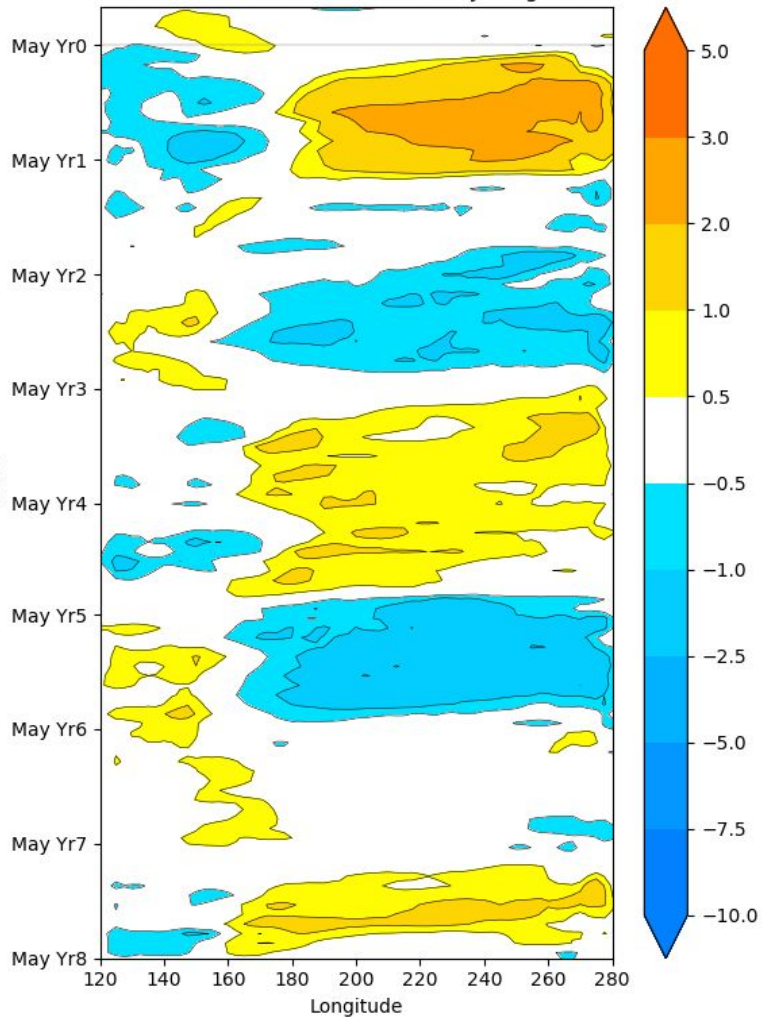
Ens2
vs
Ens 3
Zonal Wind
Anomaly

5S-5N Pacific Ocean Zonal Wind Anomaly 5 Tg India-Pakistan Ens 3



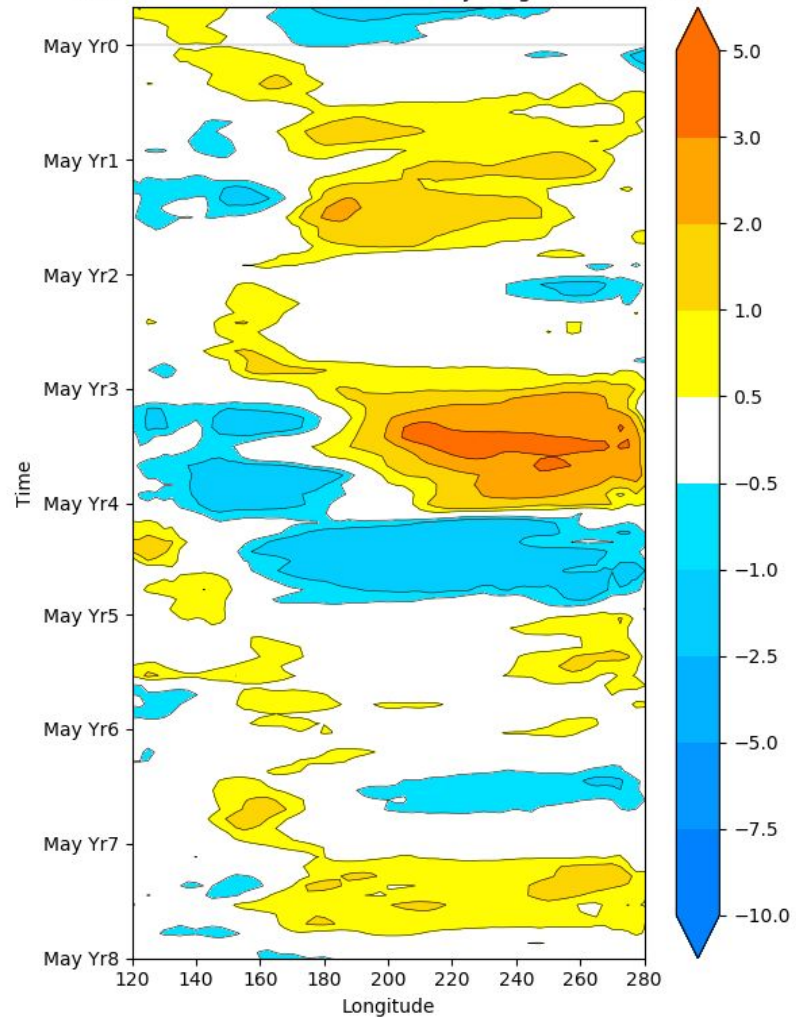
Using RSSTs: comparison of 5 Tg Ensembles

5S-5N Pacific Ocean RSST Anomaly 0 Tg Control

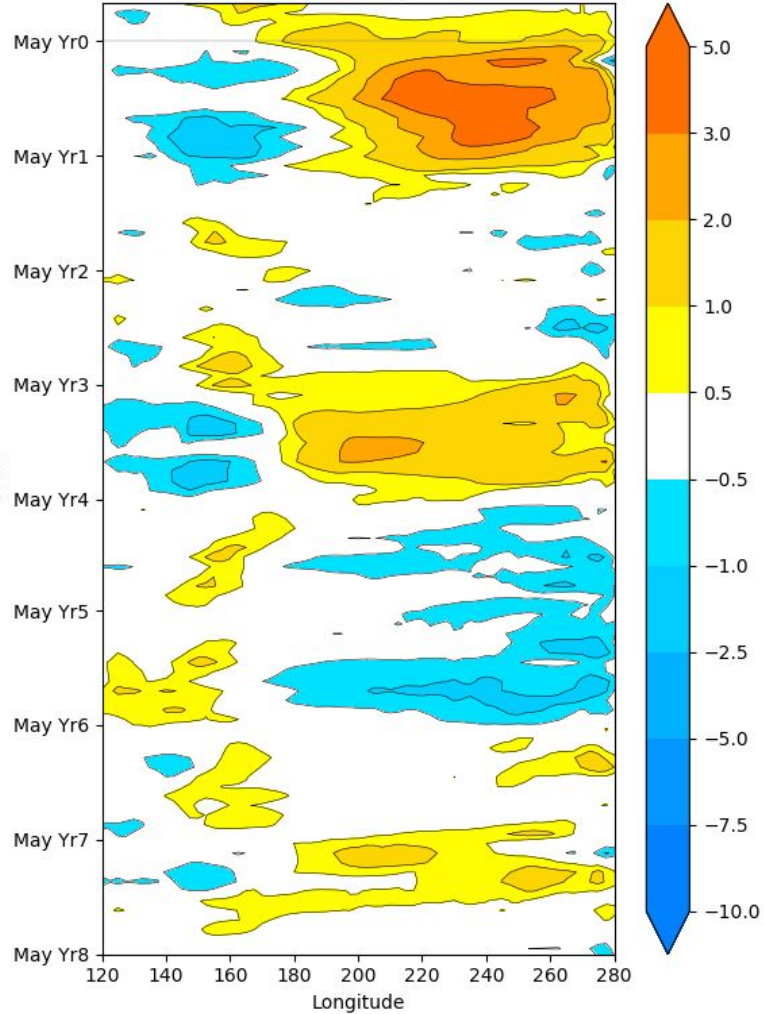


control
vs ens1
RSSTs

5S-5N Pacific Ocean RSST Anomaly 5 Tg India-Pakistan



5S-5N Pacific Ocean RSST Anomaly 5 Tg India-Pakistan Ens 2



Ens2

Vs

Ens3
RSSTs

5S-5N Pacific Ocean RSST Anomaly 5 Tg India-Pakistan Ens 3

