1 paper de la onda 3

Elio Campitelli

April 19, 2018

"Tradicional" analysis.

Now this has some problems… yada yada yada, alternative analysis.

New seasons

PC1 to PC4 represent the principal modes of variability of the geopotential field with wavenumber greater than 1…

PC1 and PC2 both are dominated by a wave 3 pattern. They both explain an almost equal proportion of the total variance and represent a wave 3 pattern offset by 1/4 wavelength. From that, one can infer that they are degenerated modes that represent the same wave pattern and it's meridional movement. PC3 is mainly a hemispheric scale wave 2 with a small contribution of wave 4 north of 45°S. PC4 exhibits a more complex pattern with both waves 2 and 3 contributing to the field. The result is a wave 3-ish pattern on the eastern hemisphere that affects the Atlantic and the Indian oceans but disappears over the central-south Pacific.

This result suggest that the ZW3 could be represented by a linear combination of PC1 and PC2 at the same time preserving it's meridional propagation and zonal variation.

An optimal (if somewhat arbitrary) division of the year can be seen in Figure X based on monthly mean values of each PC…

This division is supported by hierarchical clustering…

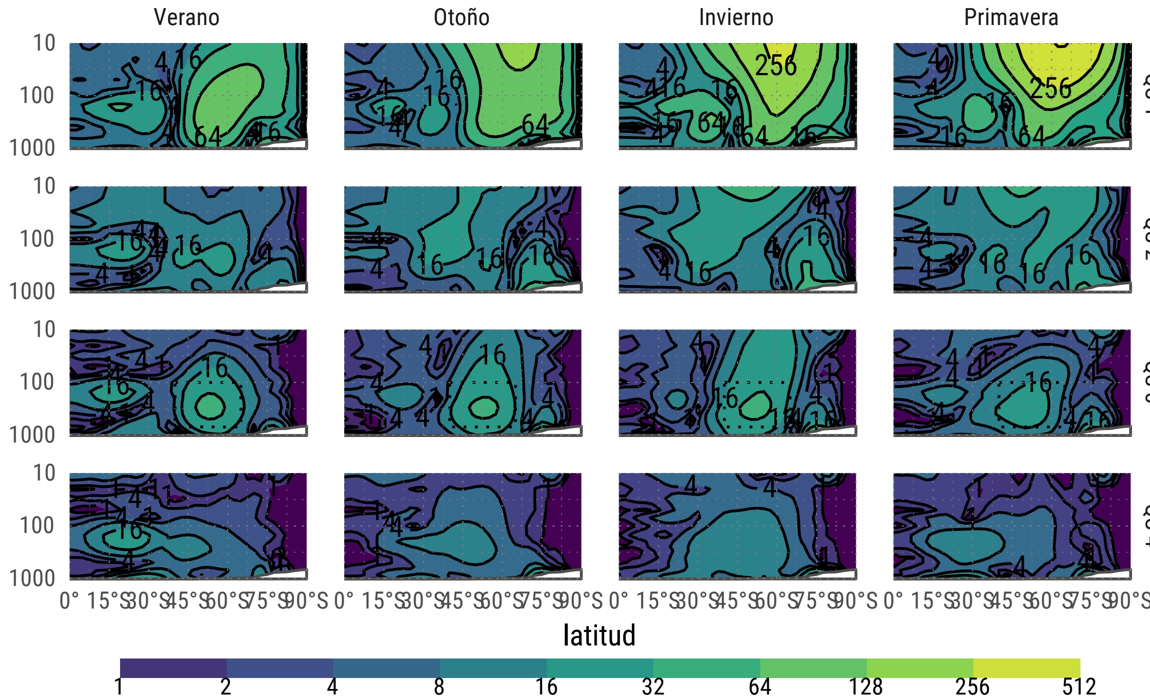


Figure 1: Fourier amplitude of geopotential height

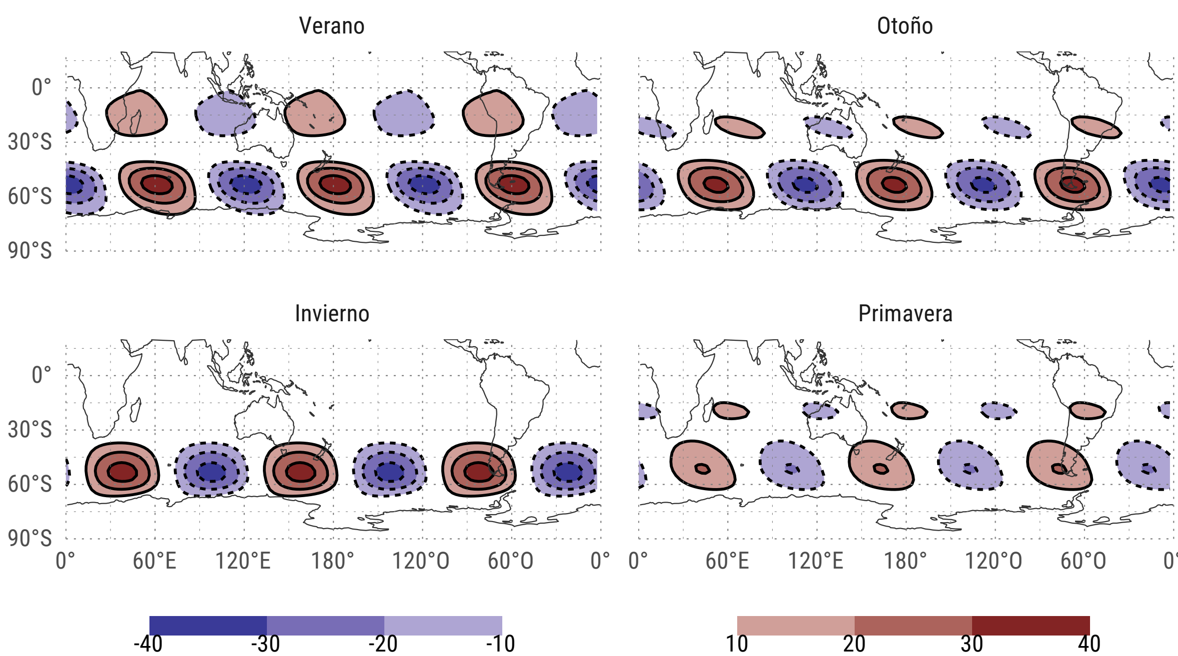


Figure 2: Wave 3 component of the geopotential field of each season at 200hPa.

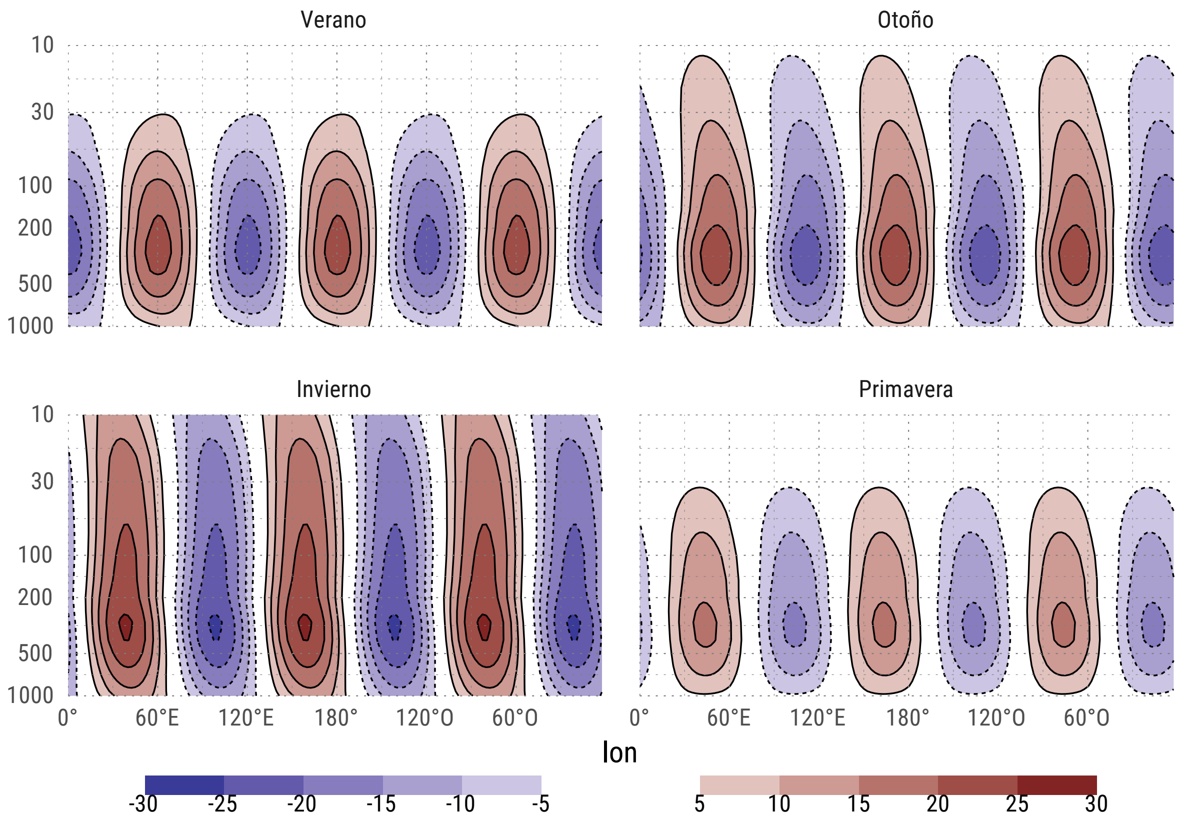


Figure 3: Mean wave 3 component of geopotential height between 65°S and 35°S

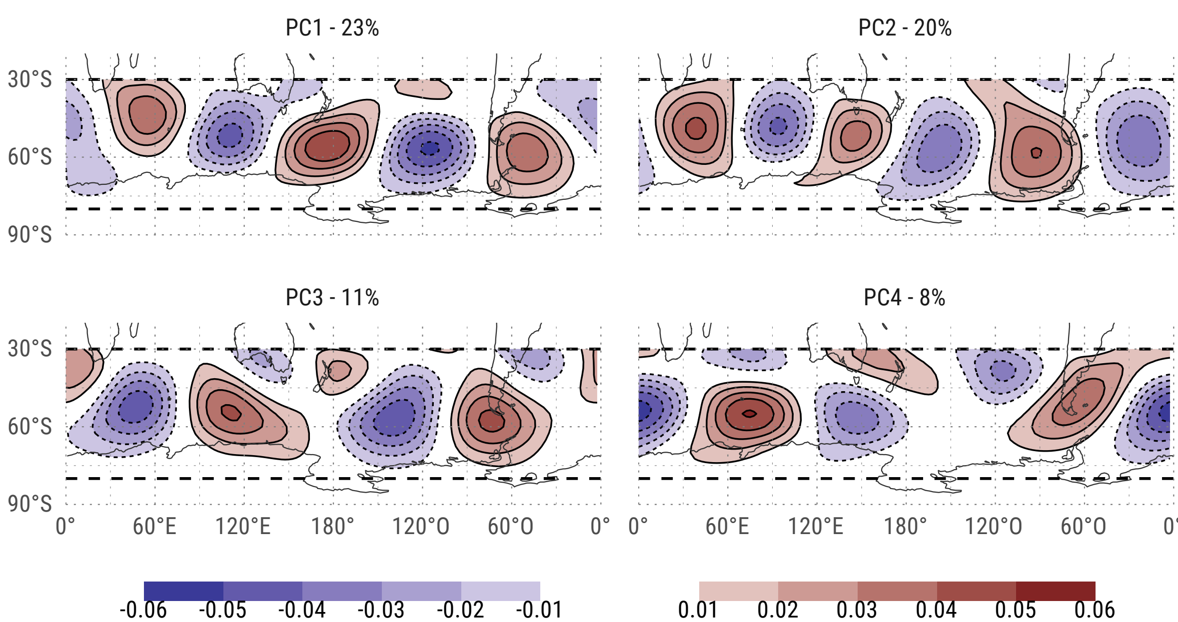


Figure 4: First 4 EOFs derived from the 200hPa geopotential zonal anomaly field between 30°S and 80°S with zonal wave 1 filtered out.

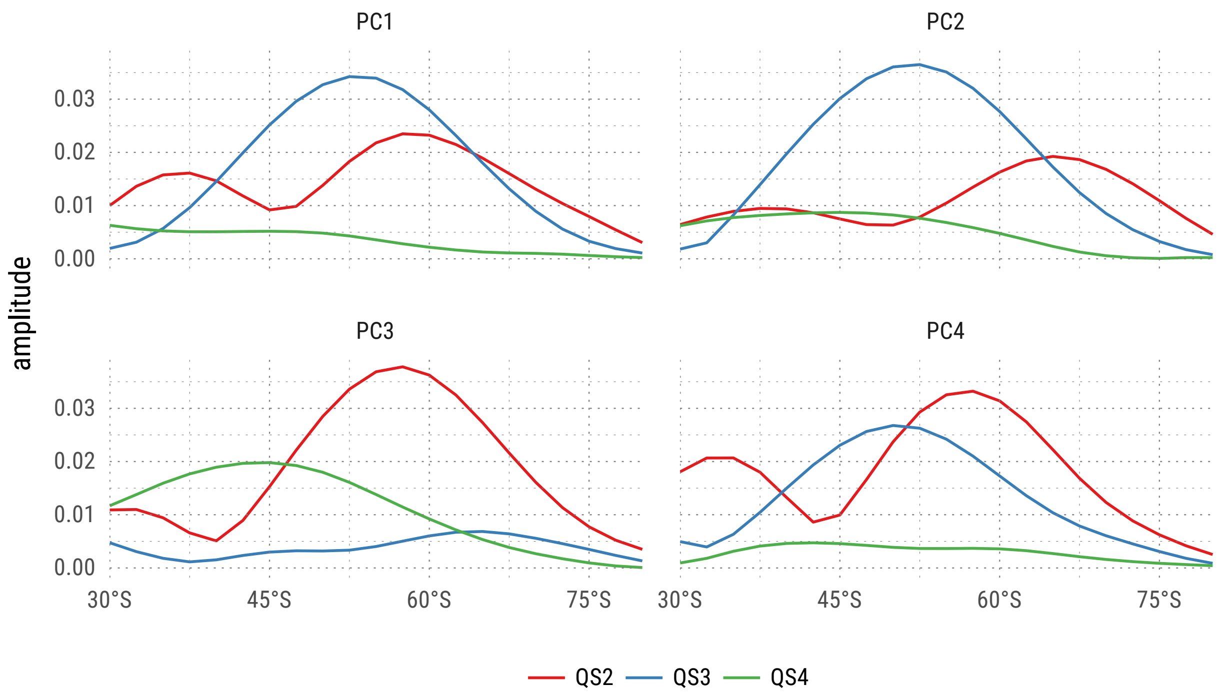


Figure 5: Fourier decomposition by latitude of each EOF.

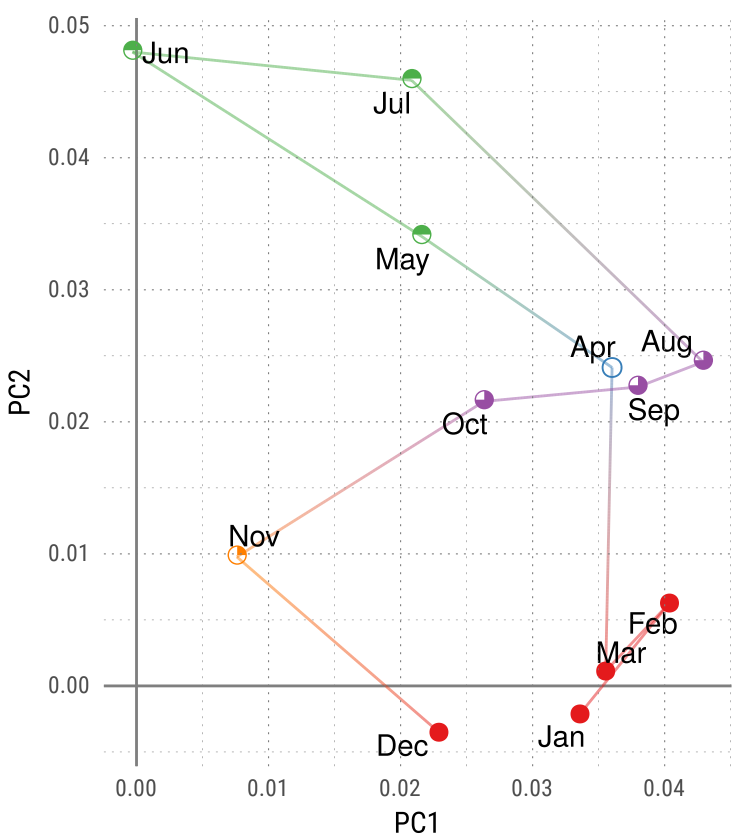


Figure 6: Monthly mean values for each PC. Colors and shapes divide months into 5 ‘seasons’.

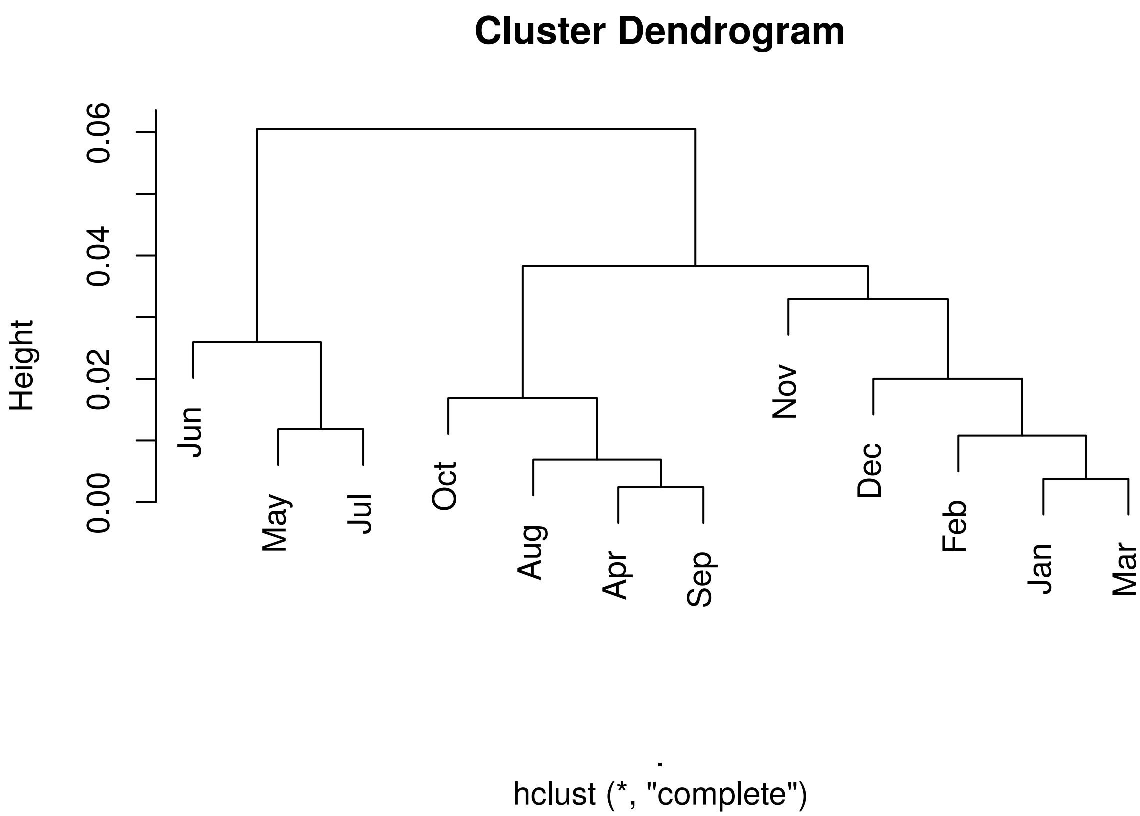
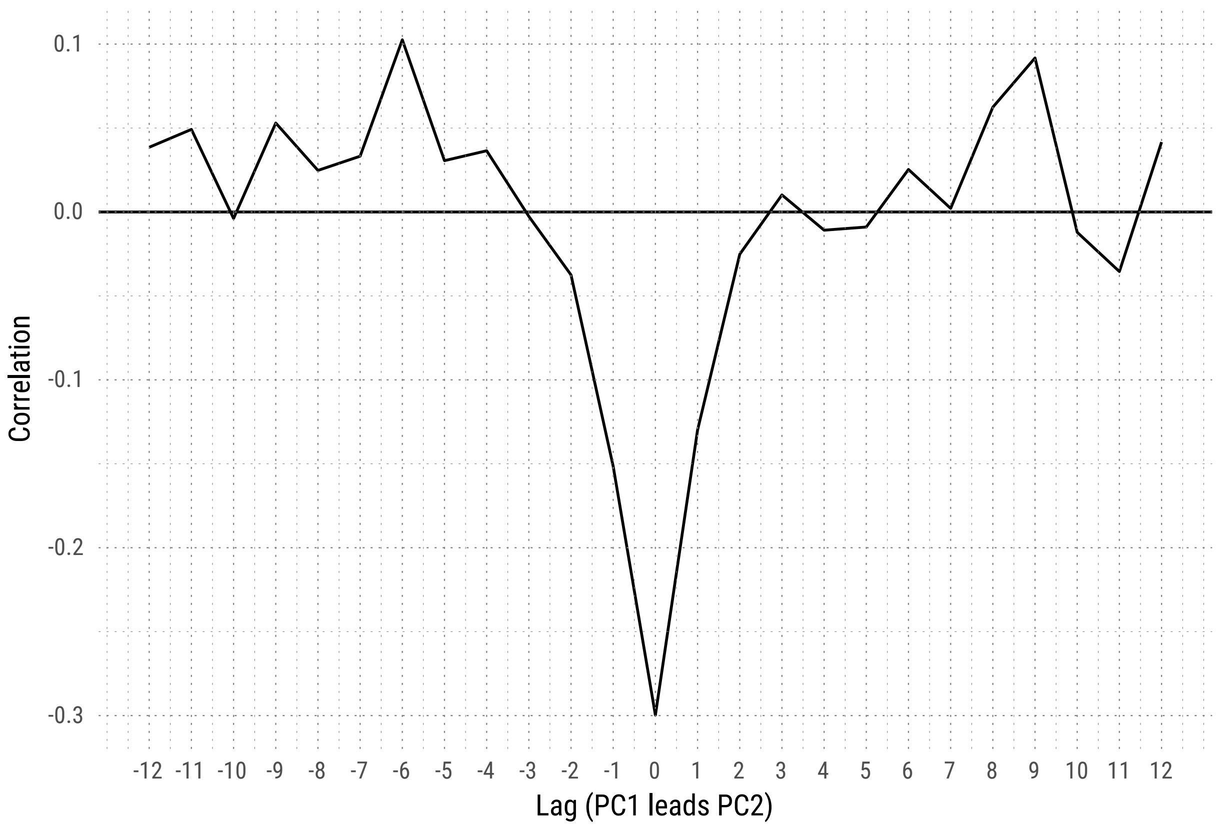


Figure 7: NO VA. Clústering jerárquico. Cortando en ~0.03 se obtienen 4 clusters, y un 5to separando Abril de ASO por continuidad temporal. Confirma la validez del agrupamiento “a ojo”



Notes:

- Making other (still sensible) decisions lead to some differences in clustering. For example, using fields with QS1 *and* QS2 filtered out puts May closer to April, and December further from JFM. Non surprisingly, a similar result is achieved by using using idealized fields from the reconstructed zonal wave 3 (since higher wavenumbers explain a negligible proportion of the viariance). JFM and ASO (and it's similarity with April), on the other hand, are robust trimesters.
- This differences imply that the ZW2 might be have an important role in the variability in May and December.
- JJ is a relatively robust grouping but with obviously more heterogeneous than JFM or ASO

Geopotential Fields

Lo anterior justifica el agrupamiento de los meses que viene.

Streamfunction

Fourier

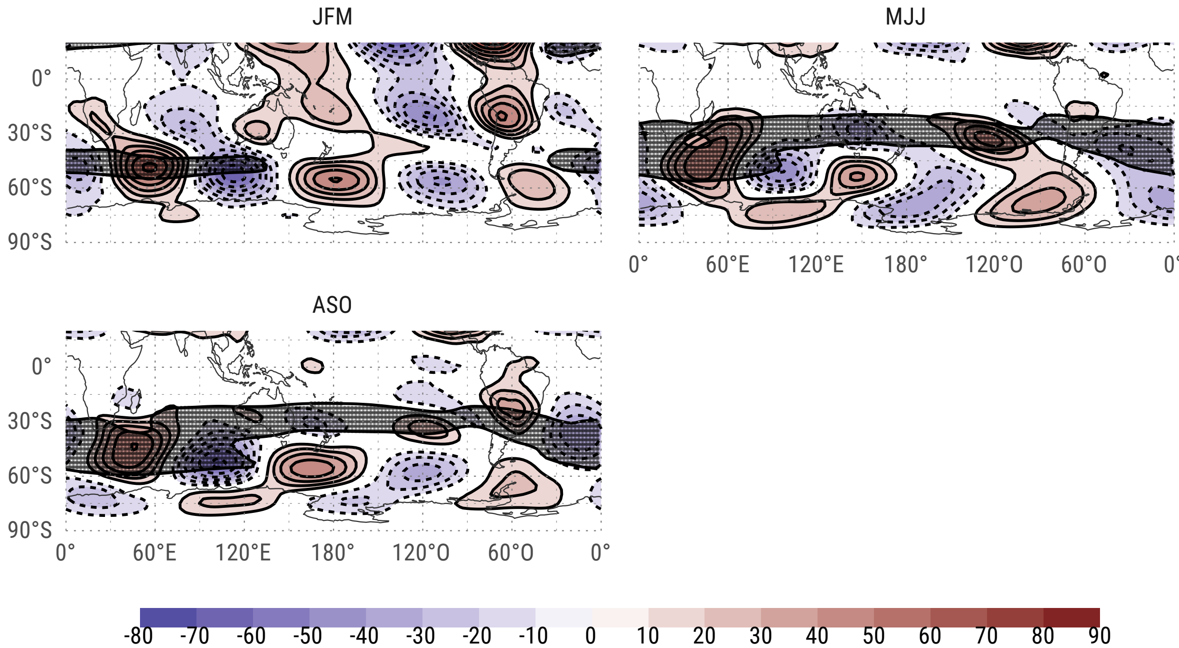


Figure 8: Zonal anomaly of 200hPa geopotential field with zonal wavenumber 1 filtered out. Areas with zonal wind greater than 30 m/s are hatched.

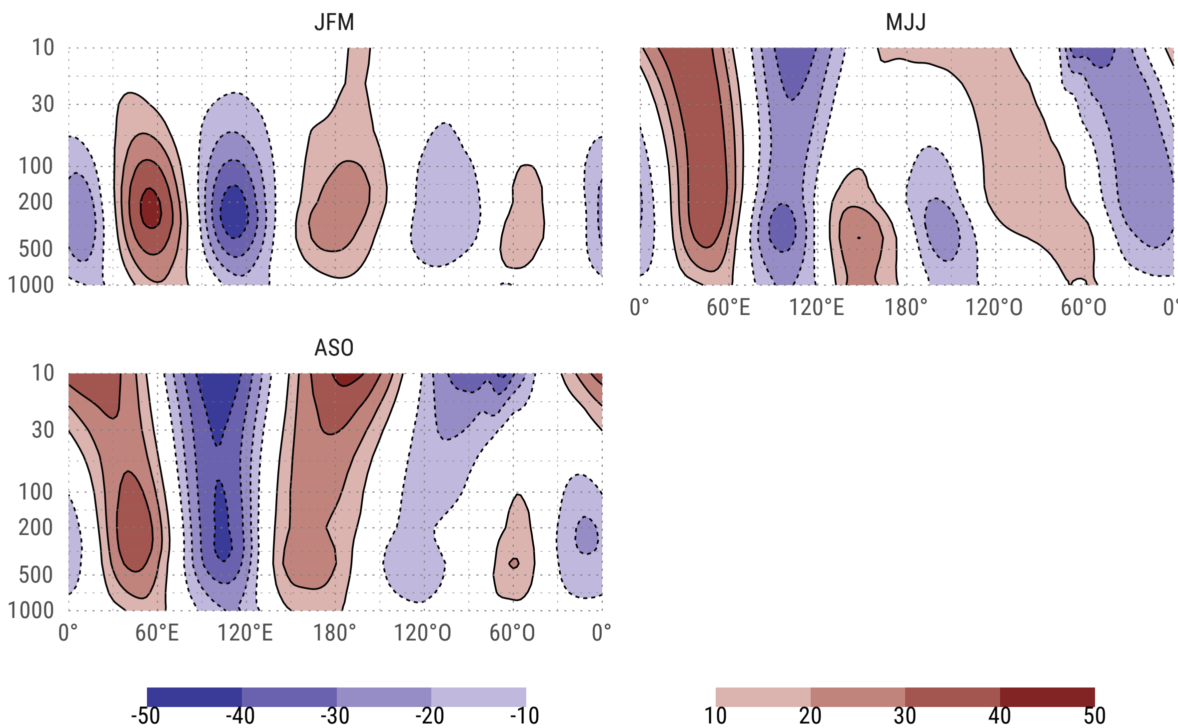


Figure 9: Mean geopotential zonal anomaly with zonal wave 1 filtered out between 65°S and 35°S

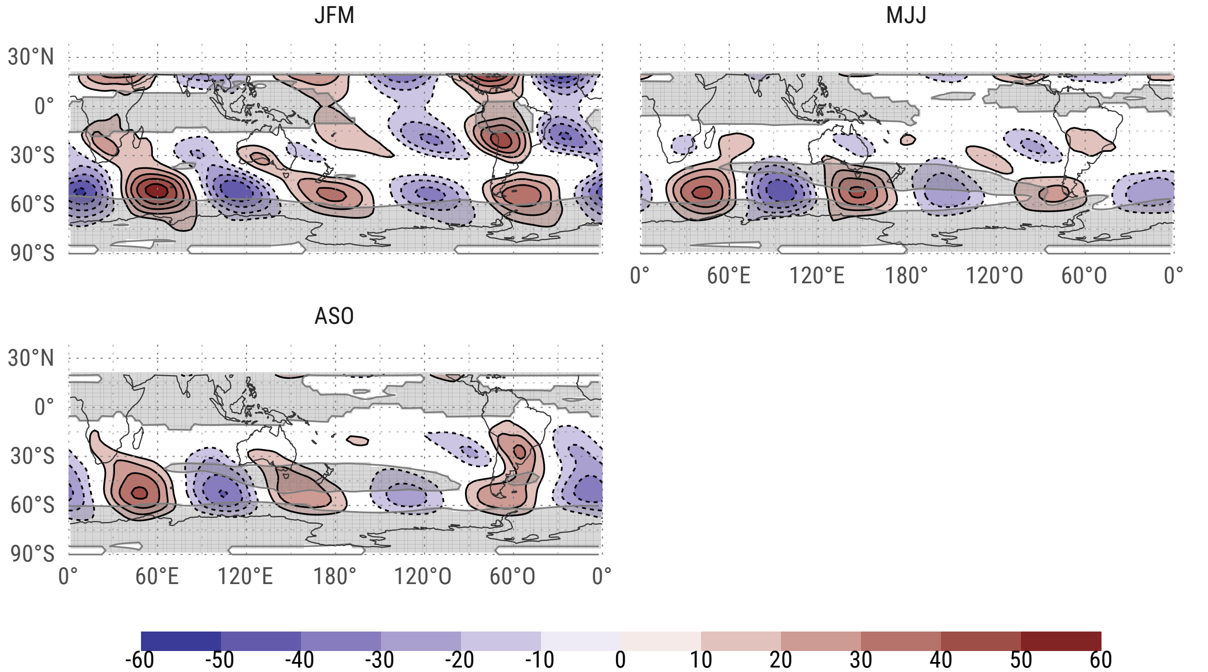


Figure 10: Zonal anomaly of 200hPa geopotential field with zonal wavenumber 1 and 2 filtered out. Areas with stationary wave number less than 3 are shaded.

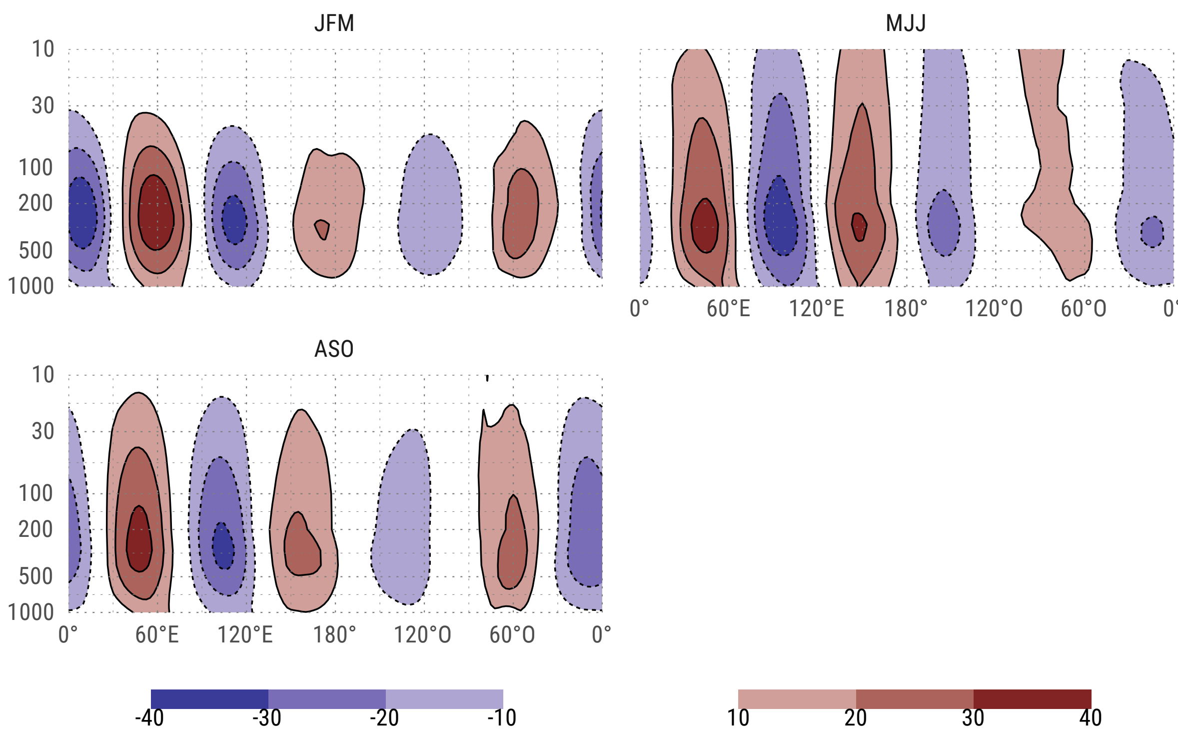


Figure 11: Mean geopotential zonal anomaly with zonal wave 1 and 2 filtered out between 65°S and 35°S

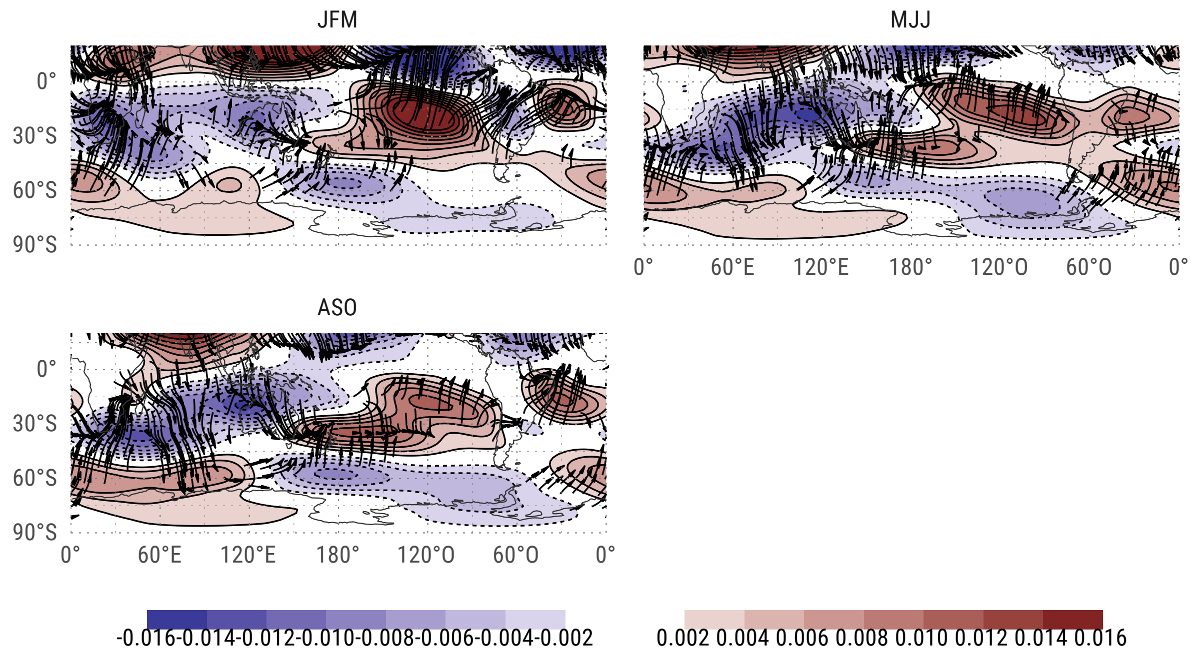


Figure 12: Mean streamfunction.

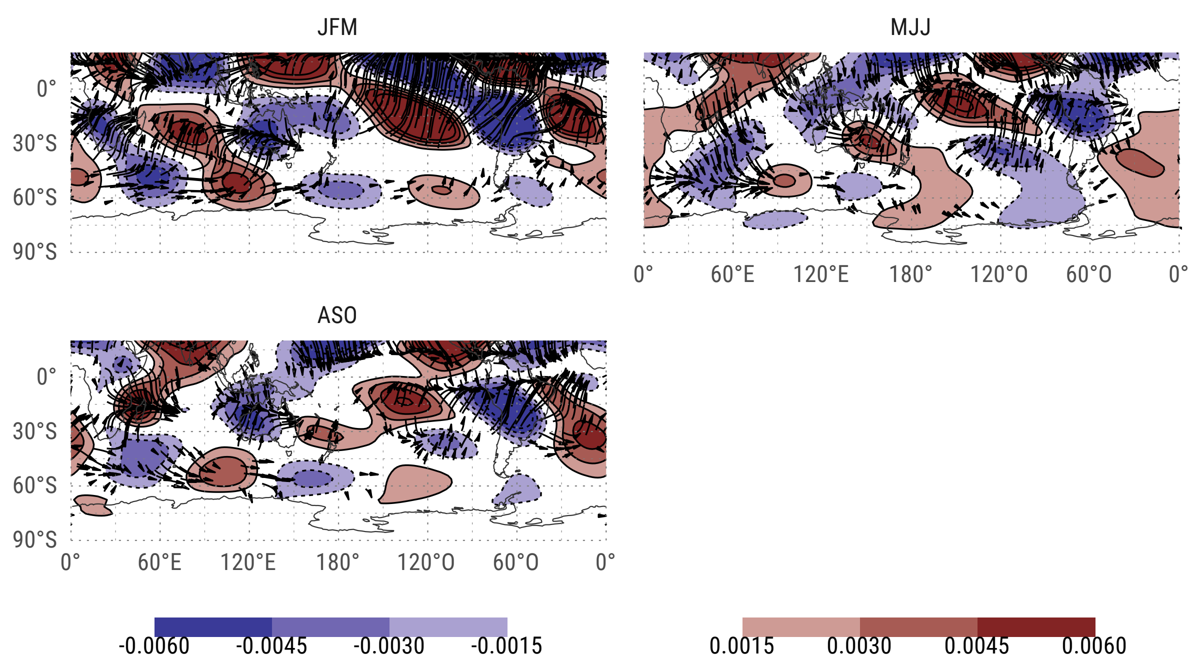


Figure 13: Mean streamfunction with zonal wave 1 filtered out.

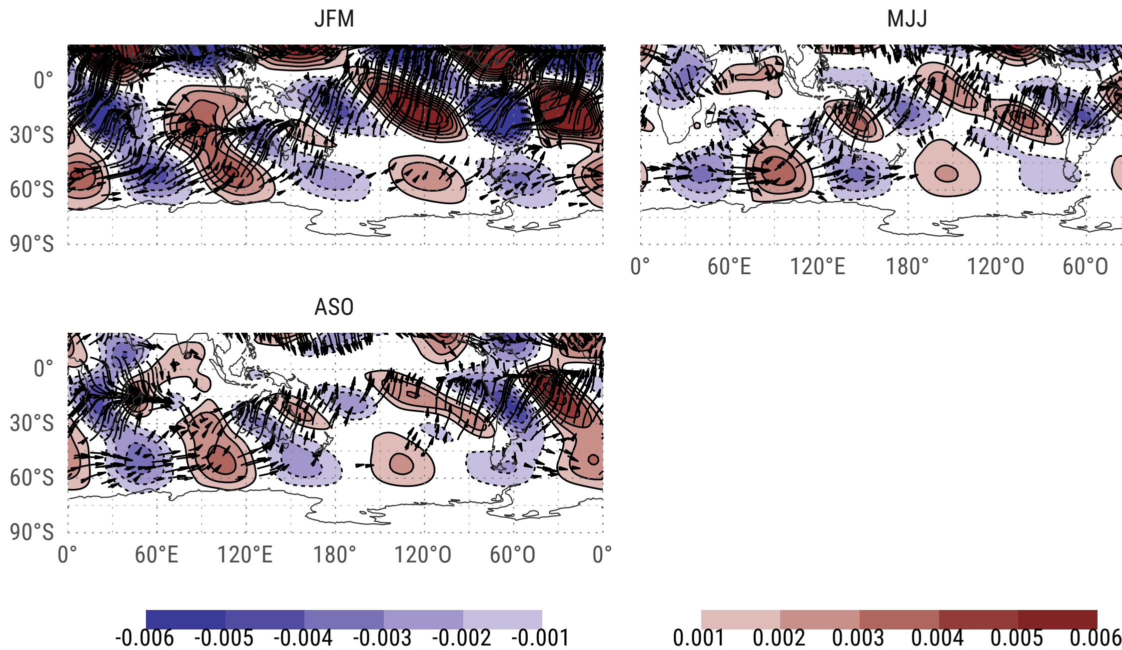


Figure 14: Mean streamfunction with waves 1 and 2 filtered out.

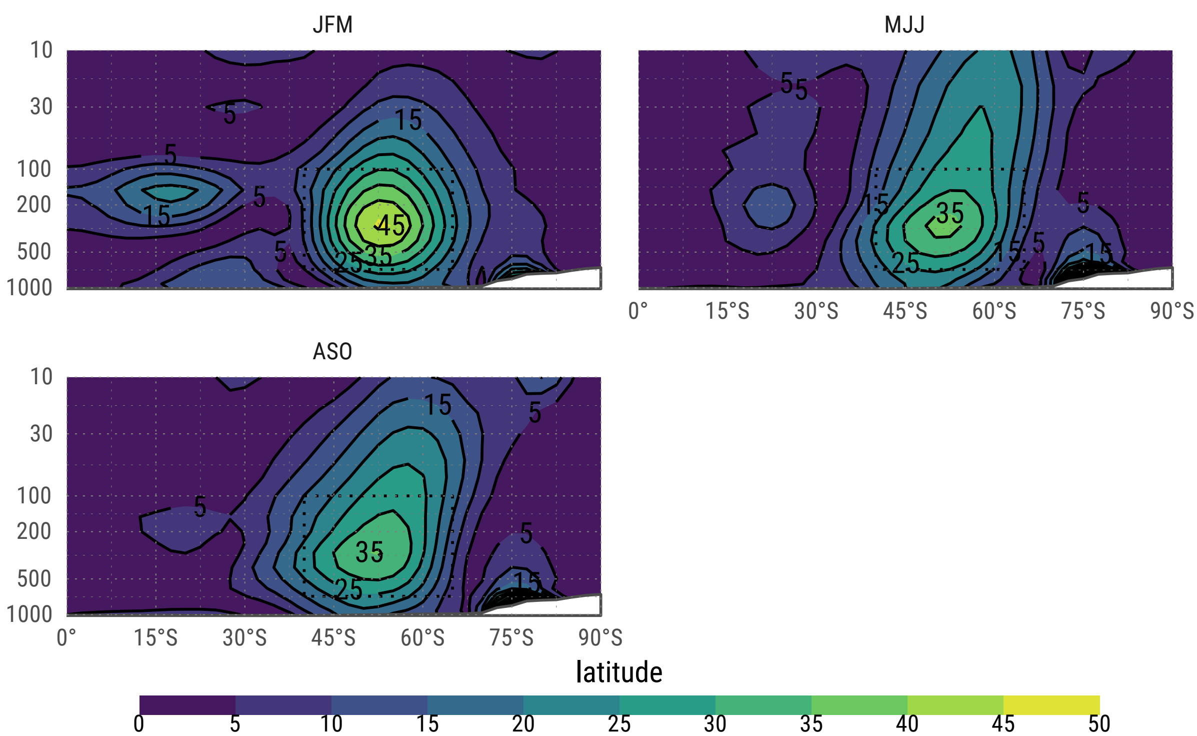


Figure 15: Amplitude of zonal wave 3 for each season defined in the text.

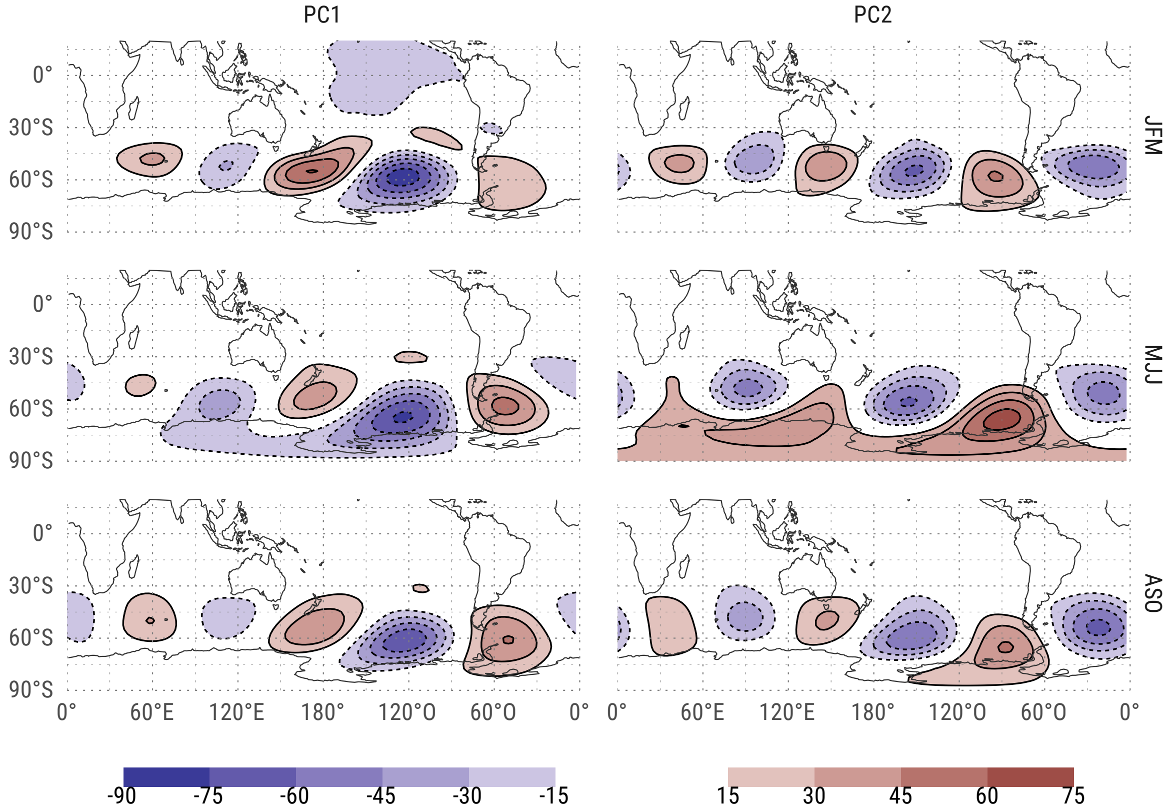


Figure 16: Regression between PCs and gh.

Table 1: Stationarity, seasonal mean monthly amplitude (MA) and amplitude of the seasonal mean (AM) zonal wave 3 for each season defined in the text.

season	stationarity	MA	AM
DJFM	0.64	35.66	23.50
A	0.62	41.66	26.23
MJJ	0.52	45.22	23.90
ASO	0.54	44.14	24.04
N	0.20	37.18	6.69

Regressions

Table 2: Correlation between ONI and each principal component

PC	estimate	p.value
PC1	-0.25	0.000000668
PC2	0.13	0.013721337

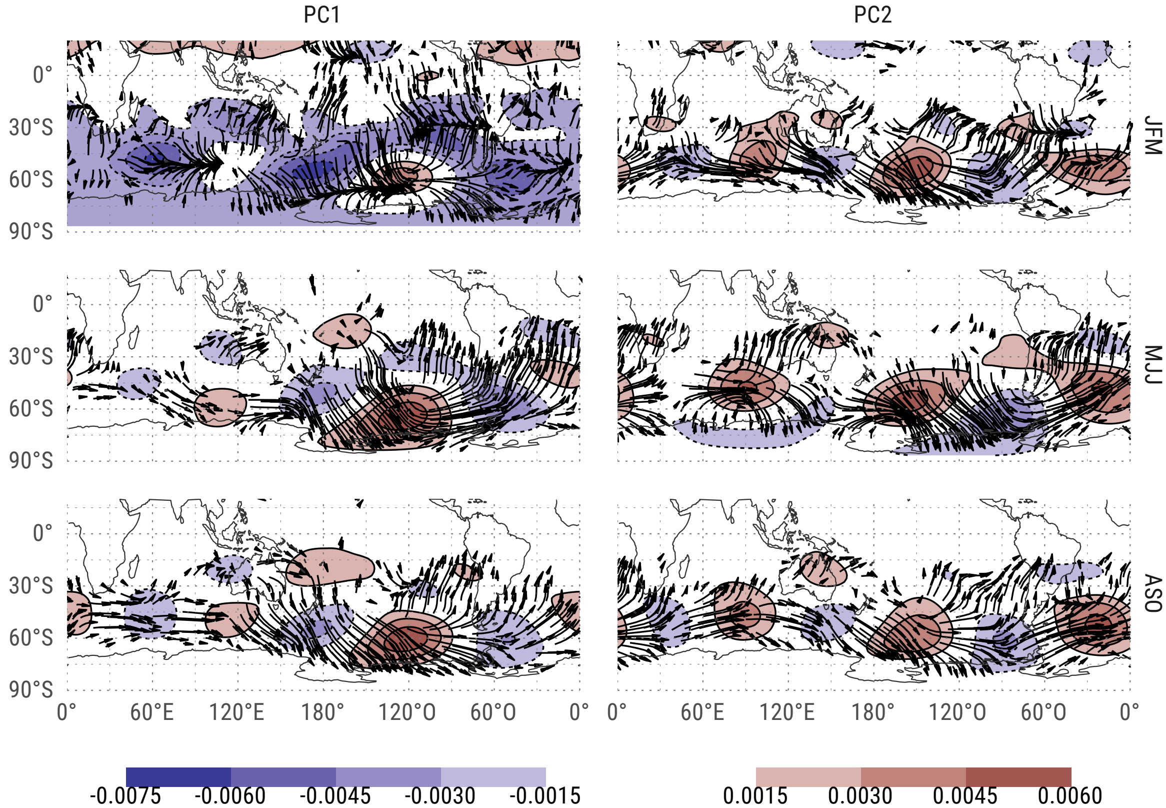


Figure 17: Regression between PCs and Psi.

Cosas para hacer

- Usar datos de ERA
- Período más largo (1980-20017?)
- ¿Eliminar tendencia lineal? (Hobbs y Raphael)
- ¿Cómo poner wavelets?

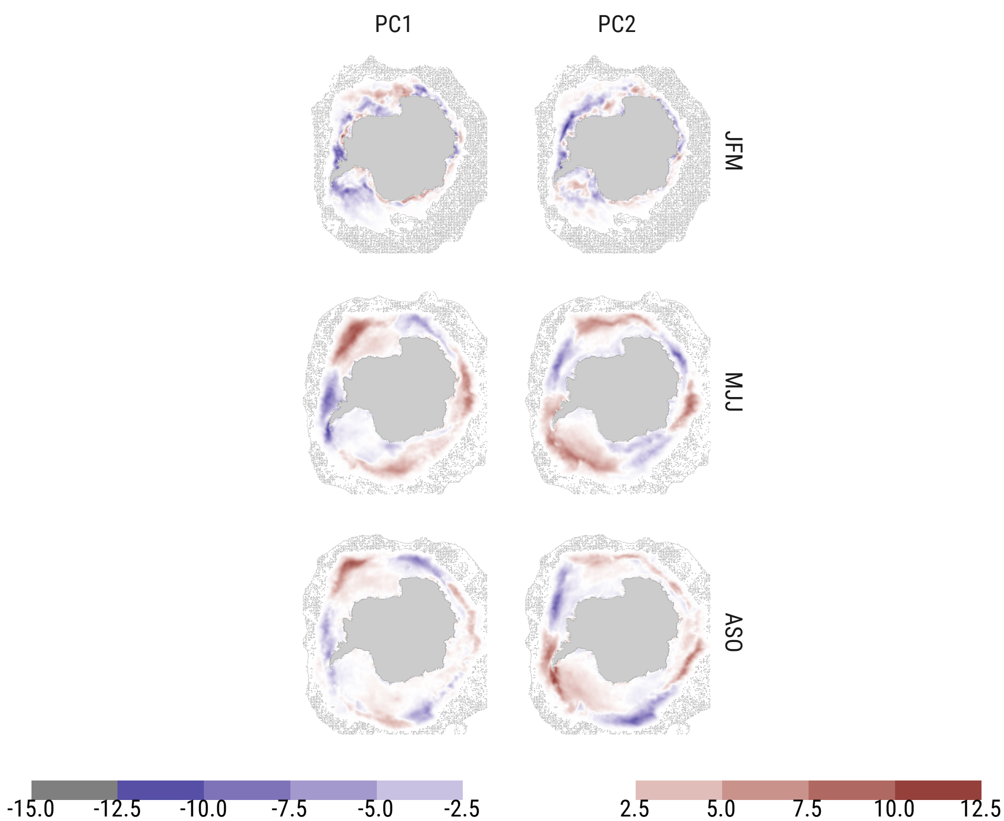


Figure 18: Regression of standarized PC with antarctic sea ice concentrations.

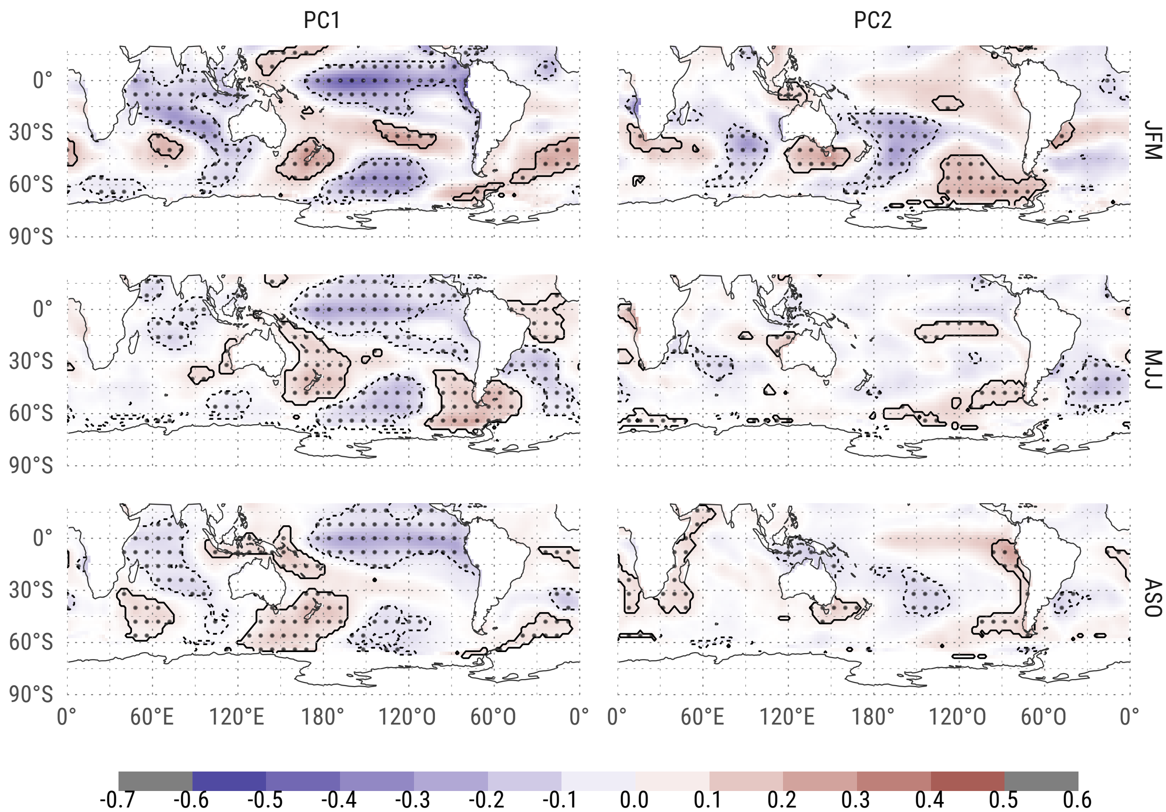


Figure 19: Regression of standarized PC with SST.

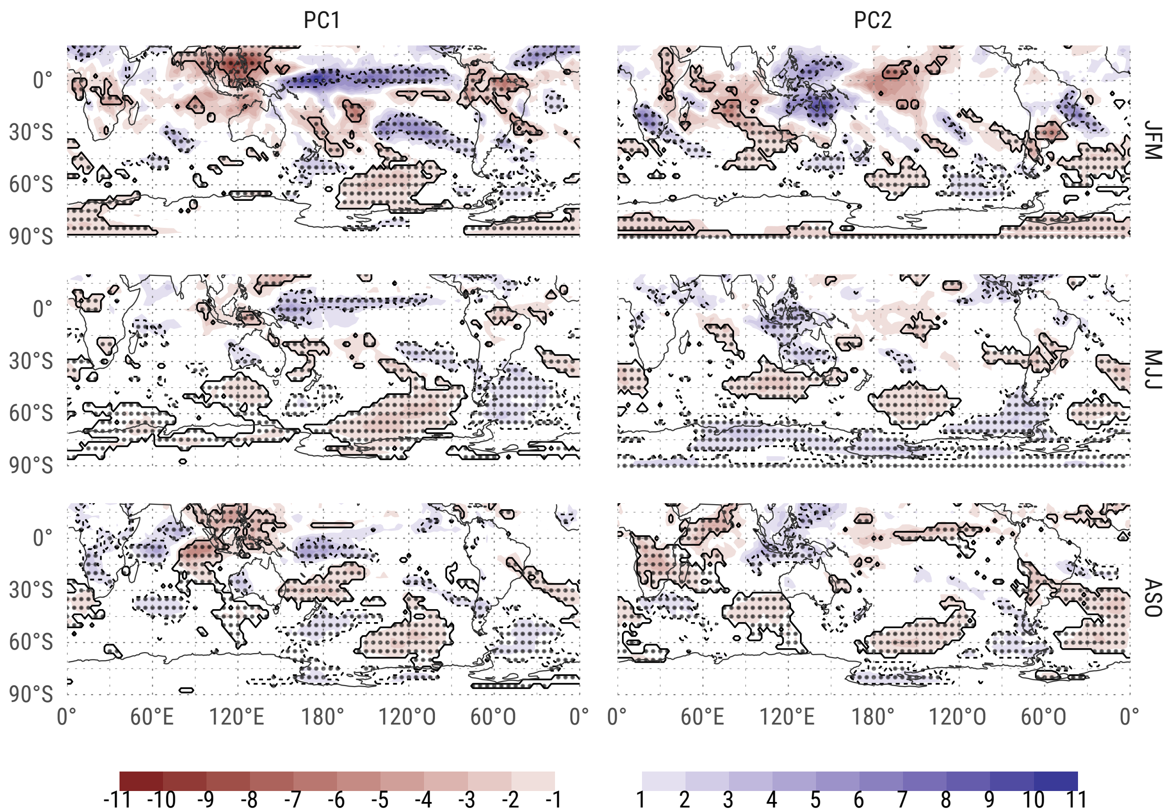


Figure 20: Regression between OLR and PCs

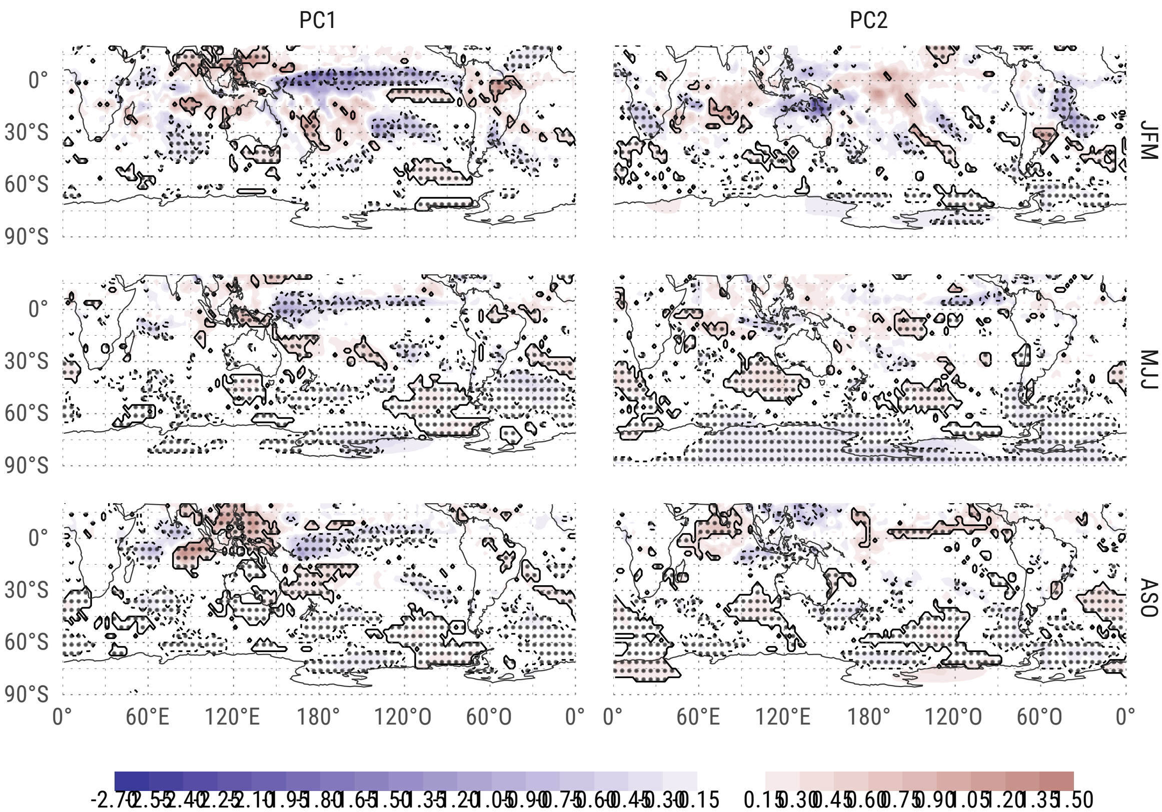


Figure 21: Regression between precipitation and PCs