INTERHEMISPHERIC JOINT BEHAVIOR OF TEMPERATURE AND GEOPOTENTIAL HEIGHT BETWEEN THE THERMAL TROPOPAUSE AND 500 AND 100 HPA LEVELS

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1. AIMS

Determination of circulation patterns associated to the joint behavior of montly mean anomalies in thermal tropopause and 500 hPa for upper-air stations located in both hemispheres. A similar analysis was carried out for the thermal tropopause and 100 hPa (results not shown).

2. DATA & METHODOLOGY

The dataset consists of radiosonde ascents spanning the period 1973-2012. The stations used are shown in Figure 1. At each station, monthly height and temperature time series for the thermal tropopause and 500 hPa were built and anomalies were obtained by removing from them those harmonics representing more than 25% of the variance.

A rotated T-mode Principal Components Analysis was carried out using the correlation matrix between the anomalies as input. Varimax rotation was applied to the first four components extracted. Their associated time series (Fig. 2, only first three shown) were separated by month and correlated with running 3-month averages for several variables.

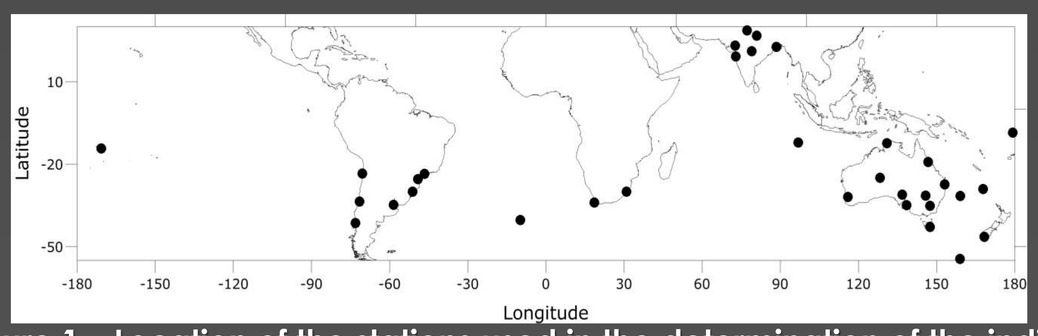

Figure 1 – Location of the stations used in the determination of the indices

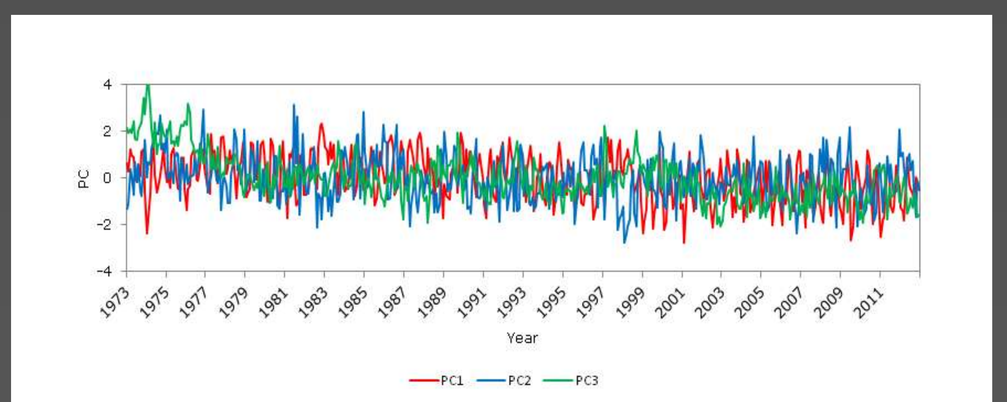

Figure 2 – First three rotated expansion coefficients (PCs)

3. RESULTS

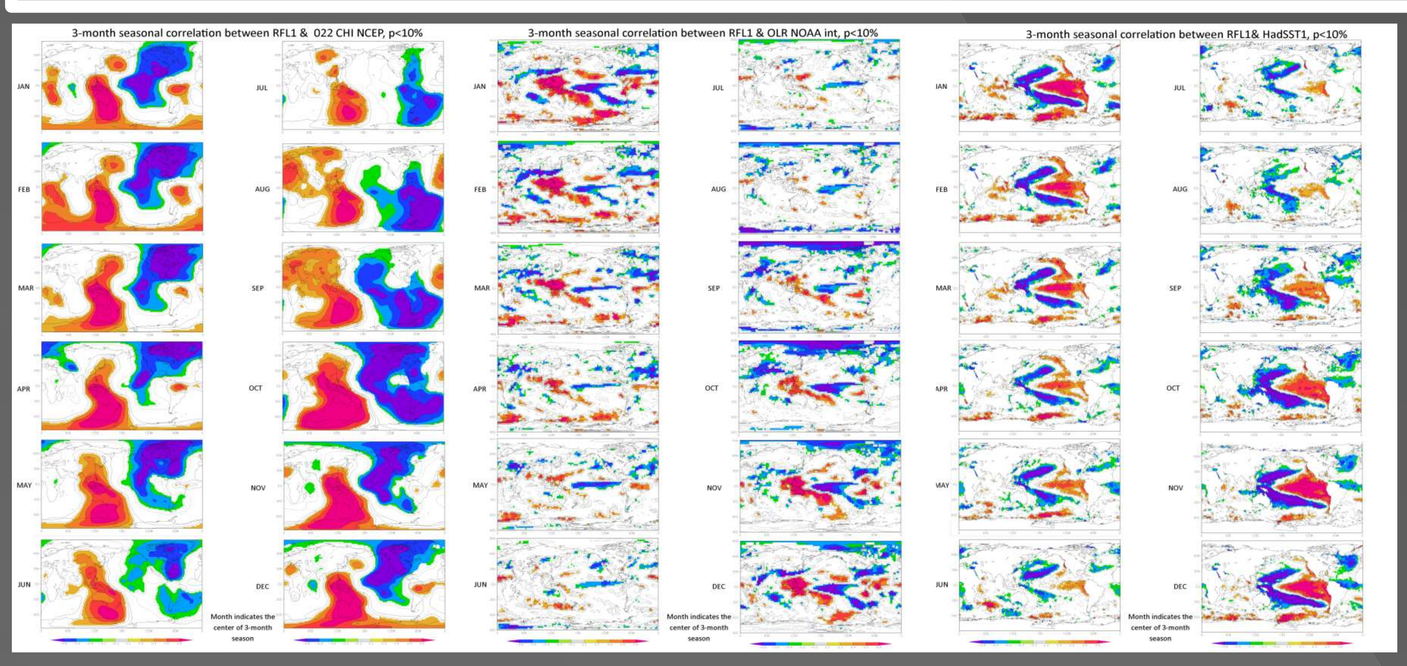

Figure 3 – Correlations between PC1 and velocity potential at σ=0.22 (left), OLR (center) and SST (right).

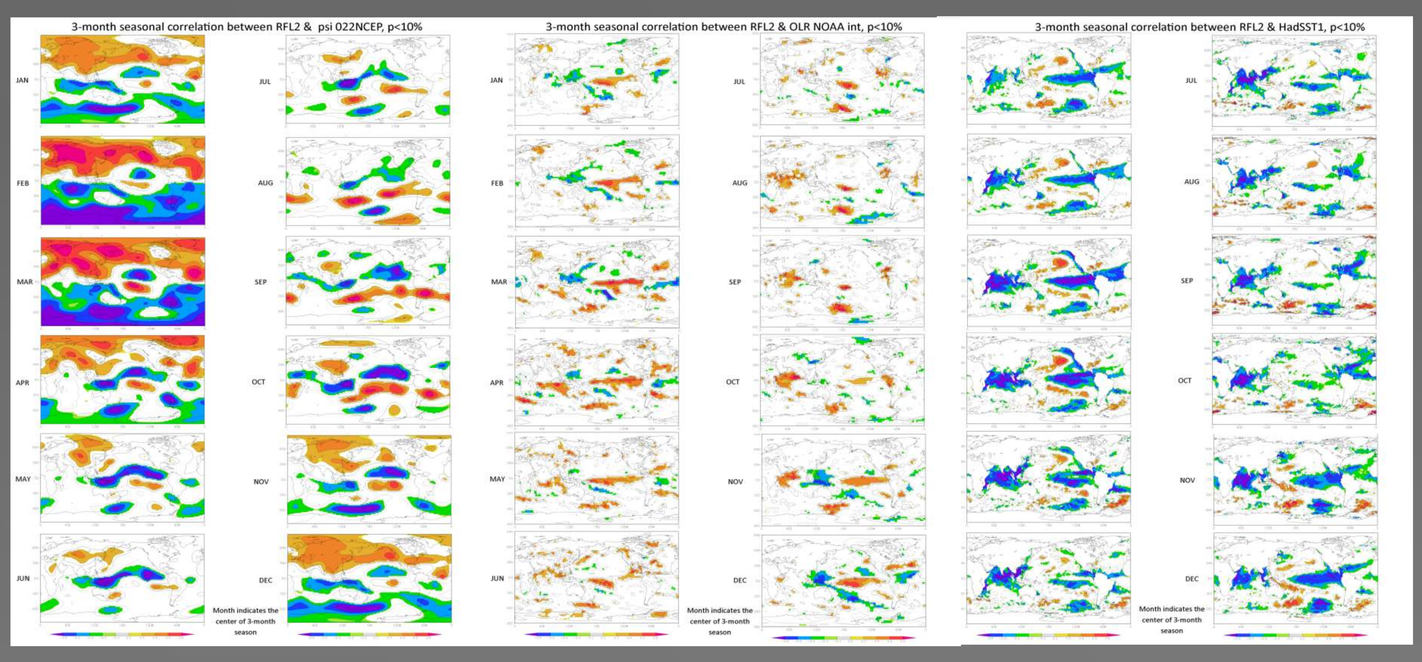

Figure 4 – As in Fig. 3 but for PC2. The left panel shows correlation with PSI.

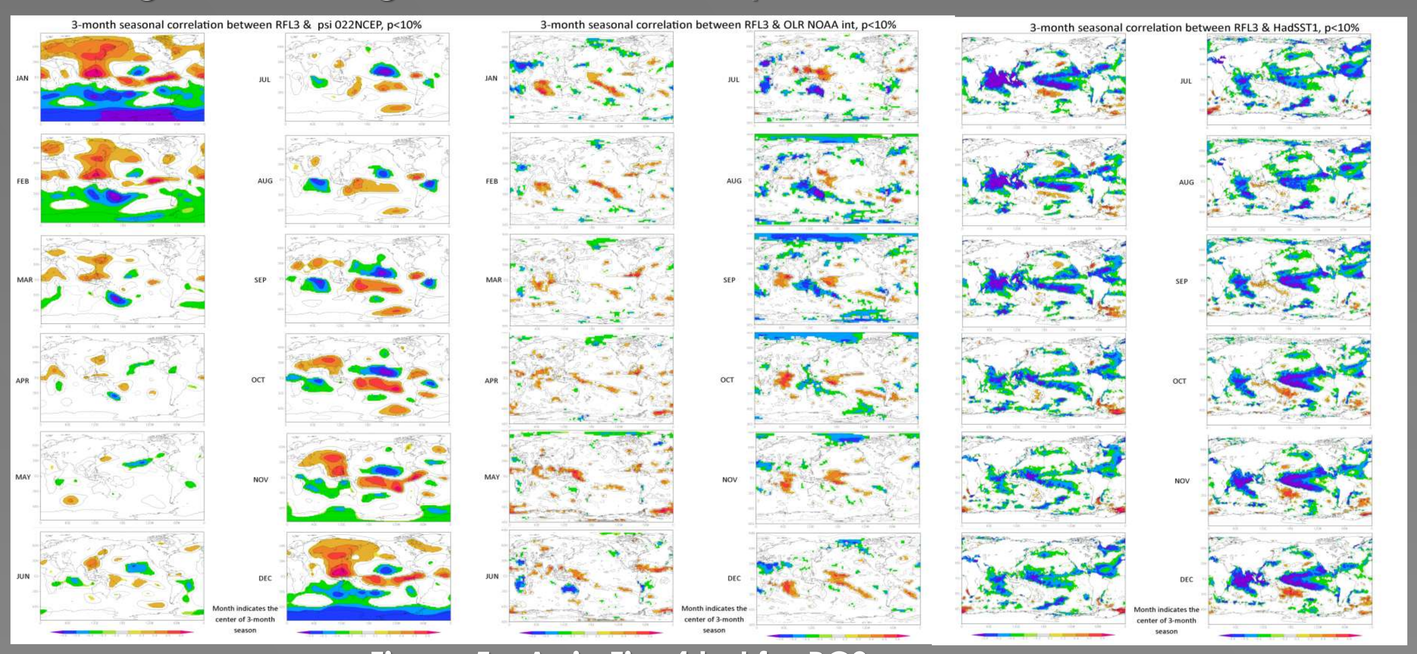

Figure 5 – As in Fig. 4 but for PC3.

✓ Correlation fields can be interpreted as amplitudes where covariability maximizes. Hence, for Figure 3 the irrotational component of the wind (CHI) has a global manifestation of a Walker cell pattern in the central Pacific, as also revealed by the OLR amplitudes. SST patterns resemble an extended Niño-like signal in the central/eastern equatorial Pacific throughout the annual cycle, yet stronger between October and March, with opposite signals both at the western equatorial Pacific and subtropical latitudes.

✓ For Figure 4, the most striking feature considering the irrotational component of the wind (PSI) is the quasi-stationary wavetrain propagation from the maritime continent towards South America between July and October. More research is needed to determine the source of the wave propagation, as the associated signals in OLR and SSTs over the maritime continent are not significant.

✓ The most prominent feature is the presence, betweenJuly and November, of signals that are symmetric with respect to the Equator and are zonally elongated, leading to three localized Walker cells that perturb the subtropical jet path. In this case, the associated OLR and SSt patterns are consistent with each other.

4. CONCLUSIONS

Preliminary results suggest that the first three leading rotated PCs show different connections between interhemispheric at intraseasonal scales. More research is needed to shed more light on the subject.

5. ACKNOWLEDGEMENTS

CONICET PIP 2012/14 grant number 0075 and PIP N° 11220090100439 funded this research.