J15.6 **SOUTHERN HEMISPHERE ATMOSPHERIC LOW FREQUENCY VARIABILITY IN A CLIMATE AGCM SIMULATION**

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1. INTRODUCTION

Observed atmospheric patterns of low frequency variability have been identified in the Southern Hemisphere, in several studies. As these structures have influence over the continents of the SH, it is important to know if GCMs can represent low frequency variability patterns and how are these influences. Previous analysis using results of a climate AGCM simulation indicated the ability of the CPTEC/COLA AGCM to represent the PSA pattern in the SH winter season (D'Almeida and Cavalcanti, 1999). In the present study, a climate simulation using a higher resolution AGCM than that used before, is analysed to study atmospheric low frequency variability in the Southern Hemisphere, in the summer.

2. DATA AND METHOD

Daily results of nine integrations of the AGCM CPTEC/COLA are analysed in the period of 1982/1983 to 1990/1991. Daily anomalies of OLR and 200 hPa meridional wind component were filtered to select the frequency between 30 and 90 days. EOF analyses, considering several regions of Southern Hemisphere were performed to compare with observations. Three main areas are considered to investigate the model low frequency variability around the S.H three continents: South America (180^0-0^0; 45^0S-9^0N), Africa (10^0W-60^0E; 60^0S-9^0N) and Australia (30^0E-160^0W;60^0S-9^0N). Only the results using one of the integrations is presented.

3. SUMMER SOUTHERN HEMISPHERE MAIN PATTERNS IN THE MODEL RESULTS

The first EOF of model filtered OLR (Fig.1 a) show two opposite centers over South America, similar to the seasaw pattern found in observations. They show the intraseasonal variability of the SACZ. When the amplitude of this eigenvector is positive, the SACZ is weak and there is more convection over Southern Brazil, Uruguay and northern Argentina. This situation is consistent with observations of dry periods in Southeastern Brazil and rainy periods in the south. Negative amplitudes imply intense convection in the SACZ and dry conditions in the south. This seasaw mode was discussed by Nogués-Paegle and Mo (1997). The same sign of the SACZ is noticed in the SPCZ region, consistent with observational studies as Grimm and Silva Dias (1995).

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The first EOF of model upper level meridional wind (Fig.1b) displays a pattern of alternating centers over South America associated with a trough and a ridge over eastern South America and a PSA-like pattern (Mo and Guill, 1987) over South Pacific Ocean, depicting the tropics/extratropics teleconnection mode.

The second eigenvector show similar aspects to the first one, but enhancing the features over the Pacific Ocean. The two eigenvectors of OLR together explain 38% of the total variance, and the variance of the third eigenvector falls to less than 10%. The variance of the first and second eigenvectors of meridional wind explain 55% of the total variance and the third, 15%.

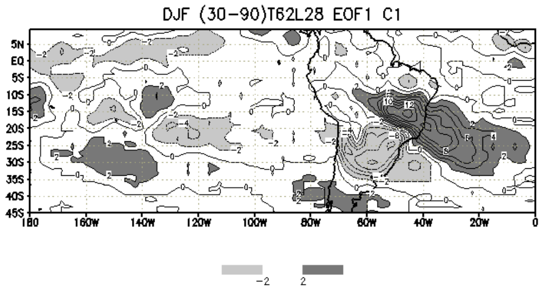

Fig.1 a. First EOF pattern of low frequency OLR.

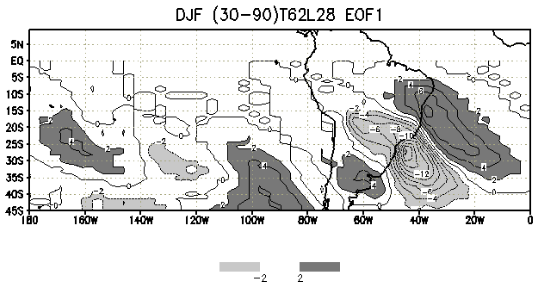

Fig.1 b- First EOF pattern of low frequency meridional wind

The analysis for Austral Africa area, indicates a dominant mode of OLR variability related also to a dipole pattern (Fig.2 a). This feature can be associated with the convection in the South Indian Convergence Zone (SICZ), similarly to the SACZ. In this case the simulated convective variability does not extend too much toward Indian Ocean, in a NW-SE band, as the simulated SACZ and SPCZ, and displays an east-west opposition of phase at lower latitudes. The dominant mode of meridional wind (Fig.2 b) indicates a long wave low frequency trough or ridge over the extreme south of Africa and short wave features. These aspects can be associated with the low frequency influence, as blocking situations on the behaviour of synoptic systems that affect Austral Africa.

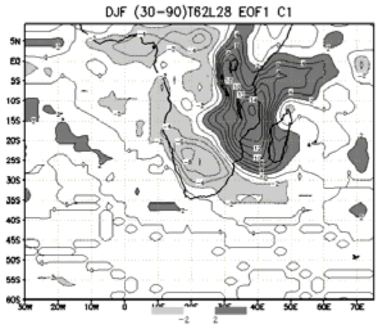

Fig.2 a. First EOF pattern of low frequency OLR

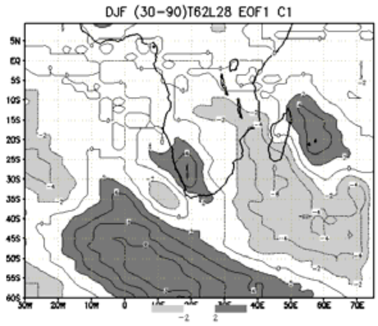

Fig.2 b. First EOF of low frequency meridional wind

An opposite OLR relation is simulated between northern Australia and eastern Indonesia region in the first EOF (Fig.3 a). The model capture an intraseasonal variability in this region that could be related to the MJO. The dominant mode of meridional wind, at 200 hPa, simulates the influence of a wavetrain from the extratropics, which could indicate the influence of low frequency variability on synoptic systems affecting Australia (Fig.3 b).

4. CONCLUSION

The model results show the influence of the intraseasonal variability over the three Southern Hemisphere continents. The simulated patterns imply in a seasaw feature affecting the three continents, indicating the influence of a low frequency wave or a low frequency oscillation. Considering a larger area comprising South America, South Atlantic and South Pacific, two opposite centers over the brazilian coast are still the dominant pattern, but large alternating centers are also simulated over middle latitudes from the western Atlantic to Indian Ocean. When the whole South Hemisphere is considered, the wavetrain over the Pacific and South America (PSA) is the dominant pattern.

The low frequency patterns identified in the model results are similar to observations depicting typical characteristics of the Southern Hemisphere summer, as PSA, SACZ, SPCZ, SICZ.

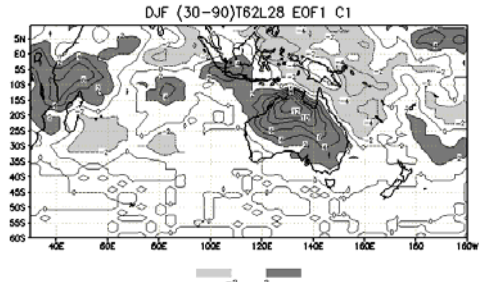

Fig.3 a. First EOF pattern of low frequency OLR.

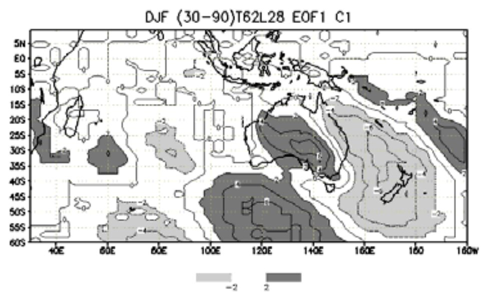

Fig.3 b. First EOF of low frequency meridional wind

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Acknowledgments: The first author wishes to thank CNPq and IAI/PROSUL/CRN055 for the support during the research and FAPESP for the travel support.