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ORIGINAL PAPER

MJO influence on ENSO effects in precipitation and temperature over South America

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By Thamirys Cavaton

Estrutura da apresentação

1. O que é MJO ?
2. O que MJO afeta ?
3. Pergunta a ser respondida;
4. Dados e Metodologia;
5. Estatística dos Eventos ENSO e MJO;
6. Análises (Ano Neutro, MJO, El Niño e La Niña);
7. Conclusão.

O que é MJO?

1. é uma oscilação tropical de 40 a 50 dias de duração (variação intrassazonal)
2. resultado da propagação de ondas de Rossby para leste e convecção profunda no Índico e Pacífico central
3. afeta os padrões de:
4. movimentos ascendentes e subsidentes
5. precipitação (regiões tropicais, altas latitudes e interação trópicos-extratrópicos)
    a. ex. Afeta a posição e intensificação da zona de convergência do Atlântico Sul (ZCAS)

O que MJO pode afetar ?

A fase positiva e negativa do ENSO é influenciada pela fase da MJO

altera o padrão de temperatura

eventos fortes → diminuem a teleconexão do ENSO

ENSO

Variação irregular dos ventos e da temperatura das águas superficiais sobre o Pacífico oriental tropical.

Pergunta a ser investigada

Para fazer a previsão dos impactos dos eventos do ENSO é importante considerar a fase do MJO ?

Dados e metodologia

1. European Centre for Medium-Range Weather Forecast (ECMWF)
    i. média da T do ar a 1.5m e 200 hPa de vento meridional
2. Dados de Reanálise do ERA-Interim
    i. resolução horizontal de 1.5°
3. Climate Prediction Center
    i. precipitação diária
    ii. resolução horizontal de 1° (América Central)
4. Outgoing Longwave Radiation (OLR)
    i. resolução horizontal de 2.5°

Grade utilizada: 1.5° x 1.5°

Período: 1979 a 2010

Dados e metodologia

1. ENSO
    a. Index do El niño pela NOAA

2. MJO
    a. Index criado
        i. combinação de análises de EOF e filtros de banda de OLR(20-200 dias) e 850 e 200 hPa de dados de vento zonal
3. Foi feito teste T

Estatística dos Eventos de ENSO e MJO

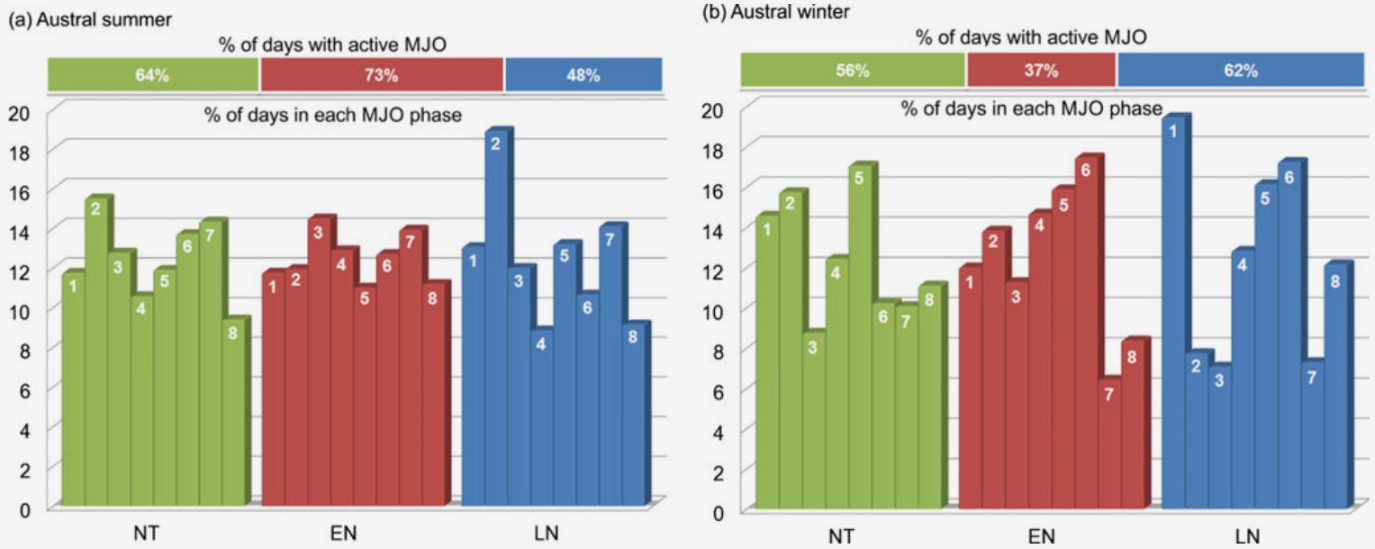


Fig. 1 Percentage of the days with active MJO (*top*) and percentage of the active MJO days in each phase (*bottom*) during neutral (*NT*, *green*), El Niño (*EN*, *red*), and La Niña (*LN*, *blue*) periods for **a** austral summer and **b** winter

Análise do El Niño, La Niña e Ano Neutro

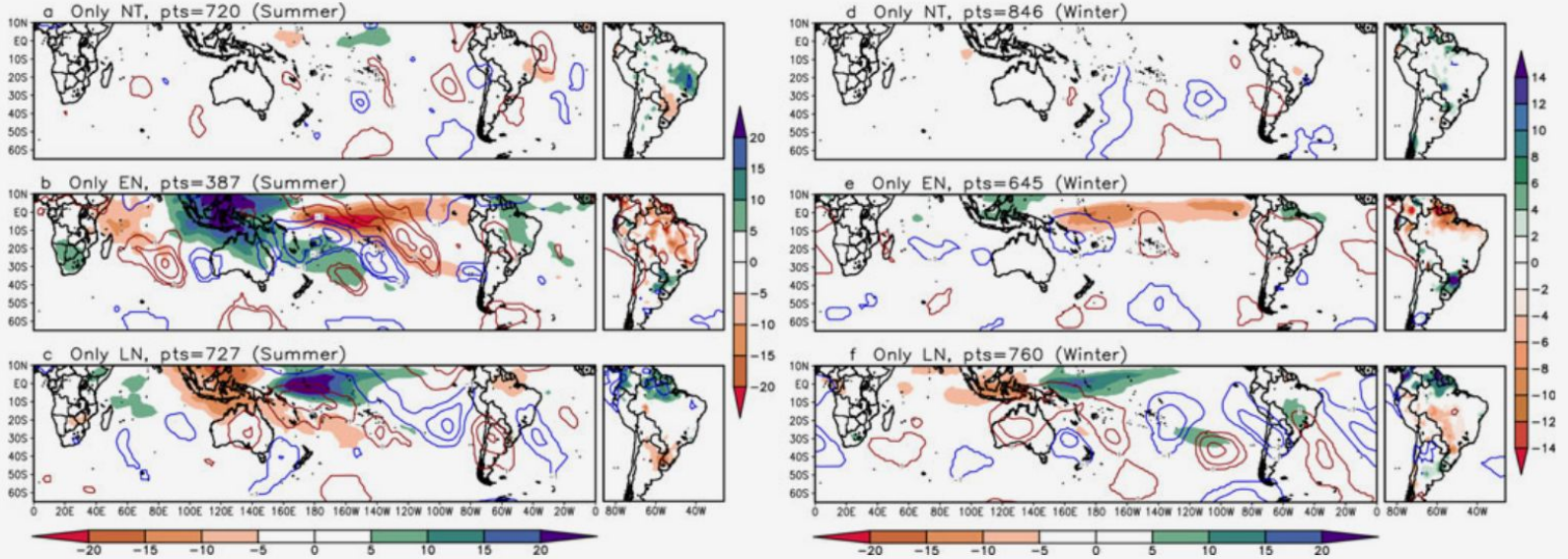


Fig. 2 Composites for inactive MJO during neutral (*NT*), El Niño (*EN*), and La Niña (*LN*) years in austral summer (**a**, **b**, **c**) and winter (**d**, **e**, **f**). Southern Hemisphere map: *OLR* (*shaded*, W/m^2) and 200-hPa meridional wind anomalies (*contours*, m/s; *blue* indicates negative and *red* indicates positive); South American map: precipitation (*shaded*, mm/day) and temperature anomalies (*contours*, °C; *blue* indicates negative and *red* indicates positive). The contour intervals are 1 for meridional wind and 0.5 for temperature, and the zero contour is omitted. Only significant OLR and meridional wind anomalies at 95 % confidence level according to Student's *t*-test are plotted. The number of days considered in each composite is indicated in the *top*

Fases do MJO durante o Verão e Inverno

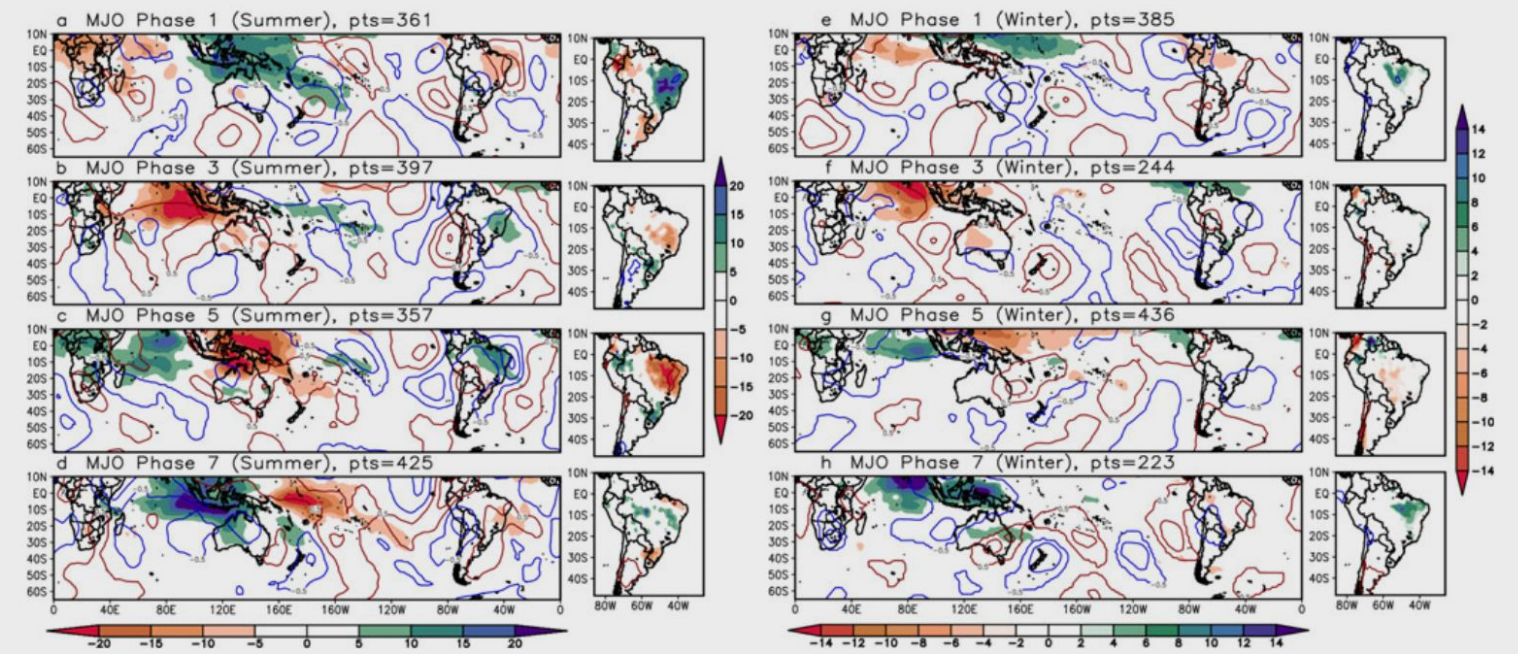


Fig. 3 Composites for MJO phases 1, 3, 5, and 7 in austral summer (**a**, **b**, **c**, **d**) and winter (**e**, **f**, **g**, **h**). Southern Hemisphere map: OLR (*shaded*, W/m^2) and 30–90 days filtered 200-hPa meridional wind anomalies (*contours*, m/s; *blue* indicates negative and *red* indicates positive); South American map: precipitation (*shaded*, mm/day) and temperature anomalies (*contours*, °C; *blue* indicates negative and *red* indicates positive). The contour intervals are 0.5 for meridional wind and 0.5 for temperature, and the zero contour is omitted. Only significant OLR and meridional wind anomalies at 95 % confidence level according to Student's *t*-test are plotted. The number of days considered in each composite is indicated in the *top*

Resultado do MJO para Ano Neutro

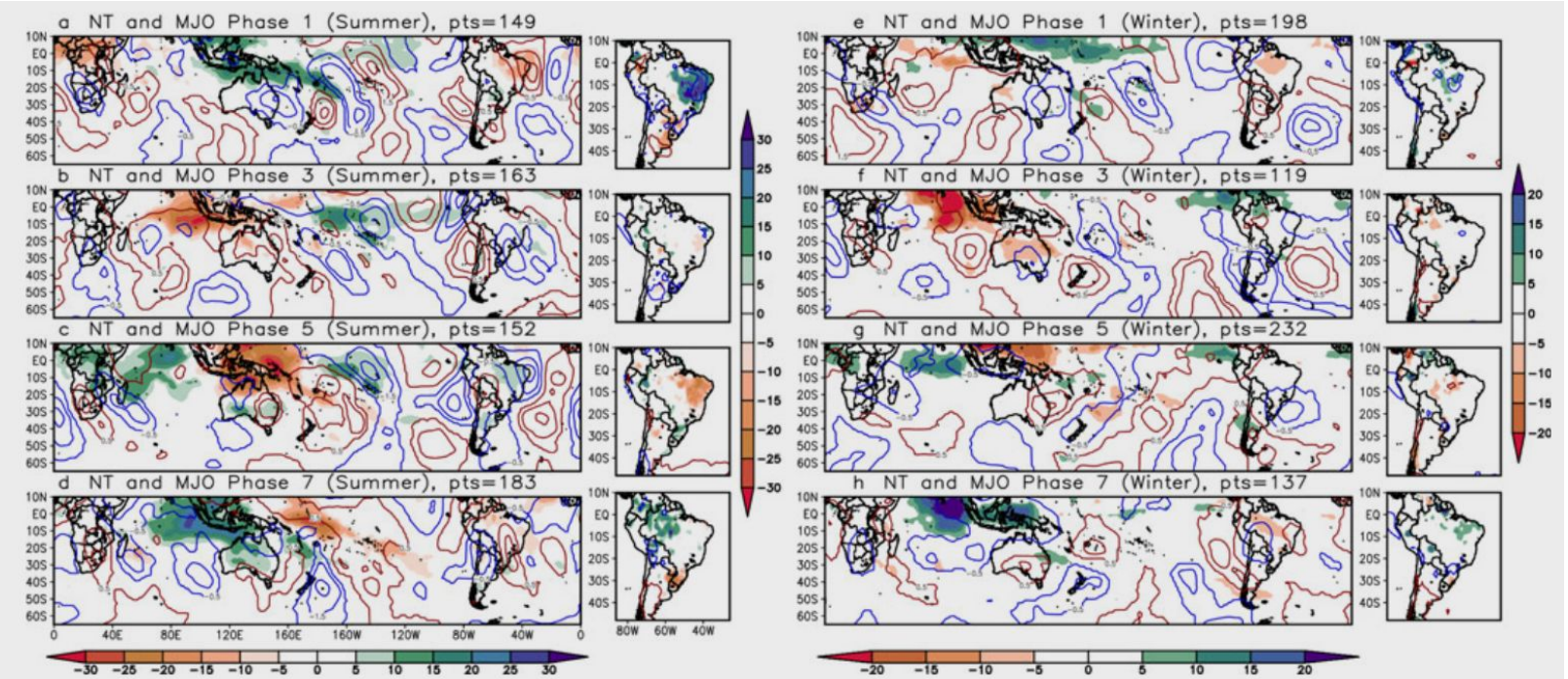


Fig. 4 Composites for MJO phases 1, 3, 5, and 7 for neutral years in austral summer (**a**, **b**, **c**, **d**) and winter (**e**, **f**, **g**, **h**). Southern Hemisphere map: OLR (*shaded*, W/m^2) and 30–90 days band filtered 200-hPa meridional wind anomalies (*contours*, m/s; *blue* indicates negative and *red* indicates positive); South American map: precipitation (*shaded*, mm/day) and temperature anomalies (contours, °C; *blue* indicates negative and *red* indicates positive). The contour intervals are 0.5 for meridional wind and 0.5 for temperature, and the zero contour is omitted. Only significant OLR and meridional wind anomalies at 95 % confidence level according to Student's *t*-test are plotted. The number of days considered in each composite is indicated in the *top*

Resultado do El Niño com o MJO

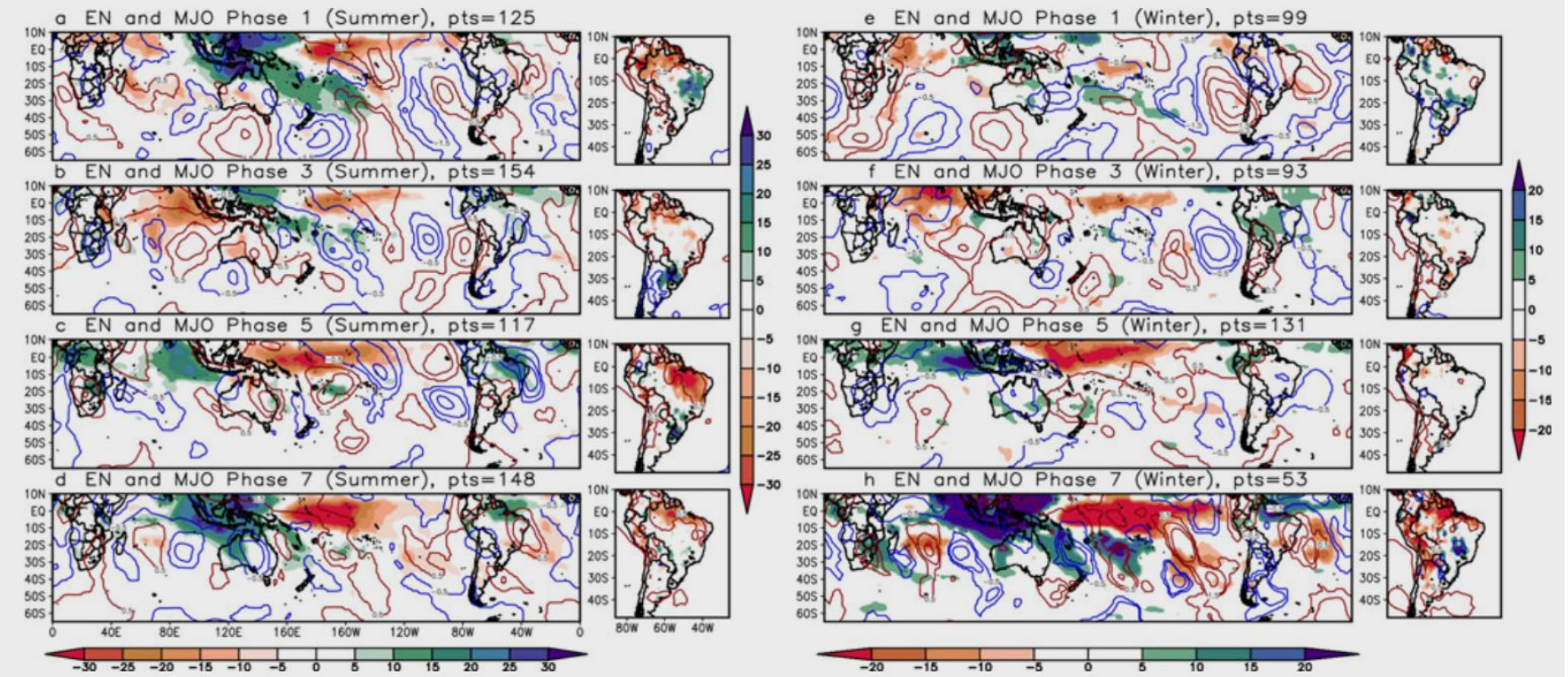
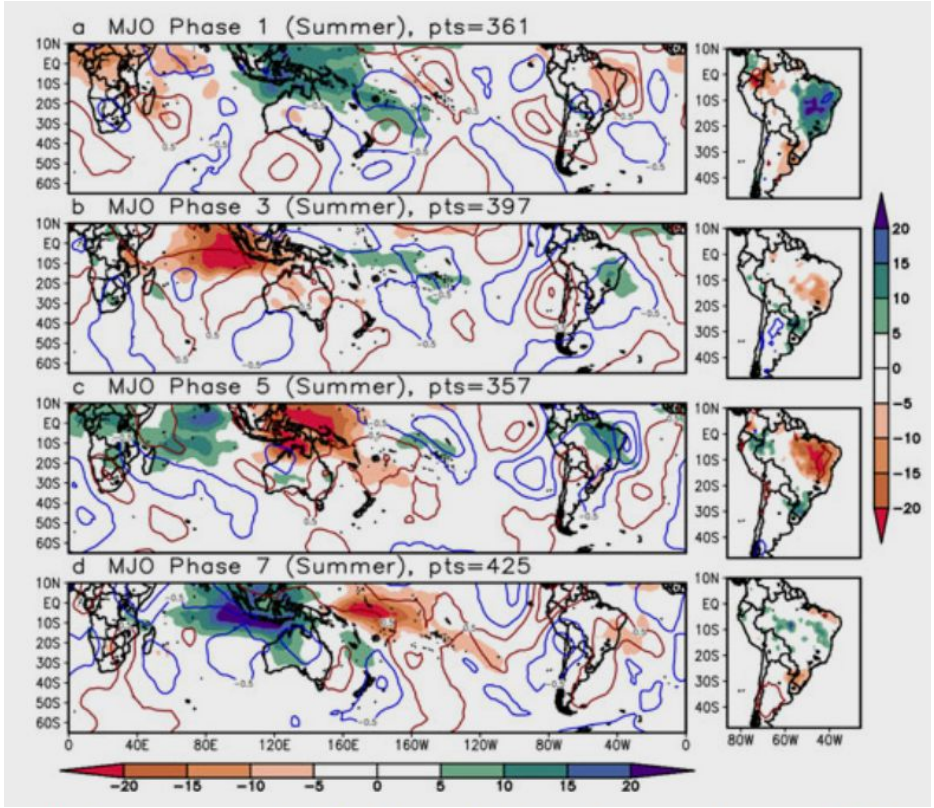
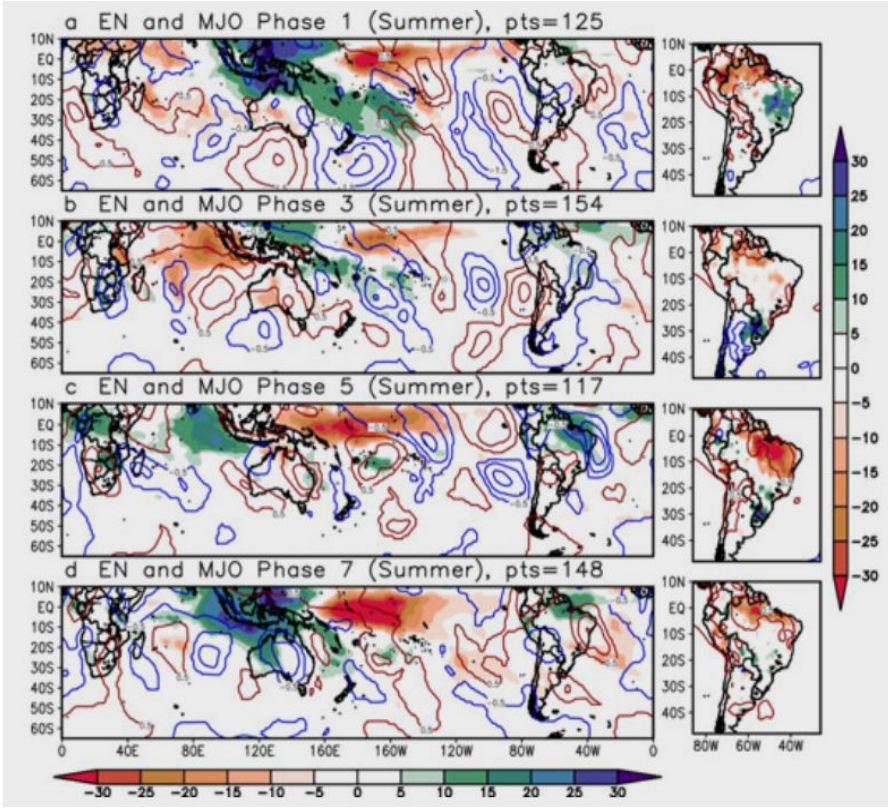


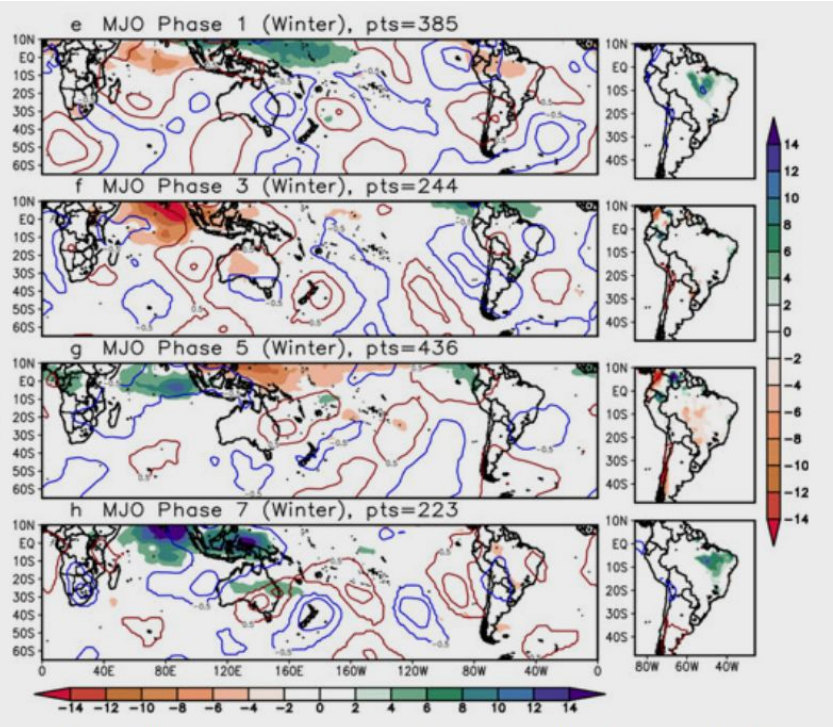
Fig. 5 As in Fig. 4 but for El Niño years

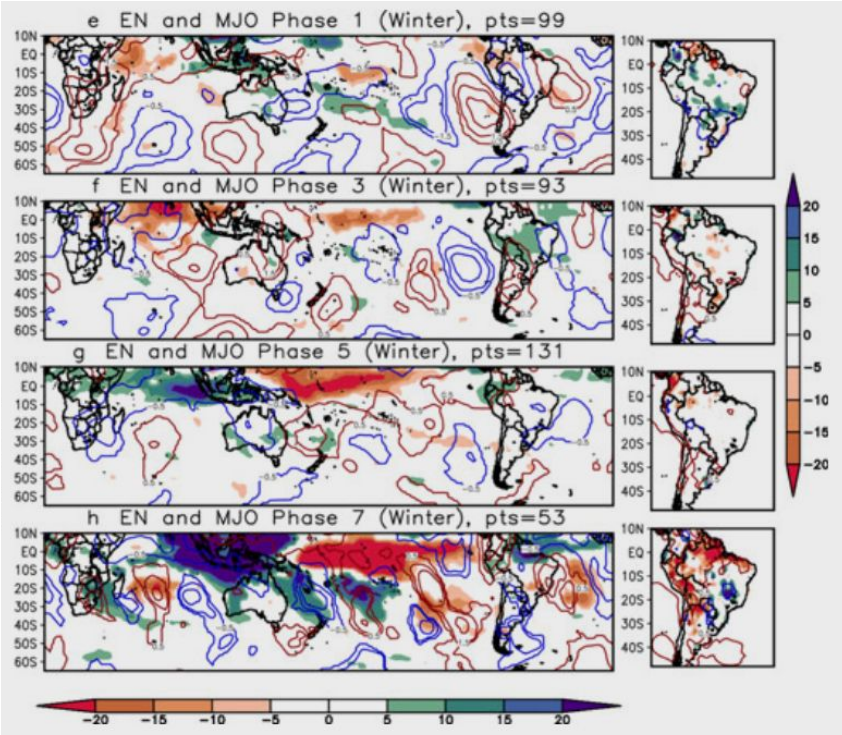
Verão: MJO X El Niño + MJO





Inverno: MJO X El Niño + MJO





Resultado da junção de La Niña e MJO

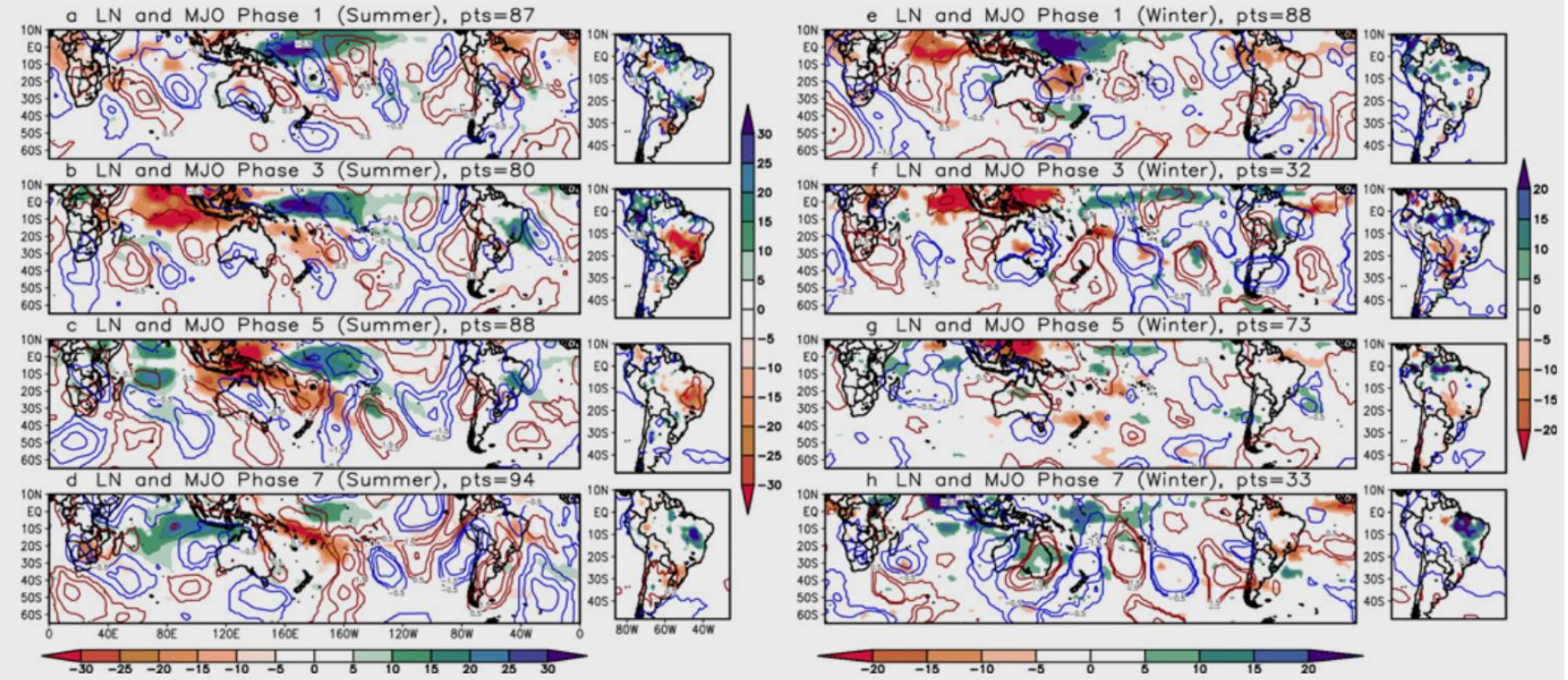
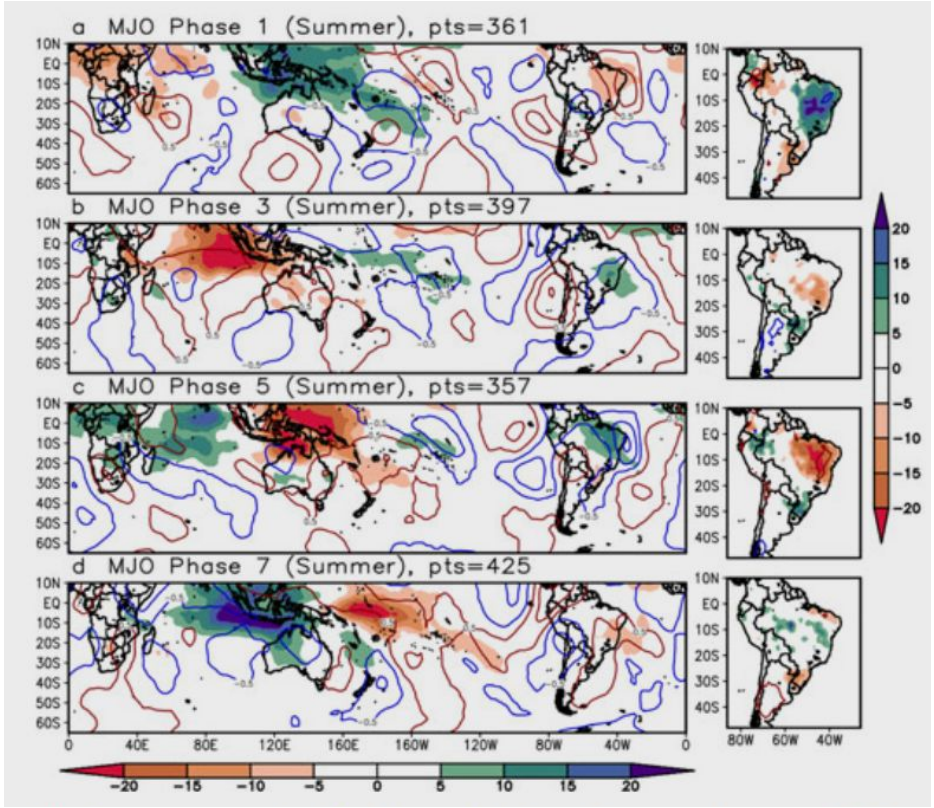


Fig. 6 As in Fig 4 but for La Niña years

Verão: MJO X La Niña + MJO



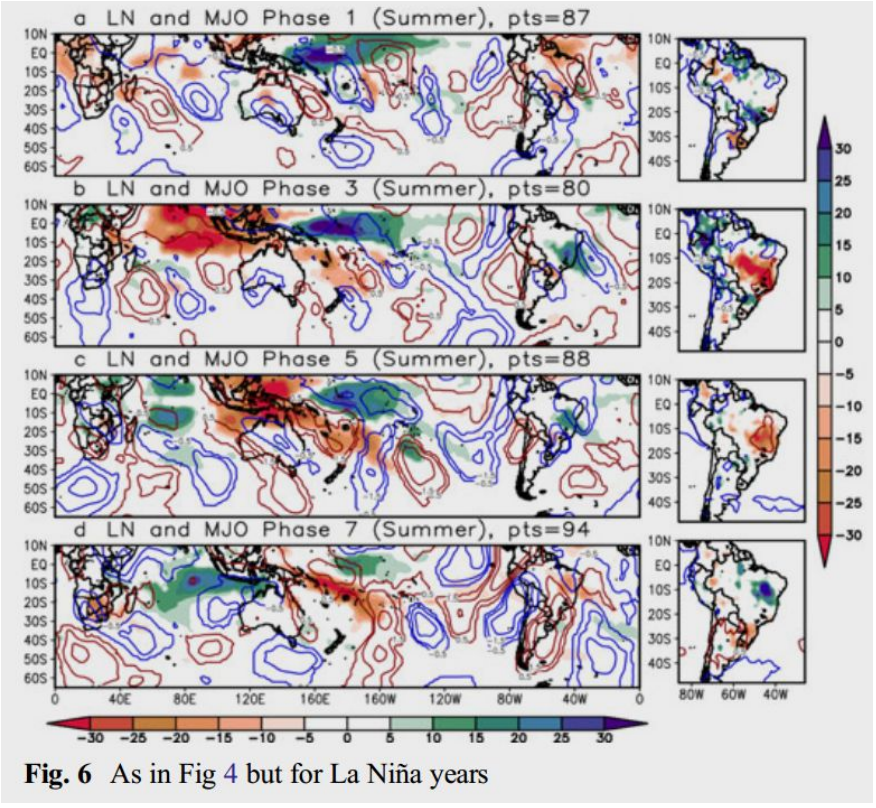
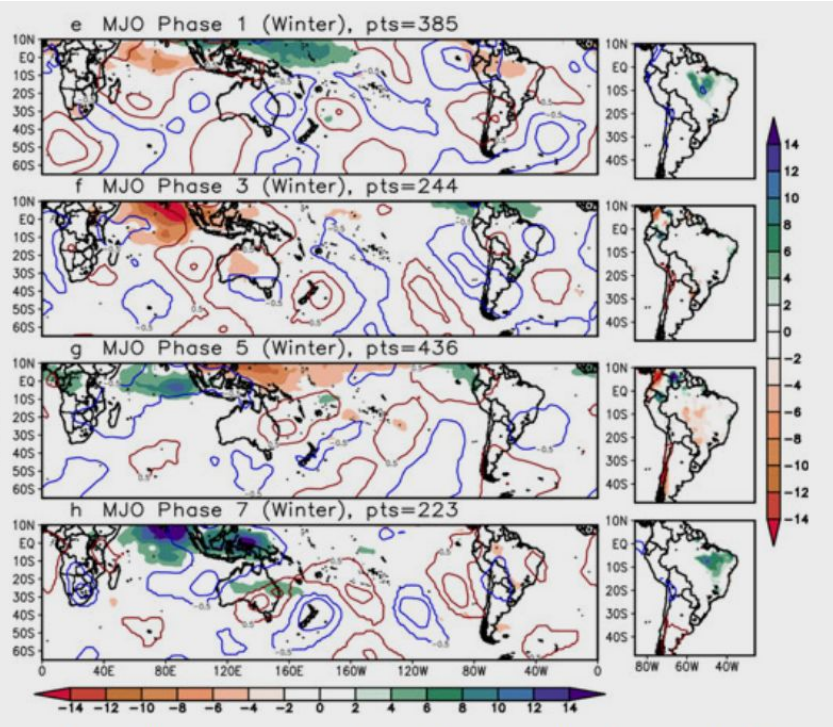
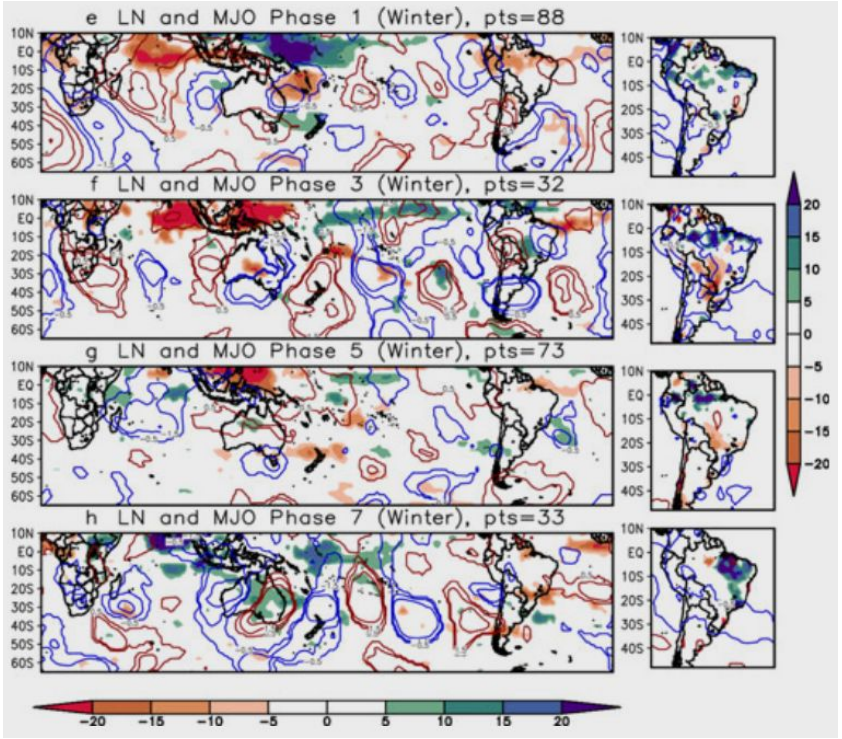


Fig. 6 As in Fig 4 but for La Niña years

Inverno: MJO X El Niño + MJO





Estatística da Temperatura e Precipitação

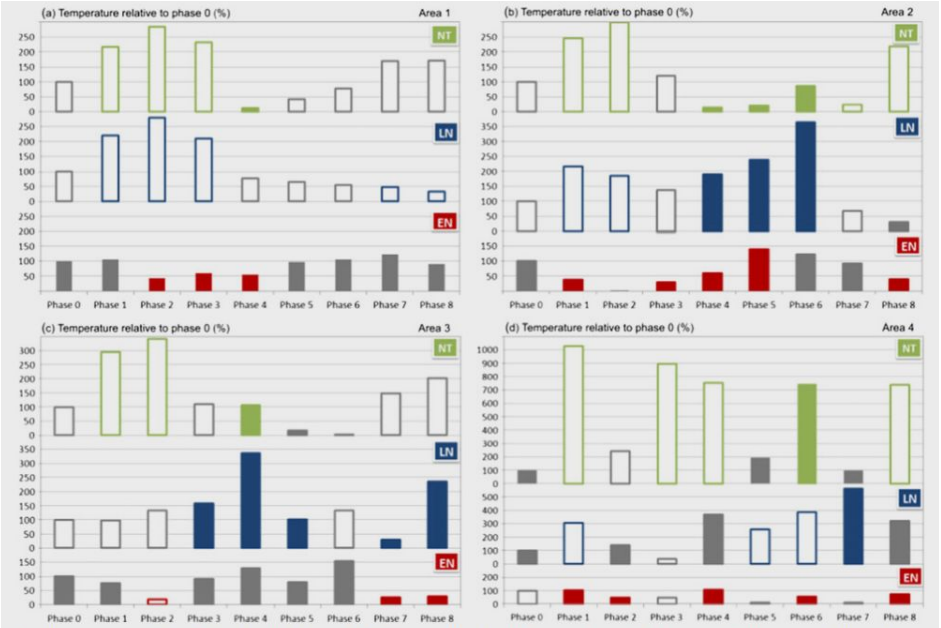


Fig. 8 Percentage relative to the phase 0 (taken as 100 %) for spatial mean of 1.5-m temperature (°C) from ERA-Interim in **a** area 1, **b** area 2, **c** area 3, and **d** area 4 during El Niño (*EN*), La Niña (*LN*), and neutral (*NT*) years in austral summer. *Filled boxes* indicate positive values and *empty boxes* represent negative values. *Colored boxes* (*red* for El Niño, *blue* for La Niña, green for neutral) indicate values that are statistical significance at 90 % confidence level according to Student's *t*-test. *Gray* boxes indicate values that are not statistically significant. The *y* coordinate axis changes for each graphic

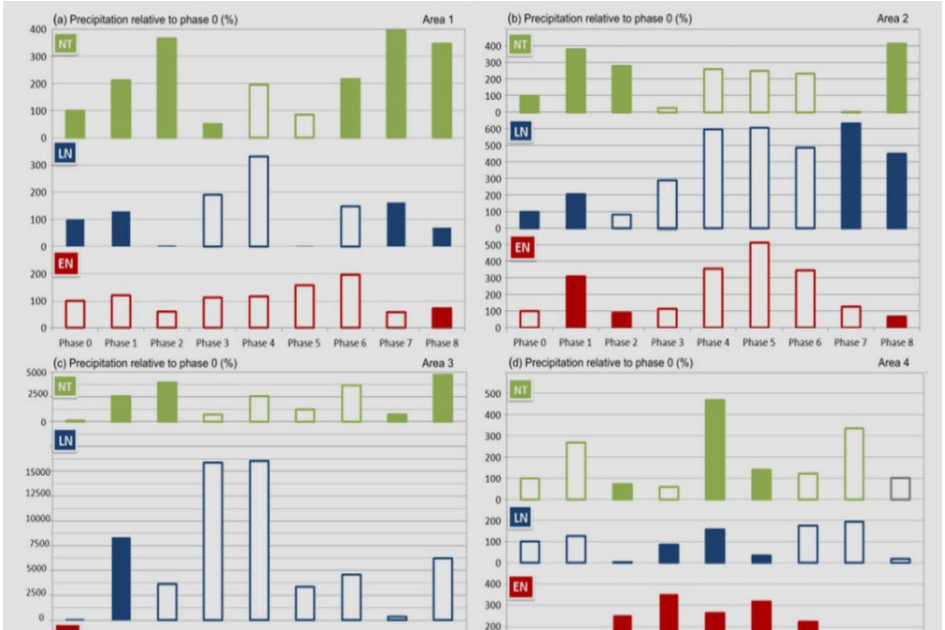


Fig. 9 As in Fig. 8 for spatial mean of precipitation (mm/day) from CPC

Conclusões

1. Anomalias de precipitação e temperatura durante o ENSO podem ser intensificadas ou enfraquecidas se houver MJO
2. A intensificação das anomalias de seca (El Niño) e precipitação (La Niña) no norte da América do SUl dependem da fase do MJO quando comparado com os eventos que MJO está inativo
3. A influência do ENSO sobre o Brasil são moduladas pela fase do MJO que dependem da:
    a. posição da convecção sobre o Índico Tropical e oceano Pacífico associado a cada fase.

Obrigada!