Introspective seasonal climate variability has important implications on mid- and high-latitude climate. Recent studies have found modulation of a variety of weather processes in the Northern Hemisphere, such as snow depth (Guan et al. 2012; Barrett et al. 2015, Li et al. 2016), sea ice concentration (Henderson et al. 2014), precipitation (Donald et al. 2016), atmospheric rivers (Higgins et al. 2000), and air temperature (Vecchi and Bond 2004; Seo et al. 2016; Zhou et al. 2016). In such studies, the leading mode of tropical intraseasonal variability, the Madden-Julian Oscillation (MJO), has tended to lag tropical convection by approximately 7 days. However, such consensus is still absent when considering the relationship and lag between the MJO and the Antarctic atmosphere. Flatu and Kim (2013) suggested a lag of 10-14 days between the Antarctic Oscillation (AAO) and the MJO, while Fauchereau et al. (2016) and Henderson et al. (2018) suggested important lags between MJO convection and extratropical circulation out to 20 days.

This study builds on previous work by further examining the time-lagged response of Southern Hemisphere tropospheric circulation to tropical MJO forcing, with specific focus on the latitude belt associated with the AAO, during the months of June (Austral winter) and December (Austral summer).

Tropical-Antarctic telecommunications

What is the MJO?
- A large-scale mode of atmospheric tropical variability
- Moves generally eastward around the equator on a time scale of 30–60 days
- Most active in the eastern hemisphere (Indian Ocean to Western Pacific Ocean)

How is the MJO connected to Antarctica?
- Large-scale latent heat release of the MJO convection excites poleward-moving Rossby Waves
- Those Rossby waves modulate surface pressure and circulation, which then modulate ice (Fig. 1)

Introduction

Maximum & Minimum Sea Ice Extent Standard Anomalies: September and March

Sea Ice Concentration Change by Phase of MJO: June (left) and December (right)

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References


