J8D.2 Apparent coupling of oceanic Kelvin waves and atmospheric convection

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1. INTRODUCTION

Recent research has shown that intraseasonal Kelvin waves in the Pacific Ocean, which were originally forced by westerly wind bursts associated with the active phase of the Madden Julian Oscillation (MJO), occasionally appear to become coupled to atmospheric convection (Roundy and Kiladis 2006). Although these events have not received much attention by either the academic or operational communities, they are not infrequent, with at least twenty events occurring in the Northern Hemisphere winter (October-March) between 1974 and 2009. These events behave quite differently than the MJO by itself, and stand to challenge the traditional understanding of the interaction of the MJO and El Nino Southern Oscillation (ENSO) along with several other tropical and extra-tropical interactions. Ultimately, the goal of this research is to help to improve our ability to forecast these events and their associated changes to background weather both in the tropical Pacific and beyond.

In this presentation, we provide an analysis of two apparently coupled oceanic Kelvin waves and atmospheric convection that occurred during the Northern Hemisphere winter of 2009-2010 (Figure 1). The first Kelvin wave (wave A in Figure 1) was initiated around 150°E and continued until about 150°W, during the month of December. This wave was associated with convection initially; however the convection stopped progressing with the Kelvin wave just around the dateline. The second wave (wave B in Figure 1) was also initiated around 150E and continued until about 140W, during the months of January and February, but this time was associated with vigorous convection throughout its entire lifetime. We analyze the development of the two Kelvin waves along with several relevant fields, including; zonal winds, sea surface temperature, and surface fluxes of latent and sensible heat. We attempt to make

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connections between these observations and a simple ocean-atmosphere coupling model by Lau and Shen (1988).

2. REFERENCES

Lau, K.-M., and S. Shen, 1988: On the dynamics of intraseason oscillations and ENSO. *J. Atmos. Sci.,* **45,** 1781-1797.

Roundy, P.E., and G.N. Kiladis, 2006: Observed relationships between oceanic Kelvin waves and atmospheric forcing. *J. Climate,* **19,** 5253-5272.

3. FIGURES

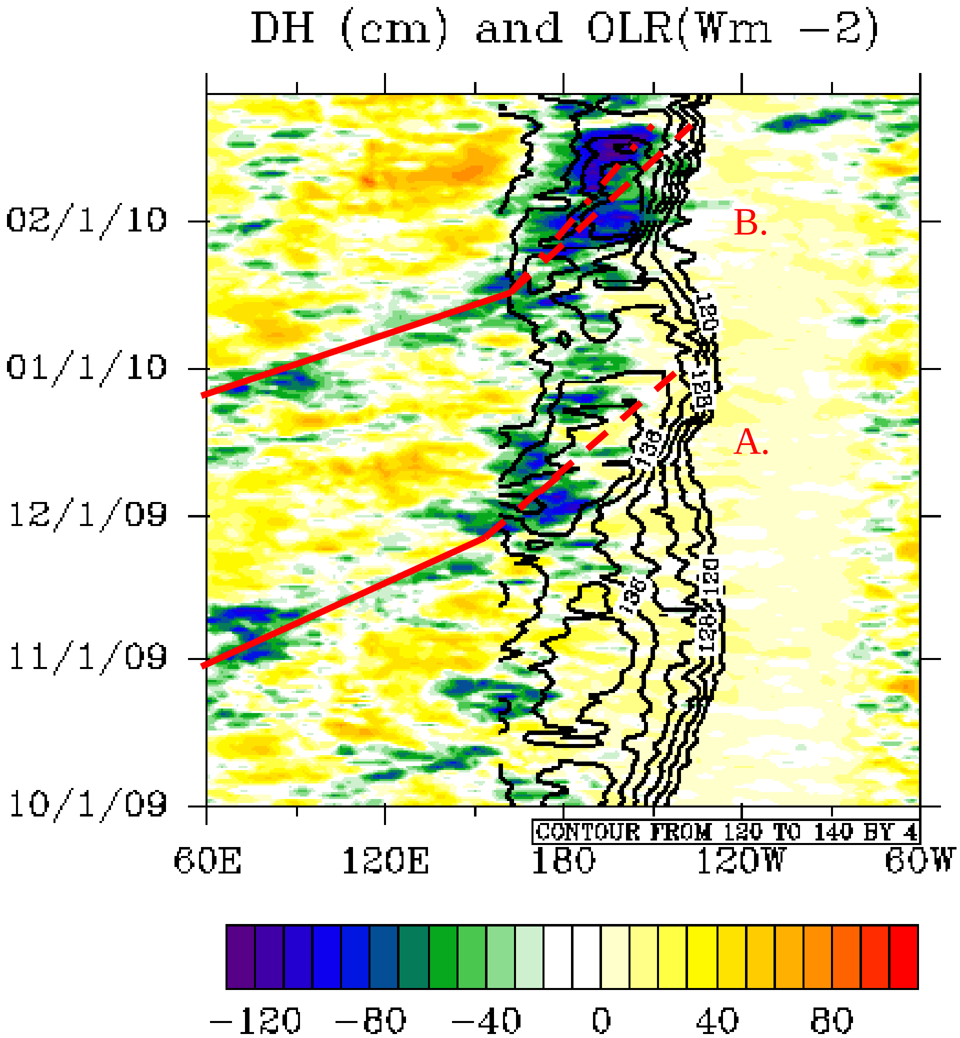

Figure 1. A time-longitude plot with OLR in W m^{-2} (shaded) and dynamic height in cm (black contours). The solid red lines represent the approximate phase speed of the two active convective phases of the MJO that are visible. The phase speeds are approximately 4.3 m s^{-1}, for the November MJO, and 6.9 m s^{-1}, for the January MJO. The dashed lines represent the approximate phase speeds for the oceanic Kelvin waves. The phase speeds are approximately 2.6 m s^{-1}, for the first Kelvin wave (wave A), and 2.4 m s^{-1}, for the second Kelvin wave (wave B).The dot-dashed lines represent the approximate phase speeds of the convective envelopes associated with the Kelvin waves. The phase speeds are approximately 2.6 m s^{-1}, for wave A, and 1.7 m s^{-1}, for the wave B.