Response to Reviewers comments

We thank the Editor and the two Reviewers for their comments and suggestions, which greatly helped us to improve our manuscript. Our point-by-point response to their comments is given below in blue colour font.

Reviewer-1's comments

We once again thank the Reviewer-1 for his/her comments. Our response to his/her comments is given below in blue colour font.

The manuscript presents a study case of an eastward moving extratropical disturbance that appears to force a convectively coupled disturbance in the tropics of similar periodicity and zonal wave number. The results are based on 2D spectral analysis of reanalysis and OLR data for the period of Dec 2012 - Dec 2013. This is an important topic that is within the scope of ACP; however, I have three major concerns:

The authors mention a number of times that this type of phenomena has not been observed before, except for one citation on Magana and Yanai (1995) work on Mixed Rossby-Gravity waves. However, there are a large number of observational studies that point to lateral forcing as a mechanism for excitation of tropical disturbances. For example: Straub, K. H., and G. N. Kiladis, 2003: Extratropical forcing of convectively coupled Kelvin waves during austral winter. J. Atmos. Sci. 60, 526-543. - Meehl, G. A., G. N. Kiladis, K. M. Weickmann, M. Wheeler, D. S. Gutzler, and G. P. Compo, 1996: Modulation of equatorial subseasonal convective episodes by tropicalextratropical interaction in the Indian and Pacific Ocean regions. J. Geophys. Res., 101, 15,033-15,049. - Kiladis, G. N., and M. Wheeler, 1995: Horizontal and vertical structure of observed tropospheric equatorial Rossby waves. J. Geophys. Res., 100, 22,981-22,997. The papers above offer additional references as well.

We agree with the Reviewer. As pointed out by the Reviewer, there are quite a few studies though not many on extratropical influence on the generation of equatorial waves. However, we have shown that the propagation of a particular wave having periodicity 18 days and zonal wavneumber 5 from mid-latitudes to low-latitudes and generate the equatorial wave of similar periodicity and zonal structure.

(2) Except for a paragraph in section 4 relating the particular event to a SSW, there is never a mention of why the authors have chosen to look at this particular case, and how it relates to climatology. The spectral analysis presented for Dec-2012 to Feb- 2013 should be compared to DJF climatology. I would also suggest expanding the discussion of SSW by comparing to other SSW events.

As suggested by the Reviewer, we have presented the climatology of spectral analysis for December-February months of 2001-15 and separately for major SSW years (2001-02, 2003-04, 2005-06, 2008-09, and 2012-13) and non major SSW years. The climatology shows the presence of eastward propagating 18-day wave with dominant k=6 in meridional winds at 55°N and k=4 in 15°N (See figure attached clissw.png; Figure 1). Similarly OLR at 15°N shows the presence of 18-day wave of k=3-6 (See figure attached cliolrssw.png; Figure 2). Detailed discussion is given in the revised manuscript comparing the spectra for SSW and non SSW winters.

(3) There is no methods section in the paper, so it is not clear how the results are obtained. For example: (i) How are the spectra calculated? (ii) Are the results qualitatively robust to the filtering band?

We used space-time spectral analysis method (Hayashi et al., J. Meteor. Soc. Jpn., 1971) for separating eastward and westward propagating waves having different zonal wavenumbers and periods.

The time and longitude variation of meridional wind (v), for example, at any latitude can be expressed as

$\mathbf{v(\lambda, t) = \sum_{k'} \sum_{\pm\omega} R_{s,\pm\omega} \cos(k\lambda \pm \omega t + \varphi_{k\pm\omega})}$**, where**

$R_{k,\pm\omega}$ is the amplitude, ω is frequency**,** k is zonal wavenumber, φ is phase.

+ sign: eastward propagating wave, - sign: westward propagating wave.

First, the longitude variation of v at each 't' is subjected to Fourier Transform in longitude

$$\mathbf{v(\lambda, t) = \sum_{k} C_k(t) \cos(k\lambda) + S_k(t) \cos(k\lambda)}$$

to obtain time variation of Fourier coefficients $C_k(t)$ and $S_k(t)$ for each zonal wavenumber 'k'.

These time variation of Fourier coefficients for each zonal wavenumber 'k' are subjected to Fourier transform in time to get Fourier coefficients corresponding to different Fourier frequencies. From these coefficients, the amplitudes (and hence power) and phases are calculated (Hayashi et al., 1971). For filtering, Butterworth filter is adopted. To see whether the peaks observed in the spectrum are significant or not, significance test is carried out against a null hypothesis, which is a non periodic and noisy time series (Emery and Thomson, 2001). The variance of the spectral peak can be compared to the background value determined by either white noise or a red noise fit to the spectrum or theoretically computed spectrum from autoregressive parameters. However, there is also a method in which a greatly smoothed version of the raw periodogram is used as the null

continuum. The smoothing is done in such a way that there is no bulge in the spectrum at the frequency of interest so that it can be different from the variance of the raw spectrum (against null hypothesis). The significance of the spectral peak can be evaluated by comparing the ratio of the spectral peak power with the Chi-squared value with the corresponding number of degrees of freedom. The variance of the spectral peak should be greater than $\frac{(\nu-1)}{\chi^2_{1-\alpha/2,\nu}}$ s(f), where s(f) is the power of the smoothed spectrum corresponding to the frequency f and ν is the number of degrees of freedom. The χ^2 values are taken from chi-square table and α is 0.05 for indicating 95% confidence level of the spectral peaks. We found that the spectral power corresponding to 18-day wave is significant in all the cases presented.

Below is a list of typos/ minor comments:

15139 - l5 The MJO is not defined and there is no reference for it. 15139 - l12 Kiladis (1993) should be Kiladis (1998) 15140 - l7 Doesn't ERA-interim starts in 1979? 15143 - l11 zonal wavenumber 3 should be zonal wavenumber 5? As the manuscript stands now there are no substantial conclusions reached and the scientific methods are unclear, therefore I recommend it to be reconsidered after major revisions.

The typos are corrected as suggested by the Reviewer.