

Interactive comment on “Combined Impacts of ENSO and MJO on the 2015 Growing Season Drought over the Canadian Prairies” by Zhenhua Li et al.

Anonymous Referee #2

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This study tried to relate summertime droughts in the Canadian Prairies to tropical Pacific forcing by means of analyzing circulation anomalies, SST patterns, and intraseasonal oscillations of tropical convection. It was concluded that a negative phase of MJO-4, concurrent with a warm phase of ENSO, leads to the 2015 growing season deficit precipitation over the Prairies. This finding provides new insight into the physical processes regulating seasonal droughts, representing an important addition to our understanding on the complex teleconnection of summer precipitation to tropical Pacific forcing. However, this reviewer feels that the manuscript needs revisions and clarifications for its acceptance for publication.

1. Given the weak-to-moderate correlation with the precipitation anomaly (just 0.33) during 1976-2016, the proposed teleconnection mechanism can only explain a fraction of the observed historical droughts. The authors may consider adding a discussion about the unexplained drought events under NINO4>0 and MJO-4<0 (i.e., in the shaded region in Fig. 5), especially which of these events can be understood by the previously proposed teleconnection mechanisms reviewed in the introduction.

We have added some discussion on the events that are not explained by NINO4>0 and MJO-4 <0, e.g., La Nina, and when MJO's weak but NINO4 is positive.

2. A warm ENSO phase and an active MJO-4 phase both favor a positive geopotential height anomaly in western Canada, suppressing the precipitation in the Prairies. However, these two factors are not independent; for instance, the MJO activity is modulated by the SST anomaly pattern (i.e., the above normal SST in the equatorial central Pacific) in the warm phase of ENSO. The authors may consider providing a relevant discussion.

We have added some discussion on MJO and NINO4 relationship.

3. Wonder what months are referred to as the growing season for the Prairies? The 2015 drought occurred in May and June, which, I guess, are early part of the growing season.

The growing season is May-August.

4. If the analysis just focuses on May-June (i.e., the two months with deficient precipitation in 2015), rather than the May-August period, you may be able to get a better correlation between the regional precipitation and the MJO-4 index?

We have performed similar analysis for May-June, the results are better for May-August and with lower p-value due to larger sample size.

5. Line 121: What is the central longitude for MJO-4?

140E

6. For consistency with Fig. 2, Fig. 3 should show SST anomalies for May-June, instead of May-August.

This is addressed in 8.

7. There are repeated descriptions of Fig. 3 in the 2nd and 3rd paragraphs of section 3.1.

We have removed the repeated part.

8. Lines 202-203: Fig. 3 shows the May-August SST anomaly, unable to provide any information about the continuous El Nino intensification in July-August. The authors should provide two panels, showing May-June and July-August SST anomaly separately.

We have changed the figure to show both May-June and July-August SST anomaly.

9. 1979-2015 and 1979-2016 are both stated as the instrumental record period which was studied. Wonder which one is correct.

The period is 1979-2016.

10. Line 265: NINO4>0 -> NINO4<0.

We have fixed this mistake.

11. Line 312-315: This sentence is awkward.

We have rephrased the sentence.

12. There are many typos. Here are some examples: Line 12: were -> was; Line 32: are -> is; Line 40: add "and" prior to "the Pacific"; Line 44: oscillation -> oscillations; Line 65 and many other places: convections -> convection; Line 70: the same phrasing, namely MJO has been found, is used in the preceding sentence. Line 122: where -> which; Line 135: delete "for ... resolution". Line 139: investigation -> investigated; Line 152: in average -> on average;

We thank the reviewer for pointing out these errors. We have fixed these errors accordingly.