Xiao et al., Evaluating the Lower Tropospheric COSMIC GPS Radio Occultation Sounding Quality over the Arctic

We thank the editor and the two reviewers for the very insightful and constructive comments. A list of comments with detailed responses are shown below.

Response to the Anonymous Referee #1:

General comments
1. I thank the authors for responding fully to my earlier points. The paper is now clearer and easier to read. The figures are generally clearer. I think it is now suitable for publication, subject to a few more clarifications.

We thank the reviewer's very positive comments.

Specific comments

1. Page 6, Line 14: The correct units of a1 are N-units K / mb.
    Page 6, Line 14: The correct units of b1 are N-units Kˆ2 / mb.

    Both equation 1 and 2 were updated to incorporate the values of the two constants into equations:

    $$N = 77.6\frac{P}{T} + 3.73{\times}10^5\ \frac{P_w}{T^2}\ .$$ (1)

    $$N = 77.6\frac{P_{dry}}{T_{dry}}$$ (2)

2. Page 7, Lines 14-16: I understand that the UCAR 1dvar retrieval depends on the errors in the RO measurement and the background field. But isn't the same thing true of the JPL method? If I have understood Lines 1-5 of Page 7 correctly, this method amounts to using model fields to provide some of the terms in Eqn (1) so that the other fields can be deduced from it. In which case, doesn't the error on the derived T/q field depend on the error in the observation _and_ the error in the model q/T field too? If this is not so, please explain.

    Yes, the reviewer is correct that the JPL retrievals are also affected by the errors from both the RO measurement and the a-priori model. However, JPL retrieval simply use a-priori temperature for moisture retrieval, or use a-priori moisture for temperature retrieval. The error characteristics in JPL retrieval could be slightly easier to interpret due to the simple method. On the other hand it is more challenging to separate the errors

resulting from RO measurement and a-priori model from the 1D-var retrieval used for UCAR retrieval.

Technical corrections

1. Page 13, Line 15: COSIMC –> COSMIC

    Corrected.

2. Page 13, Line 21: COMIC –> COSMIC

    Corrected.