This manuscript makes an effort to apply radio occultation (RO) temperature profiles in revealing the Arctic temperature variations in the troposphere associated with the sea ice change. For this purpose, the authors compare the performance of RO temperature profiles and radiosonde (RS) temperature profiles in the troposphere from 900 to 250 hPa. The way to compare RO and RS profile performance using two schemes is plausible. The conclusion of the added value of RO in studying Arctic temperature variation is reasonable.

Answer: Thank you very much for your positive comments on our manuscript. We have further improved the manuscript following your suggestions.

My specific comments are:

1. Line 20 on page 1, this sentence is confusing by just reading the abstract, the authors need revise this by pointing out what details the RO can provide.

Answer: We appreciate the comment. According to the Reviewer's suggestion, we have explained the details obtained from the RO observations in the revised manuscript, i.e., 'Results revealed that similar Arctic temperature variation patterns can be obtained from both RS and COSMIC observations over the land area, while extra information can be further provided from the widely covered COSMIC observations.'

2. Line 29 on page 1, it is arguable that radiosonde has poor temporal resolution.

Answer: Thanks very much for your rigorous thinking. In the revision, the description of temporal resolution was deleted.

3. Line 21 on page 2, this sentence is confusing, need revision.

Answer: We have rewritten this sentence.

4. Line 25 on page 2, after "furthermore" needs revision.

Answer: We are sorry for the carelessness in the manuscript. The comparisons of temperature measurements from COSMIC and different types of RS were not made in the original manuscript, and we therefore delete this sentence in the revised version.

5. Line 7 on page 4, same as 2.

Answer: We have revised the description.

6. Line 30 on page 4, I suggest the authors delete sentences as "...agree well...", instead, just providing the detailed statistics here and other places in this manuscript.

Answer: Thanks for your comment. A detailed description has been provided in the revised manuscript.

7. Line 12 on page 5, I found this sentence is not clear.

Answer: We have reworded the sentence in the revision, i.e., 'The value of operational RS observations for climate monitoring were strongly hindered by numerous and poorly documented changes in instrumentation and operational procedures (Titchner et al., 2009). In addition, differences between radiosondes from different manufacturers complicated the comparison of data records from different sources (Moradi et al., 2013). Therefore, it may be arbitrary to use the RS records directly for long-term climate monitoring and trend detection.'

8. Line 16 on page 5, I do not see where the authors describe this in section II.

Answer: We are sorry for the carelessness. We have rechecked the programs and found that the number of spatio-temporally synchronized RS and COSMIC temperature measurements at 925 hPa was 547 (see Table R1), and therefore an average of about 13 observations (547/41 = 13.341) were obtained per single RS site

during the period from 13 July 2006 to 31 December 2013. In the revised manuscript, we have corrected the descriptions.

9. Line 19 on page 5, this sentence is not true IMO.

Answer: The description of RS observations in temporal domain has been deleted in the revised version.

10. Line 24 on page 5, what is RAOBCORE and RICH?

Answer: One of the major challenges for using RS records as a reference may be their the lack of absolute accuracy, since radiosondes suffered suffer from radiation errors in temperature measurements and had have various errors/biases in humidity data, especially in the upper troposphere (e.g., Wang et al., 2003). Therefore, the RAOBCORE and RICH software packages are incorporated in this study to errors/biases in RS temperature measurements for further analysis.

11. Line 14 page 6, table I.

Answer: We have corrected the 'Table II' to 'Table I' in the revision.

12. Line 23 on page 6, what is ROI?

Answer: The full name of the abbreviation 'ROI' has been added in the revised manuscript.

13. Line 2 on page 7, you might want rewrite this sentence.

Answer: We have rewritten the sentence in the revision.

14. Line 5-10 on page 7, can you define how the anomalies are calculated?

Answer: The temperature anomaly is the difference between the long-term average temperature (sometimes called a reference value) and the temperature that is actually

occurring. In other words, the long-term average temperature is one that would be expected; the anomaly is the difference between what you would expect and what is happening. In the revision, the calculation of temperature anomaly has been clarified.

15. Line 10-25, I suggest the authors add a table to show the values of the anomalies at those RS stations and correspondent grid. Also, provide statistical details.

Answer: Thanks very much for your suggestion. The temperature anomalies at RS and correspondent RO grid on 2007 (see Table R2) and 2012 (see Table R3) were illustrated. However, Tables R2 and R3 were not incorporated in the revised manuscript because it may be redundant to list all values at each RS site. Furthermore, the temperature anomaly differences for each site have been illustrated in the right columns in Figs 7 and 8.

16. Line 23 on page 8, should be autumn 2007.

17. Line 29 on page 8, same as 16.

Answer: Revisions have been made according to above two comments.

18. Line 18-19 one page 9, this sentence is confusing.

Answer: We are sorry for the carelessness. The comparisons of temperature measurements from COSMIC and different types of RS were not made in the original manuscript, and we therefore delete this sentence in the revised version.

19. Line 10 on page 10, this sentence is confusing.

Answer: We have reorganized this sentence in the revision.

20. Line 27 on page 10, considering replacing "surface atmosphere"

Answer: We have corrected in the revision.

21. Figure 7 and 8, the black dots appear in grey color.

Answer: We have corrected the ‘black’ to ‘grey’ in the revision.

Reference

Wang, J. H., Carlson, D. J., Parsons, D. B., Hock, T. F., Lauritsen, D., Cole, H. L., Beierle, K., and Chamberlain, E.: Performance of operational radiosonde humidity sensors in direct comparison with a chilled mirror dew-point hygrometer and its climate implication, Geophys Res Lett, 30, 2003.