

## ***Interactive comment on “Evaluation of the 15-year ROM SAF monthly mean GPS radio occultation climate data record” by Hans Gleisner et al.***

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### General comments

This is a very well-written and informative paper that compares in detail the climate data record (CDR) of four radio occultation (RO) data sets: CHAMP, GRACE, COSMIC and Metop from 2001 to 2016. The four RO data sets are also compared with ERA-Interim (ERA-I) short-term forecasts. It is a valuable contribution to the literature documenting the characteristics of RO data sets. It shows the value of RO data for use in climate studies (particularly between 8 and 30 km) because of the overall accuracy and stability of RO from mission to mission. It also shows the value of RO missions (e.g. COSMIC) that fully sample the diurnal cycle.

C1

The paper is acceptable for publication subject to consideration of a few minor changes, as summarized below:

### Specific comments

1. It would be helpful if the paper would say a little more about the ERA-I data sets. On P2 line 35 to P3 line 1 it says “reanalysis data.” Later, e.g. P4 line 2 it says “short-term forecasts.” According to Berrisford et al. (2011 ECMWF Report), the ERA-I data sets include four analyses per day and two ten-day forecasts per day, initialized at 00 and 12 UTC. Exactly which of these data sets are being used to interpolate to the RO locations in space and time? Please define “short-term” and say why forecasts were used instead of analyses. Since the analysis fields are given only every six hours and the forecast fields are given every three hours, the higher temporal resolution of the forecast fields likely give better temporal interpolation to the RO times and this may be the reason why forecasts are used. A sentence or two would clarify exactly what is being done and why. A brief description of the temporal and horizontal and vertical interpolation schemes of ERA-I to RO locations would also be useful. 2. P5 lines 12-15-The paper mentions 1D-Var retrievals of water vapor, yet no water vapor comparisons of the RO data sets with themselves or with ERA-I are presented. Presumably this is outside the scope of this paper, but perhaps this should be stated here because I was expecting to see some water vapor comparisons later on. 3. The authors should state how ERA-I dry temperatures are computed for comparison with the RO dry temperatures, as in Fig. 6. Presumably the ERA dry temperature is computed by first computing the ERA-I refractivity  $N$  using the ERA-I temperature, pressure and water vapor pressure, and then computing ERA-I dry temperature from the Smith-Weintraub equation with  $e=0$  (i.e.  $T_{\text{dry}}=77.6P/N$ ). At first I thought this was RO dry temperatures compared with ERA-I temperatures, but this is clearly not the case. 4. P20 lines 6-7: The variation of the results with latitude bands compared to the global average is important. Most of the results in this paper are global means. The results are quite likely to be different in the tropics where the environment is more challenging for RO. Perhaps this

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should be mentioned somewhere toward the front?

Technical/editorial comments

5. P2 line 4: “develops” should be “develop” 6. P2 line 24 and P26 line 3: “Rieck” should be “Rieckh”. 7. P3 line 6: Please define “UCAR” (University Corporation for Atmospheric Research). 8. P9 line 8-“accuracy” should be “bias”. 9. P13 line 6: better wording might be “..profiles deviate somewhat..” 10. P13 line 10: “lead” should be “leads” 11. P17 line 7: Suggested rewording rather than starting sentence with “Believed...”: “This bias is believed to be...” or “We attribute this bias to the undersampling...” 12. P18 line 2: Suggested rewording rather than starting sentence with “Believed...”: “This effect is believed to be...” or “We attribute this effect to the undersampling of the...” 13. P18 line 7: So far not So far

End of comments Richard Anthes

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