Answer to reviewer 2

We would like to thank both reviewers for their thoughtful and constructive comments. As the comments were not numbered in both reviews, we have broken them into what appears to us to be logical units.

Main comments

I consider that this is a well-written and interesting paper. I also think that although it is interesting to see that the retrievals improved when a more robust radiosonde data set was used for training the inversion algorithm, that is something expected and not innovative as the referee 1 pointed out.

As reviewer 2 points to reviewer 1 we also refer to our response to reviewer 1 in this respect. We have added quite some detail concerning the importance of our results – albeit using a standard approach – for application in complex mountainous terrain.

However, the idea of incorporating additional information from in-situ measurements to the retrieval algorithm in order to improve the retrievals in complex terrains can be really very useful. I agree with referee 1 that the authors should go further with this line and address the points that he mentioned. I am looking forward to see how the authors address his suggestions.

Please also see above.

I also wonder if would be possible using the radiosonde data to assess how affect the horizontal distance of this a-priori information to the improvement of the retrievals.

This is an interesting question. For this purpose one could compare the mountaintop temperatures at the time of the radiosonde ascent with those obtained by the radiosonde at the same height, or investigate the temperatures from mountain stations further away. This investigation, however, is outside of the scope of this paper but will be considered in future work.

Minor comments

- Page 2272, lines 9-15: I think that it would be interesting that the authors mention if they use liquid nitrogen as cold load for the absolute calibration and how often they performed this calibration.

We have used liquid nitrogen for the absolute calibration on 22.08.2012, 19.12.2012 and 05.06.2013. We have changed the text in section 3.1.
(p.2272, l.12) In order to preserve the stability of the brightness temperature it is necessary to perform an absolute calibration with the liquid nitrogen cooled target, therefore, we have performed a liquid nitrogen calibration every 5 months.

*- Page 2274, lines 17-18: "Figure 3 shows the mean RMSE
computed between retrieved temperature and humidity profiles and radiosondes for
this dataset. " But Figure 3 only shows temperature profiles, so please correct that.*

Thank you, we have corrected it (Section 4.2).
*(p.2274,l.17-18) Figure 3 shows the mean RMSE computed between retrieved temperature
profiles and radiosondes for this dataset.*

*Page 22778, line 18: for the measurement performed in the slope is better to refer as
1600 meters above the valley floor, using the terms "above ground" could be confuse
because the measurement is performed at the surface.*

We agree and hence we have changed the text in Section 4.4.
*(p.2278, l.17-20) As a proof of concept, we test two new retrievals. The first one uses the
temperature at 1600 m above the valley floor as the additional information and the second
retrieval uses "a slope profile", i.e. temperatures at 400, 800, 1200, 1600 m (above the valley
floor) as additional regressors.*