Atmos. Meas. Tech. Discuss., 8, C3680–C3683, 2015
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Atmospheric Measurement Techniques Discussions

Interactive comment on "Metrology of ground-based satellite validation: co-location mismatch and smoothing issues of total ozone comparisons" *by* T. Verhoelst et al.

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Received and published: 30 October 2015

The authors would like to thank anonymous referee 2 for his/her careful reading of the manuscript and for the suggestions for improvements listed in the report. In particular, the referee suggests to investigate the quality of the simulations in reproducing also the extreme values in the distribution of differences, so not only the median and 0.16 and 0.84 quantiles, but also the tails of the distributions. The underlying motivation being that extreme values play a significant role in meteorology and climate change.

Author response: While it is not necessarily so that extreme values of an ECV will lead to extreme values in the differences between two instruments measuring the same event, the large gradients that occur during such events can indeed lead to large co-location errors. The case study at Dumont d'Urville during ozone hole conditions is in fact an illustration of this situation, and as such the paper already deals to some extent with meteorological/climate extremes. However, the analyzed statistics are indeed limited to basic properties of the distribution (median and quantiles). To expand on this, a comparison showing entire histograms has been added as a new Sect. 4.4, which is copied below. The authors hope that this additional analysis answers the referee's concern on extreme values.

The referee also noticed some inconsistencies in the colors used in some of the graphs. These are resolved in the revised version of the manuscript.

Newly included section:

4.4 Error distributions

The analyses conducted in the previous sections have relied on robust statistical tools based on quantiles to determine central tendency and variability. However, in the context of meteorology and climate change, extreme values are believed to be of great importance (e.g., Katz and Brown, 1992). While it is not necessarily so that extreme values of an ECV will lead to extreme values in the differences between two instruments measuring the same event, the large gradients that occur during such events can indeed lead to large smoothing and sampling difference errors. The case study at Dumont d'Urville during ozone hole conditions is in fact an illustration of this situation (Sect. 4.3.3). To assess the quality of the simulations for differences larger than those captured by the quantiles used hitherto, entire error histograms are shown in Fig. 1 for two representative cases, corresponding to the comparisons already analyzed in Sect. 4.3.2

and 4.3.3. The comparison between histograms of observed differences with those of modelled differences illustrate that also the tails of the distributions, beyond the 16 and 84% quantiles, are well reproduced by the simulations, even at Dumont d'Urville where the yearly ozone hole leads to extremely low TOC values.

References

Katz, R. and Brown, B.: Extreme events in a changing climate: Variability is more important than averages, Climate Change, 21, 289–302, doi:, 1992

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 8023, 2015.

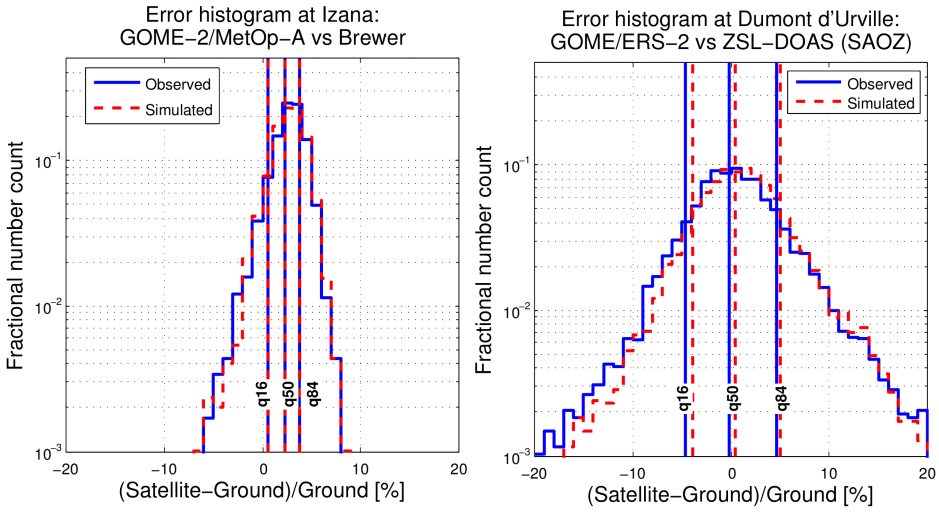

Fig. 1.