

Dear Patricia – thank you for your positive response to our manuscript changes. Please find below a summary of the further changes we have made in response to the reviewer comment. This reviewer comment is shown in black, our response in blue, and the *changed text in the manuscript in blue italics*. Line number 46 refers to the new version of the manuscript.

Many thanks on behalf of all authors,

Mel

Just a few suggestions on the new text (I thought) describing the dynamic emissivity retrieval over snow and ice and the usage at ECMWF, which has not come across perfectly and I would suggest a slight rewrite. Ideally what should be addressed in this sentence is the approach where, for ice and snow surfaces only, we do the dynamic retrieval in the window channel at 150-166 GHz and apply this emissivity, without modification, to the 183 GHz channels. Another citation to consider specifically for dynamic emissivity retrievals over snow and ice surfaces as a replacement for, or addition to, the ECMWF citations would be prior work at Meteo France (who used 89 GHz for the retrieval and a frequency-based adjustment to the retrieved emissivity to make it valid at 183 GHz) - <https://doi.org/10.1175/2009MWR3071.1>

If I was rewriting this sentence my suggestions would be (a) indicate that it specifically focuses on snow and ice surfaces, as a progression beyond the work of Baordo and Geer on non-snow surfaces that is mentioned in the previous sentence; (b) say that the relevant emissivity retrieval channel over snow and ice surfaces is 157 GHz (if talking about MHS, as was the case in the citations being made) rather than saying 90 GHz (90 GHz is the channel used for dynamic emissivity retrievals at ECMWF for nonsnow land surfaces, to be used for 183 GHz channels); (c) for fairness consider acknowledging some of the prior Meteo France work in this area, e.g. "... following earlier work by Bouchard et al. (2010)."

We thank Dr. Geer for this clarification. We have amended the text at line 46 to read:

*A dynamic emissivity retrieval was proposed by Di Tomaso et al. (2013) and Geer et al. (2014), where land surface emissivities derived at 90 GHz were used at  $183 \pm 3$  GHz and higher frequencies over snow-free land. However, this is not applicable for channels with high surface sensitivity e.g.  $183 \pm 7$  GHz as the errors are too large. Following the earlier work of Bouchard et al. (2010), the relevant window channel to derive emissivity for snow- and ice-covered surfaces is 157 GHz, which is used without modification at 183 GHz.*

Please note that Competing Interests has now been amended to 'At least one of the (co-)authors is a member of the editorial board of *The Cryosphere*.' As this is not in the main body of the text, this has not been picked up by the pdf difference pipeline and is not highlighted with different colour text in the Tracked Changes version.