

Reply to referee #1

We thank Referee #1 for reviewing the manuscript and the valuable comments and suggestions which we address below. The responses to the referee comments are given in blue italic letters.

The authors have made all the edits that I suggested. However, when copy/pasting my draft comments into the AMT dialog box, these last 4 sequential corrections were left behind. Apologies for that.

Fig. 7, caption: (corresponding to the R value) --> (PCC, corresponding to the R value)

changed as suggested

Fig. 8, caption: Probably should be (b,d) --> (c,f) and (a,c) --> (b,e). No?

changed as suggested

l. 389 (original submission): reduces --> reduce

changed as suggested

l. 427 (original submission): z --> z_{top} in view of the definition of z in Eq. (A1)

changed as suggested

Also, with respect to my comment:

"I may have missed this, but we'd like to know exactly how many WRF realizations of the Arctic clouds were used in the NN training. It feels like there is only one, which I doubt."

I suggest that the authors better clarify how the NN sampling is done over the model parameters using a single run of WRF followed by MYSTIC.

We added more information about the generation of training data to the corresponding section.

Finally, putting "the" in front of every mention of IDEFAX sounds strange to me, although I can see the logic. If it were ICA, it sounds right because we tend to read it as "the I-C-A", not the word "ica". I think it is because the clever new acronym is long enough and pronounceable, just like a real word. So, it doesn't require the "the" every time. Maybe if you write it as "the IDEFAX model", it would be OK. Anyway, the English language experts will decide.

A native American at our institute told us that he would put a "the" in front of IDEFAX. But as non-native speakers we are definitely open for correction and would let the English language experts decide as suggested.

Reply to referee #2

We thank Referee #2 for reviewing the manuscript and the valuable comments and suggestions which we address below. The responses to the referee comments are given in blue italic letters.

Almost all of my comments were well addressed, but I am still not happy with the reply to my previous comment:

2) Several important aspects are not clear:

-are the clouds in a pixel represented by one half spherical cloud (as stated in line 6) or by a field of half spherical clouds (as stated in line 63)?

It seems the authors did not change the respective parts of the text (line 63 is now line 66), and I still find this inconsistent and confusing

We are very sorry that we did not address your previous comment sufficiently. We did now change the wording in the abstract to make it clearer that a field of half-spherical clouds is used. In addition, we slightly restructured parts of the introduction. We hope the new description is now more understandable and less confusing.

The corresponding section of the abstract reads now: "The basic idea behind this approximation is similar to the independent column approximation assuming plane-parallel clouds. However, every column is approximated by an independent field of 3D half-spherical clouds instead of a plane-parallel homogeneous cloud. This field of half-spherical clouds is defined by the local cloud surface orientation angles and the cloud fraction."