Response to reviewer comments, “Identifying meteorological influences on marine low cloud mesoscale morphology using deep learning classifications”, Mohrmann et al.

Response to reviewer #1:

We thank the reviewer for their time and helpful comments on the manuscript. Based on their feedback, we have the following response and revisions to the manuscript:

Comment (1), also (6): The reviewer raises a very good point regarding the confusing wording of the manuscript title, and in hindsight we understand why a reader could be misled in thinking that deep learning was used to identify meteorological influences, and not merely for creating the classification dataset used. A title change is warranted, and we have altered the new title to be “Identifying meteorological influences on marine low cloud mesoscale morphology using satellite classifications”. As the reviewer points out, the description of the classification dataset is primarily carried out in Yuan et al. (2020), and so no emphasis is needed in the title of this manuscript. This manuscript focuses primarily on the meteorology, so we did not describe extensively the methods behind the classification or its accuracy. Still, we agree with the reviewer’s comment (both comments (1) and (6)) that the accuracy of the deep learning and a brief description of its methodology and accuracy is warranted. The following language has been added to section 2.1, paragraph 1, in the description of the classification dataset:

Old text: [list of scenes] …These scenes are then used to train a convolutional neural net, which in turn is run near-globally on such MODIS oceanic scenes., and a detailed description of the classification dataset and training can be found in Yuan et al. (2020).

New text: [list of scenes]. These categories were chosen by examining the morphological climatologies in Muhlbauer et al. (2014) and studying regions where there was little variability in morphology category (primarily the tropics, where disorganized MCC dominated), and identifying additional commonly occurring cloud morphologies. These (clustered and suppressed Cu) were then added to the pre-existing cloud categories, along with a homogeneous stratiform category initially used in Wood and Hartmann (2006). Examples of these types can be found in **Error! Reference source not found.**.

The scenes were then used to train a convolutional neural net (CNN) using as input the image of scene visible reflectance. A full description of the machine learning training and model evaluation can be found in Yuan et al. (2020). These authors found that average model precision evaluated on a test set was approximately 93% across all categories. Open-MCC had the lowest precision, most likely because it was the lowest-frequency category. The largest source of model confusion was between disorganized MCC and clustered Cu, which is unsurprising given the similar appearance of these categories.

Comment (2): Please see the first paragraph added above, where we have added additional explanation about the origins of these cloud categories. Additional information about them can be found in Yuan et al. (2020) and we do not see the value of repeating too much of that discussion in this work.

Comment (3): We have added the appropriate citation for CERES (Doelling et al., 2013)

Comment (4): We have added the appropriate citation for CERES (Gelaro et al., 2017)

Comment (5): While we understand the reviewer’s point that Figures 6 and 7 are mentioned ahead of Figures 4 and 5, their mention in section 2.5 only serves as a possible reference for the methods described and not discussed in any depth. The analysis that corresponds to Figure 6 and 7 indeed comes

later, in section 3.3, following the analysis of Figure 4 and 5 (in Sections 3.1 and 3.2 respectively). We feel that ordering the figures this way makes for a more coherent reading of the paper; the alternatives would be to move the methods in section 2.5. to 3.3 (breaking up the methods), or moving Figures 6 and 7 up, resulting in much backtracking for the reader when they reach section 3.3.

Comment (6): Addressed in response to comment (1).

Comment (7): The following line has been added to section 3.1: "Panel (a) shows the fraction of scenes covered by the dominant cloud type for that grid box" to address this omission, thank you.