

Interactive comment on “Evaluating Models’ Response Of Tropical Low Clouds to SST Forcings Using CALIPSO Observations” by Gregory Cesana et al.

Anonymous Referee #2

Received and published: 27 December 2018

Evaluating Models’ Response Of Tropical Low Clouds to SST Forcings Using CALIPSO Observations

Cesana et. al.

Summary

This paper uses CALIPSO observations to evaluate examine the ability of global climate models (GCMs), mainly the GISS-E2 and GISS-E3 to simulate the observed marine low clouds in tropics and their response to changes in sea surface temperature (SSTs). The response is inferred using inter-annual variations in cloud and SST. It is found that model which better match the observations have a better match in their

C1

response to SST variations. In addition to evaluating models, CALIPSO and passive observations are used to break down the response into those from different low cloud types, stratocumulus and cumulus.

The paper is generally well written and clear. I have only some minor comments below.

Specific comments:

Page 3, line 6: "2-dimensional swath" is a bit vague (x-y or x-z)?

Page 4, line 2: By using the nighttime only are you biasing the sampling to a particular part of the diurnal cycle? My understanding is that the GCMs sample all times of the day?

This reference examines the diurnal cycle of marine cloud feedback which might be of interest. It also examines the diurnal features of low marine clouds in some CMIP5 models.

Webb, M.J., Lock, A.P., Bodas-Salcedo, A. et al. *Clim Dyn* (2015) 44: 1419.
<https://doi.org/10.1007/s00382-014-2234-1>

Page 4, line 23: Radiative balance during which period?

Section 2.2: Some time has elapsed since the manuscript was submitted. Is there a GISS-E3 paper available that you might be able to reference that contains most of this information?

Section 2.2: Is the required model output available for a longer period of time? It is mentioned a few times in the manuscript that a short time-period is used (a decade). If there is additional model output then it should be possible to indicate how well the 10 years period chosen represents a longer dataset (at least in the models).

Page 6, line 17: You might want to point out that the low-level cloud fraction is LCC referred to throughout the manuscript.

C2

Page 8, line 32: "that is a too shallow PBL" -> "too shallow PBL"

Page 9, line 1: "strong masking effect". I thought the 500 hPa omega filtered out overlaying high clouds? In Figure S2 you show the cloud fraction profiles below 5 km. Could you not extend it vertically?

Page 9, line 9: But in the multimodel mean the response is similar to the observed?

Page 12, line 25: "2D" -> cloud-top properties?

Page 13, line 10: Do you get better results with EIS or other variants of LTS? You seem to use EIS later in the analysis (Figure 5).

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2018-1008>, 2018.