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Interactive comment on “Atmospheric parameters in a subtropical cloud regime transition derived by AIRS+MODIS – observed statistical variability compared to ERA-Interim” by M. M. Schreier et al.

Anonymous Referee #1

Received and published: 9 December 2013

Proposition: publish with major revision Using a synergistic combination of observation types and instruments to retrieve cloud parameters and vertical profiles is always welcome. The reviewer also very much welcomes the additional comparison with re-analysis data. So so far all good, aslo the writing of the manuscript is reasonable.

There are however 3 major points (in addition to the minor below) that must be addressed before the publication of the manuscript

(a) the latitude mask on your statistics, one would not necessarily expect that for Cu and/or Sc cloud types (b) the higher-order moments of the statistics you use, such as

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skewness and kurtosis. It must be made clear, and this is misleading in the manuscript that ERAI with a resolution of 80 km can in no way represent the positively skewed distribution of theta, q as this would be subgrid - these positively skewed distributions are due to narrow updrafts with diameter of $O(1 \text{ km})$ or less. Negative skewness in Sc is due to stronger downdrafts due to cloud-top cooling. Therefore I doubt it makes any sense to plot skewness and kurtosis for ERA-Interim and plotting it for MODIS might be just ok but still at edge of resolution (c) please revise your Figures 5,6. These are not good quality anyway and there are too many lines. It might be necessary to check significance of skewness and kurtosis for Modis, and it is up to you if you decide to keep it (at least I would remove kurtosis), but clearly it makes no sense to keep ERAI skewness etc. and you should make this clear in text that for the ERAI resolution is too coarse

Detailed, mostly minor corrections: p24052 L18: 'helps'->'help' L26: 'and its influence in'->'with their characteristic distributions' p24053 L7 'Bechthold'->'Bechtold' L7: remove 'strong' L8: 'is ..pointed out by people like'->'has been pointed out by' L27:'well-distributed, but limited time periods ... ', rewrite as 'targeted in-situ aircraft observations over limited time periods' p24054 L5: 'located on the'->'onboard' L6: 'has made these kinds of observations'->'has been operational' L10: remove 'in the lower parts of the vertical structure' L16: 'also located on'->'onboard' p24057 L16-17: remove 'The centers of the boxes are given by latitude = $-17 + (3 \times j)$ and longitude = $187 + (4 \times j)$, where $1 \leq j \leq 12$, and j is an integer' p24058 L1-2: remove 'To characterize the influence of the cloud type on this study' and start with 'The' L10-15: what do you mean by 'clouds higher than 680 hPa pressure level'? their cloud top is below 680 hPa? Also why do you also use a latitude mask for the cloud types? It would be desirable not to have such a mask p24060 L2: better to say again in words what is 're', 'tau_c', 'T_c' L2-3: remove commas in ', and' p24061 L6-7:'the relative occurrence and frequency of cloud fractions', text as also in Figure legend is not correct, what you show is "annual mean evolution of relative occurrence and frequency distribution of cloud fractions for the five cloud types' L19:'at 2005'->'in 2005' p24062 L3-4:'The limited resolution (250m

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to 1 km) of MODIS may result in a shift of trade Cu pixels towards clear sky' or isn't it the opposite? this can be conveniently checked with a toy data (pixel) model the L11-12:'decrease from Sc to trade Cu', decrease of what? L14-15:'ERA-Interim has lower values of skewness', lower values of what p24063 L10-11:'The calculation of re in ERA-Interim is calculated' strange expression, correct P24064 L10: remove 'a priori assumptions or other imposed behavior in the cloud retrievals' p24066 L22-23:'but does not reproduce the strong negative skewness seen in Zhu and Zuidema's simulations of trade Cu' I thought one would especially from LES expect positively skewed distributions from LES

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 24051, 2013.

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