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Interactive comment on “Diagnosing the average spatio-temporal impact of convective systems – Part 1: A methodology for evaluating climate models” by M. S. Johnston et al.

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General comments

The authors present a compositing approach for the comparison of tropical deep convective systems between satellites and general circulation models (GCMs). The compositing methodology builds on that of Zelinka and Hartmann (2009), whereby rain rate is used to identify the centres of deep convective systems. Approaches such as this have the potential to provide a valuable standard framework for the evaluation of cloud-related processes in GCMs. This study is of particular interest due to the importance

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of improving the representation of deep convection in GCMs.

Specific comments

The authors may want to consider the following specific minor comments:

1. Previous studies have used compositing methodologies or other approaches for the evaluation of cloud fields in GCMs: Field et al (2008; doi:10.1175/2008JCLI2235.1) applied the methodology of Field and Wood (2007; doi:10.1175/JCLI3998.1) to investigate the representation of extratropical cyclone cloud fields and rain rate; Williams and Webb (2008; doi:10.1007/s00382-008-0443-1) applied a cloud-regime approach to investigate cloud fields; Nam and Quaas (2012; doi:10.1175/JCLI-D-11-00347.1) used the COSP satellite simulator (Bodas-Salcedo et al, 2011; doi:10.1175/2011BAMS2856.1). The authors of the current study, which presents a complementary methodology for the evaluation of tropical convective processes, could consider including a brief discussion of these or similar studies.

2. Further discussion about equatorial waves and organised convection in the tropics may be beneficial. In particular, a short paragraph mentioning the different types of equatorial waves and their basic properties (e.g. direction of propagation and typical speed) could be included. Can the methodology be modified to provide classification of the individual events into different types of wave? This could form a basis for future work, providing further insight about the average propagation direction disagreement between the satellite and GCM data.

3. In section 4.1, it is mentioned that there are four modes in the timing of rain rate (Figure 2): two modes associated with low rain rates and another two modes associated with high rain rates. The high rain rate modes lag the low rain rate modes by approximately 4–5 hours. Can the features of Figure 2 also be interpreted to suggest that there are just two modes of convective initiation, with the most intense systems taking 4–5 hours longer to mature compared to the least intense systems? This alternative interpretation may be wrong, but it may be worth considering.

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