

# ***Interactive comment on “Incorporation of inline warm-rain diagnostics into the COSP2 satellite simulator for process-oriented model evaluation” by Takuro Michibata et al.***

## **Anonymous Referee #1**

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The authors describe enhancements to the COSP satellite simulator package intended to aid in model development and evaluation of precipitation processes. New diagnostics on subcolumn fields permit better and easier comparison with satellite datasets, and the paper provides an excellent example of this capability using A-Train data.

This paper is clearly written, concise, well referenced, and should provide a useful guide for users of these tools in the future. I found it well organised and clear, and have only minor recommendations for ways to improve the manuscript, which are mostly textual in nature. It suits the scope of this journal and should be suitable for publication after some minor modifications.

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Minor points:

Title and throughout – The authors use ‘warm-rain’ consistently with a hyphen, whereas elsewhere in the literature it is usually not hyphenated (e.g. Stephens and Haynes 2007, Chen et al. 2011, Suzuki et al. 2011). I would suggest changing this to match the literature. In the specific case of the title, ‘warm-rain’ could be replaced by ‘precipitation.’

P1L1 - ‘has been widely used’ contains a value judgment, and could be simplified to ‘is used’

P3L2 – This is one example of this manuscript’s slight tendency for overdoing the number of citations in some places. Here and elsewhere it may be better for readers if the authors select one or two of the most important and relevant citations, rather than a half dozen.

P3L10 – I found the beginning of this section to be quite abrupt, immediately discussing CFADs without putting this into context. Given that the section is titled ‘Concept and design’ it might be useful for readers if the overall concept is stated before going straight into the details. Perhaps a short paragraph before Section 2.1 begins, or a sentence to lead into why CFADs are then discussed. This is done in a roundabout way later in this first paragraph, implying that such diagnostics are useful for fingerprinting processes. It would read better if this were rearranged a little.

P4L12 – ‘A-Train’ should be defined, either here or at its first mention (P3L6), preferably with a citation to one of the relevant Stephens or L’Ecuyer papers.

P4L28 – This section title might be better without ‘scientific perspectives’ in there, as this is quite vague.

P4L31 – Stay consistent, either refer to COSP or COSP2.

P5L6 – Please state which specific data products were used including which version or processing level, as this is more important for readers’ interpretation than the original

papers cited here.

P5L16 – I disagree with the causative statement here, saying that because the model generated more SLWCs this means that the chosen period is good enough for robust statistics. This could be rewritten to say that it is indeed a long enough period (which I agree with), but that is not proven by the fact that the model had more SLWCs, which is what the current text suggests.

P5L19 – This could be clearer, as saying that ‘MIROC6 overestimates . . . by 15%’ can be misleading. Please say what the reference is, or it might be best if just stating that MIROC6 finds 48.5% drizzle versus 33.3% in A-Train data. What I mean is, if the A-Train data are taken as truth, then MIROC6 overestimates drizzle by almost 50% relative to the A-Train data, so it’s better to write what is meant explicitly so that it can’t be misinterpreted.

P5L21 – I disagree with the authors’ interpretation that the model’s ‘geographical pattern’ of precipitation is in good agreement with observations. I would suggest that this statement should be modified or given some caveats at least, since the patterns in the tropical oceans and continental precipitation seem quite different in the figure.

P6L6 – It is implied here that effective radius and the subdivisions of Re used in the analysis are related to whether or not clouds are precipitating. This is surely spelled out in some of the referenced literature, but a sentence or two stating this explicitly would be useful for readers. A reference to Lebsock et al. 2008 might be helpful.

P7L15 – Reword ‘by more simple way’

Fig 1 – The use of double quotes to show emphasis (How “often” does it rain) should be replaced by a switch to regular/italic font, or removed.

Fig 4 – Please state in the caption whether the colour scale used is identical to those in Fig 3. If not, please provide a colour bar in the figure.

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