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Discussions

Interactive comment on "Rainfall erosivity estimation based on rainfall data collected over a range of temporal resolutions" *by* S. Yin et al.

Anonymous Referee #1

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The manuscript addresses an important topic, i.e. what temporal resolution is required for making accurate estimates of rainfall erosivity. This topic is of global interest, given the often non-existent or difficult-to-acquire quality rainfall datasets at high temporal resolutions. As much as I applaud therefore this effort, I do have a number of concerns with the current version of the manuscript. These are:

1. The authors rightly take the EI30 measure as the reference given its wide-spread use. However, they fail to discuss properly the kinetic energy component of this indicator, and the issues of measuring/estimating it. The kinetic energy of rainfall can be measured (e.g. with disdrometers), but given the non-availability of such measurements for most stations, mostly it is estimated based on empirical equations. The authors simply present equation (2) but fail to give a rationale for it. Other studies exist

that compare various existing empirical relationships (e.g. van Dijk et al, 2002, Journal of Hydrology 261, 1-23 and see also Salles et al. 2002, Journal of Hydrology 257, 256-270), and should at least be discussed here.

2. It is not always very clear which erosivity values are taken as input for estimating the modelling error. E.g. if the authors refer to monthly, is this always "average monthly"? If so, why, and would it not be more useful to look at erosivity values for individual months? This would relate better to the ongoing discussion on ways forward for erosion monitoring (e.g. Vrieling et al, 2014 Global and Planetary Change 115, 33-43).

3. In relation to the last point, I would encourage the authors to contribute to this discussion and (based on their results) give more concrete recommendations for ways forward. Currently the authors refer in a very general way to "users" in their conclusions. In my view, end-users are never those that want just to make an estimate of erosivity, but rather they need erosion estimates and possibly a monitoring framework, e.g. for planning purposes and impact evaluations. Adding a clearer opinion on how to move forward with erosivity analysis, including its embedding in mapping/monitoring frameworks, would be a welcome addition to this manuscript.

4. While the research seems well-embedded in existing erosivity estimation efforts in China, in my view the authors could make a better link with other ongoing efforts in other areas that look at different temporal resolutions of rainfall data. I am thinking for example about Panagos et al (2015, Science of Total Environment 511, 801-814) who normalize R-factor estimates for Europe based on recording intervals. Although the authors focus on rainfall station data, another line of research (i.e. application of satellite rainfall estimates) should be acknowledged, i.e. work by Vrieling et al (2010 in Journal of Hydrology, and 2014 cited above), but also for China (Fan et al, 2013, Journal of Mountain Science 10(6): 1008-1017). This is especially relevant for end-users that require spatially-consistent information on soil erosion. In fact, a performance evaluation for the stations in the manuscript of erosivity estimated from satellite rainfall products could be a nice follow-up study for the authors (but probably not for this paper).

5. Perhaps I misunderstood something in the paper, but it seems to me that the models are only evaluated for the temporal scale to which they are applied. In Tables 3 and 4, the event-based models are only evaluated on the basis of events modelled. While there is nothing wrong with that, I would also expect the models to be evaluated at the aggregate scale. I mean that EI30 estimated from event-based models should also be added up to monthly and yearly values, to evaluate if fine-scale temporal resolution data improves also the accuracy of aggregate erosivity measures.

Other comments: - P4967L11: delete first "as"

- P4967L19 and L28: it is unclear what authors mean with "breakpoint data"

- P4967L22: change "to develop" into "by developing"

- P4968L14: "course" should read "coarse"

- P4968L23-24: strange sentence. This can be deleted as it is obvious that these intensities are "easy to calculate".

- P4970L10-11: "the eastern water erosion region of China": it is unclear what is meant with this.

- P4976L9-11: see also general point (2) above. The authors could also use all annual values for the stations (i.e. for all years) rather than just the average annual erosivity.

- P4982L7: "Predication" should read "prediction". However, the sentence is also unclear. Rather state "Erosivity could not be predicted accurately in southwest China using rainfall amount as input." Even if rephrased in this way: what rainfall amount? Hourly? Daily, monthly, yearly?

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