

## ***Interactive comment on “Reconstruction of droughts in India using multiple land surface models (1951–2015)” by Vimal Mishra et al.***

### **Anonymous Referee #3**

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General comments: This manuscript demonstrate the method to reconstruct meteorological and soil moisture droughts in India by three LSMs, i.e. VIC, Noah, and CLM. The overall scientific idea is clearly expressed in detail. The manuscript could be considered to be published after the following minor concerns are addressed. And the language should be carefully polished and make the whole manuscript concise and precise. Specific comments: 1. Page 1 Line 8. In Abstract, “As a large population of India is dependent on agriculture, soil moisture droughts adversely affect agriculture and groundwater resources ” This sentence is illogical and should be rephrased. 2. Page 5 Line 5. The definition and the formula of SPI and SSI should be clearly expressed in the manuscript instead of just giving the cited literature and leaving the readers to the literature. In another word, the manuscript should be self-contained. 3. Page 5

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Line 18. It would be better if the Indo-Gangetic Plain Region can be shown in supplemental figure. 4. Page 6 Line 20. How do you compare the TWS (which is the total terrestrial water storage including both surface water, soil moisture and groundwater) and the total column soil moisture (which is just the soil moisture stored in aquifers)? 5. Page 7 Line 5. Why the ranks of 2014 and 2015 droughts identified in this manuscript are different from the cited literature Mishra et al., 2016b. Which study is confirmed by the in-situ records and which is biased identification? This affects the quality of the drought reconstruction in this manuscript and should be addressed carefully. 6. Page 8 Line 2-5. What do you mean by “soil depths were calibrated in all the three LSMs”? Are the soil depths in LSMs the same or not? If they are the same, “The 1-month lag between peak precipitation and peak root-zone soil moisture from the CLM can be due to a relatively deeper soil column.” Should be deleted. If not, “since. . . .” should be deleted. Above all, you should clearly express the reason and not confuse with each other: soil depths, the number of soil layers or processes related to soil hydrology. Technical corrections: 1. Page 1 Line 25. The citation Mishra et al., 2016b comes first before 2016a. The literature should be cited in order of their appearance in manuscript. 2. Page 3 Line 4. Digital elevation map (DEM) should be rewritten as digital elevation model (DEM).

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