

## Response to Referees

We thank you for your time and valuable feedback. Please see below, our responses (in blue color text) to the comments.

### 5 Referee 3

The present paper explains the break in Clausius-Clapeyron scaling rate in India through use of observation and a surface energy balance approach balance by thermodynamic. The reasoning and the basis of the work is fine, there are few comments I'd like the authors to address before publication (minor revision), as follows:

1. I 'd like to know if the authors have made cross-validation when implementing the method.

10 Since our model is mainly focused on inferring the parameters of the joint distributions and developing return period event, we wanted to use all data for better estimation of the parameters. It was not intended for predictions as there are no time-varying covariates that we are using for estimation. We do agree that if one were to use time-varying covariates, it would be ideal to verify the model in a cross-validated mode.

2. Other than the present assumed distribution of Log-normal, are the GEV or GPD method also tested for comparison?

15 Since not all locations in the spatial fields will have extreme events, we think it is sensible to use the log-normal distribution for estimation of the parameters for the joint distribution of the spatial fields. GEV or GPD are preferred distributions when all the data are block maxima or threshold over values. In our study, it is not that case. Hence, we preferred not set up the models using all extreme value distributions.

3. Line 10 “gaging site” -> “gauging site”

20 4. Line 27 “gage”-> is it gauge?

NOAA’s NCEI (<https://www.ncdc.noaa.gov/IPS/hpd/hpd.html>) specified these precipitation measuring stations as rain gages. Hence, we used this term. For example:

*“Description*

25 *This publication contains hourly precipitation amounts obtained from recording rain gages located at National Weather Service, Federal Aviation Administration, and cooperative observer stations.”*

We will ensure that it is consistent throughout the manuscript in the revised version.

5. Line 30 the annotation is quite hard to understand, I have hard time transforming from R to A. I would expect a simpler annotation used than the one here.

30 We use A for annual maximum event for each site and duration and year. Then, based on these events, for each anchor station, we also capture all the rainfall in other stations along with this event. This we denote using R. We will clarify this using a simple example based on a sample year data.

6. Line 83, “across the gauge sites was developed”-> “that was developed”

We think this sentence is fine. It was meant to say that a hierarchical Bayesian approach was developed.

*“A hierarchical Bayesian approach that provides the ability to partially pool model parameters across the rain gauge sites was developed.”*