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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Space-time clustering of climate extremes amplify global climate impacts, leading to fat-tailed risk" *by* Luc Bonnafous and Upmanu Lall

Anonymous Referee #2

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The general finding of the paper is by no means new, the insurance industry knows this and operates accordingly since at least the 1990ies. Nevertheless, as most physical risk assessments in the banking sector today are based on mere local lookups on hazard maps, the paper does reiterate the point for these audiences.

Methodologically, one might be able to look into 'dry' conditions with such a rather crude approach (SPEI), while for 'wet' conditions, run-off and hydrological routing (terrain etc.) all matter and a corresponding 'wet' index will unlikely reveal intense flooding conditions, as it can also be composed of many wet days, but no torrential rain or strong flooding.

Instead of the rather simple method, why do the authors not consider to just apply a state of the art probabilistic drought and flood model at high spatial resolution to this problem?

The paper lacks a clear story and logical structure. Code and data provided only upon request only, this is not state of the art (GitHub has been invented etc.)

Detailed remarks: page 1, line 19: Well, most such approaches do indeed only consider local risk and neglect spatial (and spatio-temporal) dependencies. But please not the insurance underwriting does indeed consider both the spatial extent of natural catastrophe events as well as clustering etc. since at least the early 1990ies.

page 1, line 21 ff: see Hillier et al., 2020 (https://www.nature.com/articles/s41558-020-0832-y) for a valid counter-argument

page 2, line 5: Please check the literature a bit more carefully, at least consider a selection of the global flood risk impact assessments. But it is true that few to none exist for specific industry sectors.

page 2, line 12: limits of insurability. Provide at least some references, as the statement 'designed based on the prior local climate record' is a bit vague. Probabilistic risk assessments are standard for pricing of natural catastrophe risks, hence not purely based on climatology. And most cat models are re-calibrated (also to changes in hazard) every few years.

page 2, line 13: records page 2, line 13: could be is ok, but please state that a large portfolio of global assets diversifies in itself, i.e. it is very unlikely that all locations are hit by flooding the same year. Quantification of physical risk based on mere local lookups on hazard maps will therefore overestimate risk, especially in tails (only the annual expected damage is additive).

page 3, line 4: on urban center, please rephrase, at least analysis would provide for the case of an urban area. . . or metropolitan area. . .

page 5, line 17: The description of the method and reference to supplemental figure does mix with results. A better methods description and separation of some of the details to the results section might be suggested.

page 6, line 7ff: While SPEI works well for ‘dry’ conditions, ‘wet’ can mean many things, but rarely flooding (as routing matters a lot).

page 6, line 20: a heavy tail effect..

page 7, line 1: why binomial distributions?

page 7, line 2ff: The argument can not be followed and ‘mega-catastrophe’ is not defined or characterised

page 8, figure 1: axis descriptions missing.

page 8, line 9: not a surprise at all to detect an ENSO signal.

page 9, figure 2: vertical axis?

page 10, figure 3: vertical axis?

page 11, line 10ff: this is very vaguely described and not well connected to the results of the paper presented.

page 11, line 15: the jump in argumentation to parametric insurance is quite arbitrary.

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