Nonlinear Processes
in Geophysics
Discussions

EGU

Interactive comment on "Compound extremes in a changing climate - a Markov Chain approach" *by* K. Sedlmeier et al.

Anonymous Referee #1

Received and published: 23 March 2016

General: This is an interesting article examining changes in the occurrence and likely impacts of compound extremes. It addresses a problem which is not well represented in the literature, namely how frequently extreme events occur in close succession and whether there will likely be changes in the future. The method employs a novel method using a first order markov chain to describe the persistence, recurrence time and predictability of repeated extreme events. The paper is clearly written, subject to some minor corrections below, and well presented.

Specific: Section 3 discussion of results (approx L250 on), it would be good to see some comparison with other research on the persistence of extremes in different regions and possible causes. e.g. Sillmann & Croci-Maspoli 2009, Furrer et al 2010, Photiadou et al 2014. Furrer, E.M., R.W. Katz, M.D. Walter, and R. Furrer, 2010: "Statistical modeling of hot spells and heat waves." Climate Research, 43, 191-205

Photiadou, C., Jones, M., Keellings, D., Dewes, C., 2014. Modeling European hot spells using extreme value analysis. Clim. Res. 58, 193–207. doi:10.3354/cr01191 Sillmann, J., Croci-Maspoli, M., 2009. Present and future atmospheric blocking and its impact on European mean and extreme climate. Geophys. Res. Lett. 36, L10702. doi:10.1029/2009GL038259

Similarly a sentence or two comparing the reliability of different models and observations would be good - e.g. CFSR and ERA-40 can be very different. This could be in the data section.

Did you test the significance of the changes in the reference period as well as the future? How did you account for uncertainty in the results?

L338 note about relative extremes - This should really be mentioned in the method section along with how you selected the extremes (e.g. thresholds, and at which level). Possibly a table of extremes would be informative for comparison?

Technical corrections: L3 "the number of occurrences" L9 types L11 replace "which are" with "including" L12 rogue comma before fullstop. L26 occurrences L36 changes in the number of L46 should this be chaotic attractor? L107 please put into present tense to match the rest of the text. L115 ditto L145 unnecessary comma at start of line. L180 "number of states" L189&192 "Thus in the sense of successive compound ..." L216 should this be per 100 days? L245 maybe say very rare? There are a lot of extremes in that sentence. L273 highest persistence is

Figure 9 caption rogue fullstop before Percentages.