

## ***Interactive comment on “Effects of record length and resolution on the derived distribution of annual precipitation” by C. I. Meier et al.***

**C. I. Meier et al.**

jorgemoraga@udec.cl

Received and published: 29 February 2016

We thank Anonymous Referee #2 for his comments, which are addressed below in the same order as they were made:

1. We are actually not aware of any previous attempt at applying Eagleson's (1978) derived distribution analysis (DDA) in the study of the inter-annual variability of annual rainfall. The paper has been cited 195 times (per Scopus) with most applications related to ecohydrological modelling of soil moisture dynamics (and vegetation), derived distributions of runoff frequency, stochastic rainfall modelling (intra-storm or else seasonal/intra-annual variability), morphological evolution of drainage basins, and applications related to floods and urban stormwater management. Surprising as it might

C6903

seem, we do think that this is the first time that the effects of record length and resolution on the DDA have been systematically addressed.

2. Please note here that it is whole years that are resampled from the available record, so as to not seasonally bias our results. For example, when resampling 7-yr long series, we take the 25 (Concepción, CL) or 32 (Lugano, CH) year-long records, and randomly sample 7 complete chronological (Jan 1st to Dec 31st) years of storms, without replacement. In this way, we construct a “new” possible 7-yr long record, for which we test the DDA and compare it with the traditional approach of fitting a pdf to annual totals. We repeat this approach 200 times at every location, for each record length ( $n = 3, 5, 7, 10, \text{ and } 15$  years). As mentioned in the manuscript, this type of re-sampling destroys the correlation structure of annual precipitation. We did test the null hypothesis that there is no temporal correlation and it was not rejected, at both sites.

3. For brevity, we did not indicate that we only neglected storms  $< 1$  mm for the case of Concepción, but not in Lugano. This was because it was difficult to obtain the detailed storm information from paper pluviograms, for such type of events (Lugano has digital data). On average, in Concepción, the contribution of such small events to total annual rainfall is of only 4.1 mm/yr (std. deviation of 1.8 mm), so we feel this is justified. We should also mention that sadly, the original pluviograms for Concepción were lost, so that the storm characteristics for these small ( $< 1$  mm) events cannot be recovered.

4. We will indicate results from goodness of fit tests in the revised version of the manuscript, as requested by the referee.

5. Indeed, we concur that Figures 5 to 8 for the DDA (right side, plots in blue) seem to have a bias, but the reason for this is quite simple, actually: on average, the derived distributions have a very low coefficient of asymmetry, with little variability, so that distributions are almost symmetrical. Moreover, the range also has little variability. Thus, when the mode (=peak density) of each derived distribution (in blue) is smaller than the full-sample mode (either the normal in black or the derived in light green), the area

C6904

under the pdf curve at the left of the full-sample mode will have to be strictly larger than 0.5, so that the area to its right is strictly smaller than 0.5 (so that total probability is still 1). Conversely, when the peak density is larger than that for the full-sample pdfs, the reverse will happen.

6. Even though we thought this was clear enough from the title onwards, we will add a “disclaimer” to our conclusions, stressing that our results only have to do with the inter-annual variability of annual rainfall, and are thus not useful for the study of seasonal variation or the analyses of extreme, short-duration events.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 12987, 2015.