Manuscript: hessd-9-12145-2012: Hydrological drought across the world: impact of climate and physical catchment structure

Major remarks

The authors investigate certain aspects that impact the development of large-scale hydrological droughts. These aspects comprise climate, soils and groundwater systems. The impact of climate is analysed by considering the five major Koeppen climate classes. Soils are represented by the choice of 3 different soil texture types and the corresponding soil water storage characteristics: Field capacity, critical soil moisture for potential evapotranspiration and wilting point. Groundwater systems are represented by different response times of a groundwater model that is based on linear reservoir theory. For their study, the authors were using a simplified conceptual hydrological model that is forced by the WATCH forcing data.

The study is interesting and sheds some new light on the topic of hydrological droughts. The text is generally written concisely. I only have one major concern that is related to the structure of the soil moisture representation in the hydrological model and related outcomes of the study. The three different soil textures and their characteristics directly influence the soil water storage characteristics, and thus related results likely have a strong dependence on the structure of the soil hydrology scheme. The representation of the soil is rather simple in the used hydrological model, having 30 cm top soil connected to the subsoil groundwater reservoir, and a constant grassland land use with 50 cm rooting depth. This means that a very flat soil is used. But schemes with several layers going down to several meters or deeper will certainly show a different behaviour, as they even can mimic some aspects of groundwater – surface interactions. The more sophisticated a soil module is in this direction, the more a change in soil texture and associated characteristics may influence the results about the impact of soil type on hydrological drought development. With such schemes the boundary between simulated surface soil moisture and groundwater becomes blurred. Thus, the used simple scheme strongly limits the validity of the results regarding soil type/texture. This should be clearly mentioned throughout the paper, particularly with detailed information in Sect. 4.3, but also in Sect. 2 and especially in the conclusions Sect. 5.

In summary, I suggest accepting the paper for publication after minor revisions have been made.

Minor Comments

In the following suggestions for editorial corrections are marked in *Italic*.

p. 12147 – line 15
The word “well-off” seems uncommon. Replace by “prosperous” or “wealthy”.

p. 12147 – line 21
Water *security* …

p. 12149 – line 16/17
It is written:
“Despite these studies, the role of the different mechanisms governing the modifications still remains poorly understood.”

This implies that the mechanism how climate impacts the development of hydrological droughts is poorly understood, which I would disagree. I suggest rephrasing this sentence. It is more the magnitude of importance of climate in relation to the importance of catchment characteristics that is not well known.

p. 12150 – line 11
Time series of *daily* climate *data (see Sect. 2.3.1) have* been used ….

p. 12150 – line 12
… and *a* simple …

Please add information on the spatial resolution of the hydrological model. I assume it is 0.5 degree, such as the WATCH forcing data.

p. 12152 – line 2
… to *characterize the* physical …

p. 12153 – line 16/17
It is written:
… and it is set equal to a fixed fraction of the rainfall: …

Please, don't write that unspecific, and provide the fixed number you are using!

p. 12156 – line 7, 10 and other places
It is written:
… probability field of realization climate, soil and groundwater system …

This doesn't read very fluently. Please try to improve!

p. 12157 – line 16
… on a *1.125* degree …

p. 12157 – line 24-26
Sentence is difficult to read. Please rewrite!

p. 12159 – line 3
… *fields* was also…

p. 12162 – line 1-2
It is written:
… (52 to 67 times the mean daily discharge, respectively) is about twice as high as for the A- and C-climates (29 and 26 times the mean daily discharge, respectively).

According to Fig. 3c, it seems to be 0.52 to 0.67 for B and E-climates, and 0.29 and 0.26 for A and C. Please correct!

p. 12162 – line 4
… *fields* based on…

p. 12165 – line 24-25

Defining abbreviations for terms that are only used once afterwards, is not recommended (“snow_more”, ”snow_less”). Please change text accordingly!

p. 12168 – line 22
… in *reliably* simulating …

p. 12171 – line 3
Please state clearly that you considered soils mainly with respect to different soil water storage characteristics, and refer to the associated limitations of your approach (see major remarks).

p. 12171 – line 12
… all *climate conditions*. In … …lower *than, or* as …

p. 12171 – line 22
A better …

p. 12187 – Fig. 1
I would recommend the use of complete words (and not only abbreviations) within the diagram to make it easier for the reader to look at the conceptual structure.

p. 12189 – Fig. 3 and p. 12191 – Fig. 5
The circles in the panels are not explained. If they are not important, please remove them (especially as they limit the visibility of the whiskers). Otherwise you have to explain them.