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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Worldwide soil moisture changes driven by future hydro-climatic change scenarios" *by* L. Verrot and G. Destouni

L. Verrot and G. Destouni

lucile.verrot@natgeo.su.se

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There was a calculation error implying changes in Figure 4 and associated results. The changes are as follow:

L14-17: Regardless of RCP scenario, the greatest projected changes are found for the occurrence frequency of dry/wet events. Especially large increases in dry-event frequency, combined with increased inter-annual variability of dry-season water content, indicate increased drought risk for several large catchments over the world, with the considered RCP scenario determining which these catchments are.

L266-272: The greatest relative changes are found for the occurrence frequency of both dry and wet θuz events, as defined in section 2.5. The greatest of these changes are projected to occur under the scenario RCP 8.5 (Fig. 3). For this scenario, the catch-

ment Nam9 in southern US exhibits the greatest increase in dry-event frequency, by up to 15 times (1'400%) greater than that in 2006-2025; this means that this catchment may reach a 75% frequency in 2080-2099 for the dry events with only 5% frequency in 2006-2025. Under scenario RCP 2.6, the same catchment Nam9 is projected to experience a smaller relative increase in dry-event frequency, by less than 3 times (200%) greater than that in 2006-2025; this means a 16% frequency in 2080-2099 for the dry events with 5% frequency in 2006-2025. The catchment Nam9 represents an extreme case among the studied catchments; overall, across all catchments, the average (median) projected relative change in dry-event occurrence frequency is an increase of 95% (0%) under the RCP 8.5 scenario (average and median increase of 12% and -8%, respectively under the RCP 2.6 scenario).

L286-291: The greatest increase in wet-event frequency, by up to 9 times (808%) greater than that in 2006-2025, is projected for the southern Brazil/Uruguay catchment Sam3; a frequency of up to 45% may be reached here for the wet events under the scenario RCP 8.5. Under the RCP 2.6 scenario, the projected increase in wet-event frequency in this catchment is smaller, leading to a nearly 1.5 times (50%) greater frequency than that in 2006-2025 (from 5% up to 7.5% frequency in the latter period). Overall, across all catchments, the average (median) projected relative change in wet-event occurrence frequency is an increase of 2% (-8%) under the RCP 8.5 scenario (average and median increase of x% and y%, respectively under the RCP 2.6 scenario). In general, the results in Fig. 4 show that the representative GHG concentration pathway to the future, as represented by each RCP scenario, is important for the projected changes in occurrence frequency of dry and wet soil moisture events around the world.

L308-310: The relatively large changes in inter-annual soil moisture variability, in particular during the dry season, combine with the large increases in dry-event (wet-event) frequency to indicate increased drought (flood) risk for several catchments. However, the geographic change pattern shows scattered large-change catchments for both RCP

scenarios and is more heterogeneous for inter-annual variability (Fig. 6) than for dry- and wet-event frequency (Fig. 5).

L317-320: Overall, over the whole year the greatest changes are in the dry- and wet-event frequency. Seasonally, the inter-annual variability of seasonal θuz exhibits the largest differences in change direction between the two RCP scenarios; these opposite change directions are exhibited for a majority of the catchments during the dry season (44 catchments), and for almost as many catchments (40) during the wet season.

L342: 44% L343: 38%

L373-390: Projected changes are considerably greater for the occurrence frequency of dry and wet soil moisture events, and also relatively large for the average value and particularly the inter-annual variability of seasonal water content in the dry and the wet seasons of the study catchments. For the changes in the dry/wet event occurrence (Fig. 4) and in the average seasonal water content (Fig. 5), the geographic pattern variability depends on the considered radiative forcing (RCP) scenario. The greatest changes in these soil moisture aspects emerge for the RCP 8.5 scenario, with greater spatial heterogeneity under the RCP 8.5 than under the RCP 2.6 scenario. The changes in the inter-annual variability of seasonal soil water content (Fig. 6) differ from the above-described result differences between RCP scenarios in that they are more or less equally large and spatially heterogeneous over the world for both RCP scenarios. For this seasonal water content variability among years, around half of the individual study catchments exhibit opposite directions of change under the two RCP scenarios. In general, the particularly large changes in dry/wet-event frequency and inter-annual variability of seasonal soil moisture combine in implying changed flood and drought risks across the world. Especially the largest increases in dry-event frequency and inter-annual variability for the dry season under both RCP scenarios, indicate increased drought risks for several large catchments, which need to be investigated further in focused follow-up studies.

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Figure 4

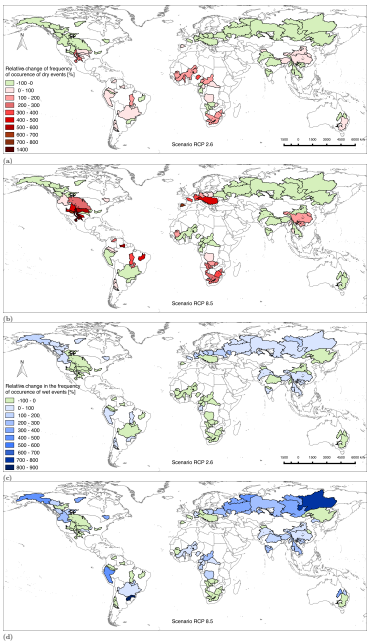

Fig. 1.