Analytical framework for screening long-time and large-scale soil moisture variability and its comparison with GRACE satellite data

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Soil moisture is a central component of the hydrologic cycle and its spatiotemporal variability offers a great challenge in assessing large-scale hydrological processes. As this variability depends greatly on prevailing hydro-climate, along with soil texture and its primarily spatial heterogeneity, soil moisture may be relatively easily constrained by large-scale water balance consideration in time and knowledge of soil property distribution in space. We have developed a relatively simple soil moisture model that relies on explicit account of spatial soil hydraulics parameters and catchment-wise organized hydro-climatic data and their variation in time. The current state of field techniques does not allow the retrieval of large-scale soil moisture data for direct comparison with model results. However, the recent GRACE satellite data provides for the first time large-scale directly comparative of large-scale water storage variability. This study compares the developed soil moisture model's ability to reproduce main variability dynamics in long-term data series of unsaturated water content and groundwater table position at the catchment scale with GRACE data, for a set of large tropical catchments.