Geophysical Research Abstracts Vol. 21, EGU2019-3900, 2019 EGU General Assembly 2019 © Author(s) 2019. CC Attribution 4.0 license.



## Is there a baseflow Budyko curve?

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There is no general theory to explain differences in baseflow between catchments, despite evidence that it is mainly controlled by climate and landscape. One hypothesis is that baseflow fraction (the ratio between baseflow and precipitation) can be primarily attributed to the aridity index (the ratio between potential evapotranspiration and precipitation), i.e. that there is a "baseflow Budyko curve". Comparing catchment data from the US and the UK shows, however, that aridity is not always a good predictor of baseflow fraction. We use the revised Ponce-Shetty annual water balance model to show that there is no single "baseflow Budyko curve", but rather a continuum of curves emerging from a more universal model that incorporates both climate and landscape factors. In humid catchments, baseflow fraction is highly variable due to variations in a catchment's wetting potential, a parameter that describes catchment storage capacity. In arid catchments, vaporisation limits baseflow generation which leads to lower variability in baseflow response. Adapting the model to explain variability of the baseflow index (the ratio between baseflow and total streamflow) shows that the aridity index is generally a poor predictor of baseflow index. While the wetting potentials and other parameters are obtained by fitting the Ponce-Shetty model to annual catchment data, their links to physical properties remain to be explored. This currently limits the model's applicability to gauged catchments with sufficiently long records.