RCM simulated and observed hydrological drought: a comparison of the 1976 and 2003 events in Europe

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Abstract High-resolution regional climate model (RCM) output has been used recently to characterize the spatial and temporal characteristics of large-scale hydrological droughts. Hence the output was interpreted in a spatially explicit manner. This study aims to test the limits of such use and investigates how spatial and temporal characteristics of two large Pan-European droughts (1976 and 2003) were simulated by flow-constituting variables derived from a high-resolution re-analysis. Observed streamflow records of the recently updated European Water Archive (EWA) served as a reference. The results show that while spatial extent and general timing of the extreme hydrological conditions were reproduced by the re-analysis, the simulated droughts were less persistent and interrupted more frequently than the observations suggested. The results support the conclusion that the usefulness of regional climate model simulations at this scale is still limited and targeted validations are required to explore the limits of interpretability in space and time.

Key words drought; streamflow; regional climate model; re-analysis; Europe