



Does the Danube exist? Versions of reality given by various regional climate models and climatological datasets

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We present an intercomparison and verification analysis of several regional climate models (RCMs) regarding their representation of the statistical properties of the hydrological balance of the Danube river basin for 1961-1990. We also consider the datasets produced by their common driving general circulation model, from the ECMWF and NCEP-NCAR reanalyses. The hydrological balance is computed by integrating the precipitation and evaporation fields over the area of interest. Large discrepancies exist among RCMs for the monthly climatology as well as for the mean and variability of the annual balances, and only few datasets provide estimates which are consistent with the observed discharge values of the Danube at its Delta. Actually, both reanalyses fail completely to capture the long-term average as well as the seasonal cycle of the water balance. Since the considered approach relies on the mass conservation principle and bypasses the details of the air-land interface modeling, we propose that the atmospheric components of RCMs still face difficulties in representing the water balance even on a relatively large scale: the upscaling procedure is not a trivial one. Moreover, since for some models the hydrological balance estimates obtained with the runoff fields are not consistent with those obtained via precipitation and evaporation, some deficiencies of the land models are also apparent. NCEP-NCAR and ERA-40 reanalyses result to be largely inadequate for representing the hydrology of the Danube river basin, both for the reconstruction of the long-term averages and of the seasonal cycle, and cannot in any sense be used as verification. We suggest that these results should be carefully considered in the perspective of auditing climate models and assessing their ability to simulate future climate changes.