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Impact of climate change on freshwater resources: an inter-basin comparison using a consistent set of climate and development scenarios

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Current analyses of the impact of climate change on basin-scale freshwater resources employ a diverse range of socio-economic and climate scenarios that complicate inter-basin comparisons. To derive a clear and quantitative understanding of the impacts of climate change on future freshwater availability, we apply a consistent range of high-resolution (0.5º x 0.5º) climate and developmental scenarios to drive a series of basin-scale hydrological models across four continents. Projections of climate change include different greenhouse gas emissions scenarios (SRES A1b, A2, B1, B2) and prescribed increases in global mean temperature (from 0.5 to 6 °C) that includes the speculated 2 °C threshold of 'dangerous climate change'. Quantitative assessments of uncertainty in predictions include inter-GCM comparisons and use of ensembles. Basin-scale simulations cover a broad range of spatial scales, climatic, environmental and developmental conditions, and comprise the Rivers Mekong and Okavango, as well as tributaries of the Mackenzie, Parana, Nile, Yangtze and Yellow rivers. In addition to changes in river discharge, simulations also assess change in freshwater storage. Preliminary results for the Nile headwaters suggest that initial increases in river flow due to increased precipitation will be negated by increased evapotranspiration once global mean temperature rises by more than 2 °C from baseline conditions.