



Global hydropower potential during recent droughts and under changing climate

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There is a strong dependency of world's electricity sector on available water resources for hydropower generation. Recent droughts showed the vulnerability of the electricity sector to surface water constraints with reduced potentials for hydropower generation in different regions worldwide. Using a global modelling framework consisting of the VIC hydrological model and a hydropower model, we assess the impacts of recent droughts and future climate change on hydropower generation potentials worldwide. Our hydrological-electricity modelling framework was optimized and evaluated for 1981-2010, showing a realistic representation of observed streamflow and hydropower generation. We assessed the impacts of recent droughts and future climate change for more than 25,000 hydropower plants worldwide. Our results show that hydropower production potentials were significantly reduced during severe recent streamflow droughts (including e.g. summer of 2003 in Europe and 2007 in the United States). Model simulations with bias-corrected CMIP5 general circulation model output indicate that in several regions considerable reductions in hydropower production potentials are projected due to declines in streamflow during parts of the year. Considering these impacts and the long design life of power plant infrastructure, adaptation options should be included in today's planning and strategies to meet the growing electricity demand in the 21st century.