Geophysical Research Abstracts
Vol. 18, EGU2016-10047-2, 2016
EGU General Assembly 2016

A north-south divide in Europe: how projected changes in water quality differ depending on climate and land management

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The key results from the application of catchment-scale biophysical models to eight river-systems across Europe to assess the effects of projected environmental change (change in climate, land use, nitrogen deposition and water use) on water quantity and quality will be presented. Together the eight sites represent a sample of key climate and land management types, and those aspects related to the Water Framework Directive were modelled: river flow, river and lake nitrogen and phosphorus concentrations, and lake chlorophyll-a. The baseline period was 1981-2010 and the scenario period, 2031-2060. The robustness and uncertainty of the models was assessed. Long-term trends and seasonal variations in all the major modelled variables were simulated well in the baseline period. Dynamic models however typically produced results with lower variance than the observations. The predicted effects on water flows differed between northern and southern sites. In the north and mid-latitudes, the increased evaporation was balanced to some extent by increased precipitation, leading to relatively small effects on flows, though seasonal effects may still be important. In the south the increased temperatures and lower precipitation act to reduce water flows considerably. In general, the projected effects of climate change on nutrient concentrations were rather small. The effects of credible land use changes on nutrient concentrations were larger. However, there were exceptions and there were considerable differences in the response between sites dependent on the mixture of nutrient sources (agriculture versus wastewater). Modelled ecological changes were not generally proportional to the changes in nutrients.