27-O Comparing simple models to predict river water temperature.

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River water temperature is controlled by the net heat flux that results from multiple processes involving the atmosphere, the hydrologic regime, and the upstream conditions of the catchment. While physically-based models are able to describe the individual processes but require a large amount of data, simpler statistical models are routinely used for long-term predictions, usually considering solely air temperature as predictor variable.
Here we test a suite of hybrid lumped models, belonging to the *air2stream* family (Toffolon and Piccolroaz, Environmental Research Letters 2015), which are derived from physical principles, rely solely on air temperature and streamflow, and are of similar complexity as standard statistical models. We refer to a dataset of 38 Swiss rivers, which includes rivers classified into four different hydrological categories: low-land natural rivers, lake outlets, snow-fed rivers, and regulated rivers. In all cases, *air2stream* models outperform statistical models in the prediction of river water temperature. Moreover, the analysis of the performances of the different versions of *air2stream* contributes to a deeper comprehension of the physical mechanisms controlling river thermal response, to a level that would be inaccessible using simpler regression-based models. An exercise of cross-validation on five windows over a 30-year period further demonstrates that the *air2stream* model is robust and can be suitably adopted for long-term analyses.

27-O 10 years of experimental manipulations to assess the response of flow alteration on river food web.

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10 years of experimental manipulations in a regulated river to evaluate the response of the food web to flow and temperature changes.
Effects of flow alteration on the aquatic biota have predominantly been reported in relation to diversity, and few studies have focused on its effect on food webs. In this study, we applied a Before After Control Impact experimental design (BACI) to determine the response of the food web to fluctuating ramping rates using stable isotopes. Carbon ($\delta^{13}C$) and nitrogen ($\delta^{15}N$) stable isotope values of invertebrates and fish were compared under restricted (2002/2004) and unrestricted (2005/2012) ramping rate flow regimes. Study control sites consisted of 3 sites on the unregulated Batchawana River and one upstream site on the Magpie River. Two sites situated below the Steephill dam on the Magpie River were considered as impacted sites, subject to ramping rate variations. The unrestricted ramping rate flow regime had little impact on the transfer of carbon through the food web as no significant differences in $\delta^{13}C$ values were found when applying BACI analysis to each trophic level of the food web. However, macroinvertebrate and fish $\delta^{15}N$ values were significantly higher in the impacted sites compared to the control sites, with the trend toward differences being greatest under unrestricted ramping rate for macroinvertebrates. The changes may result from the physiological response of organisms to water temperature changes. Food web length, calculated based on the difference between macroinvertebrate and fish $\delta^{15}N$ values, was also affected by the flow regime and was significantly shorter under the unrestricted ramping flow regime, implying a shift in the diet of fish toward lower trophic level invertebrates. Results from this study highlight the influence of ramping rates on the functioning of the lotic food web, suggesting the need for information on flow alterations to be considered in river management decisions.

27-O Assessing the impacts of pumped-storage operations.

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