

Real-time simulation of runoff and prediction of compound meteo-hydrological extreme events

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Monitoring of environmental systems is getting more popular amongst policy and decision makers. A proper environmental monitoring system simulates real-time behavior of the natural system, which is a fundamental step in the preparation for natural disasters such as floods, droughts, and compound extreme events. Using high-performance computational systems, atmospheric observations, and numerical weather predictions, we have developed a web application to provide real-time monitoring and forecasting of water components at hydrometric gauging stations. We developed an automated framework, which first, extracts the forecast time series of weather variables (e.g. precipitation and temperature) from global data providers; second, reformats and transforms extracted weather data into the input format of the Soil and Water Assessment Tool (SWAT); and third, it runs the SWAT model of the watershed on the Cloud for the next ten days. The simulated results include river discharge, soil moisture, actual evapotranspiration, and water yield can then be visualized on the geo-server. Finally, the probability of having a compound extreme event in the next ten days is calculated. Compound extreme events are simultaneous occurrences of many climatic or hydrological extremes. We tested the framework successfully in two glacierized catchments in the Swiss Alps and it can now be implemented in other regions.