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A strategy for using climate data for hydrological modelling

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Hydrological modeling is the basis for water related impact assessment and the development of management strategies. These models are driven with meteorological data such as precipitation, temperature, wind and humidity. Depending on the nature of the problem, hydrological modelers require meteorological data with a very high spatial and temporal resolution, e.g. to a few kilometers and hours. As dynamical downscaling to such a high resolution is computationally very costly, a continuous downscaling of global climate projections is not feasible for a longer time period. For BINGO, a double-tracked strategy will be implemented to cope with this problem: 1) high resolution dynamical downscaling is limited to episodes favoring hydrological extremes and 2) conditional weather generators are used to simulated large ensembles of spatio-temporal driving fields consistent with the current or projected climate. The first track requires identification of the relevant episodes from global simulations. This is realized by clustering atmospheric variables to obtain a set of circulation patterns. Episodes containing sequences of circulation patterns associated with hydrological extremes are then further downscaled and bias corrected. The second track relies on setting up a weather generator allowing to simulate all relevant variables consistent with the recent climate. We seek to establish a link between this generator and large scale atmospheric drivers to allow simulations consistent with climate projections. While dynamical downscaling is strong in simulating meteorological driving data associated with particular events, conditional weather generators simulate a broader range of events consistent with the large scale situation. The two tracks thus complement each other.