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# Higher dimensionality of hydrologic model parameters need not imply higher complexity or prediction uncertainty

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Higher dimensionality of hydrologic model parameters is often, in an ad-hoc manner, associated with higher model complexity and prediction uncertainty. We establish a formal relationship between hydrological model complexity and prediction uncertainty, where we show that higher model complexity leads to higher prediction uncertainty. We build on this relationship to demonstrate that hydrological model complexity depends not only on number of parameters but also on allowed range of parameters' magnitude. For this, we first provide an algorithm to numerically quantify hydrological model complexity within the aforementioned prediction uncertainty formalism. We then consider two hydrological model structures: Sacramento Soil Moisture Accounting Model (SAC-SMA) and SIXPAR model. Since SIXPAR model structure is a conceptual simplification of SAC-SMA and has smaller number of parameters (6 in the case of former and 13 in case of the latter), one expects complexity of the former to be lower than the latter in the case when range specification for total storage capacity and effective recession coefficient for upper and lower zones are the same (parameter range "equivalence"). We estimate complexity of these two model structures for a case when parameter ranges for SIXPAR are equivalently looser than those of SAC-SMA and find SIXPAR structure to be more complex than SAC-SMA. This suggests that complexity of a model structure crucially depends on allowable parameter ranges. Similar conclusions on complexity of ANNs and SVMs have also been cited elsewhere. We therefore suggest that an assumed one-to-one correspondence between model parameter dimensionality and model complexity or prediction uncertainty should be treated with caution.