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## SPUX - a Scalable Package for Bayesian Uncertainty Quantification

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SPUX (Scalable Package for Uncertainty Quantification in "X") is a modular framework for Bayesian inference and uncertainty quantification. The SPUX framework aims at harnessing high performance scientific computing to tackle complex aquatic dynamical systems rich in intrinsic uncertainties,

such as ecological ecosystems, hydrological catchments, lake dynamics, subsurface flows, urban floods, etc. The challenging task of quantifying input, output and/or parameter uncertainties in such stochastic models is tackled using Bayesian inference techniques, where numerical sampling and filtering algorithms assimilate prior expert knowledge and available experimental data. The SPUX framework greatly simplifies uncertainty quantification for realistic computationally costly models and provides an accessible, modular, portable, scalable, interpretable and reproducible scientific workflow. To achieve this, SPUX can be coupled to any serial or parallel model written in any programming language (e.g. Python, R, C/C++, Fortran, Java), can be installed either on a laptop or on a parallel cluster, and has built-in support for automatic reports, including algorithmic and computational performance metrics. I will present key SPUX concepts using a simple random walk example, and showcase recent realistic applications for catchment and lake models. In particular, uncertainties in model parameters, meteorological inputs, and data observation processes are inferred by assimilating available in-situ and remotely sensed datasets.