Flood hazard model calibration using multiresolution model output

Objective

High resolution physical model outputs are computationally expensive. Researchers may not have enough computational resources to formally calibrate certain model parameters. We develop an approach that incorporates multiple resolutions of outputs to calibrate a high-resolution model.

Approach

We approximate the expensive model output using information from multiple resolutions in an emulation step. In a subsequent calibration step, we compare the emulator projections to observations to infer and quantify uncertainty surrounding the `best' estimate of physical model inputs.

Impacts

Our multiresolution model calibration approach can improve inference for less sensitive model parameters with consistent meaning across resolutions. In the case study, our approach does not improve inference for more sensitive parameters that may have less consistent meaning across resolutions over traditional calibration approaches.

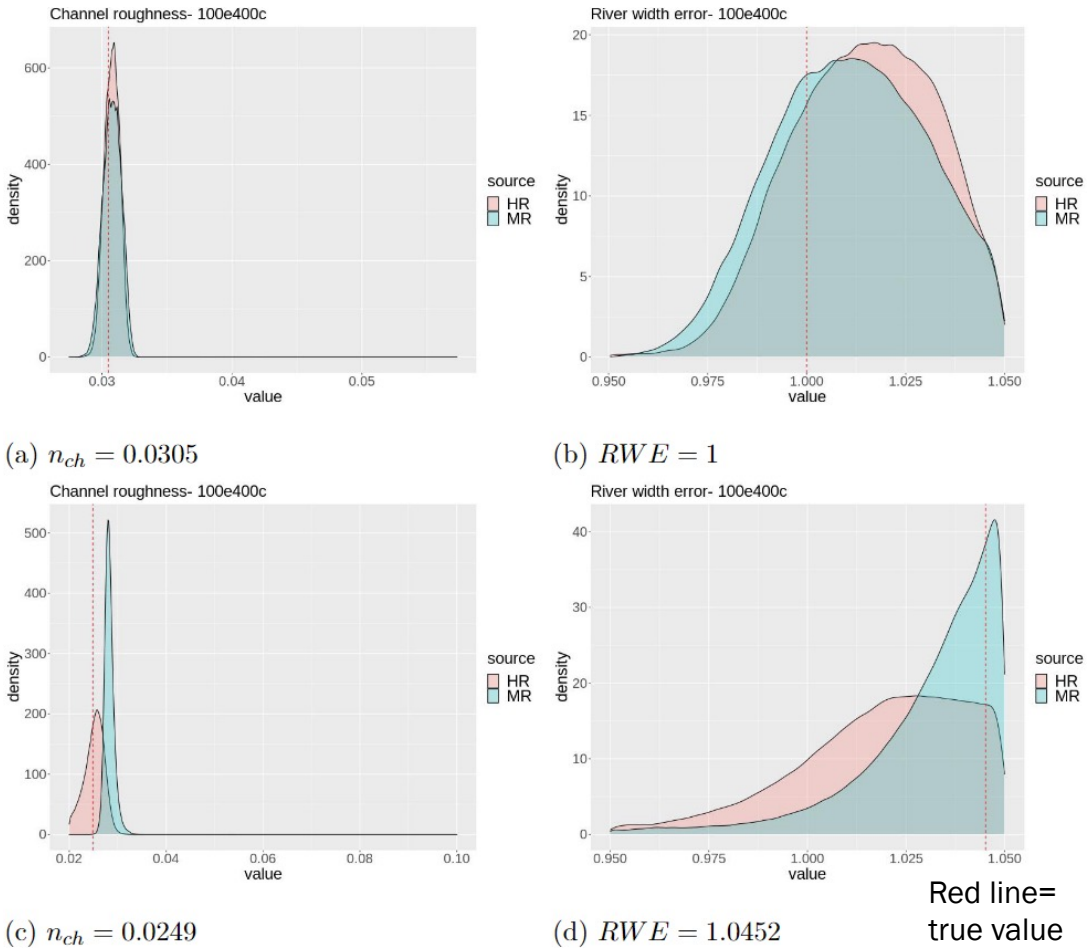

Figure: Posterior densities from each calibration approach (MR: multiresolution and HR: high resolution only) for the less sensitive (RWE: river width error) and more sensitive (n_{ch}: channel roughness) physical model parameters.

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Roth, Samantha, B Lee, S Sharma, I Hosseini-Shakib, K Keller, and M Haran. 2022. "Flood Hazard Model Calibration Using Multiresolution Model Output." Environmetrics n/a (n/a): e2769. https://doi.org/10.1002/env.2769.