ETH
Eidgenössische Technische Hochschule Zürich
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Institute of Environmental Engineering

Prof. Dr. Paolo Burlando
Professor and Chair of Hydrology and Water Resources Management

SEMINAR

Thursday, July 11, 16:00 h, ETH Hönggerberg HIL E 10.1

Dr. Giuseppe Mascaro
School of Sustainable Engineering and the Built Environment
Arizona State University, Tempe, AZ

Challenges and opportunities of hyperresolution hydrologic modeling

Abstract:

The application of physics-based distributed hydrologic models (DHMs) at hyperresolutions (~100 m) is expected to support several water-related and climate applications, but is still prevented by critical data, model validation, and computational challenges. Here, we introduce strategies to address some of these challenges through an application of a DHM at a nominal resolution of ~88 m in a regional basin of ~21,000 km^2 in Mexico. Specifically, we present an approach to increase the resolution of the hydrometeorological forcings, and techniques to calibrate the model against sparse in-situ observations of soil moisture and evaluate its ability to simulate spatial patterns of land surface temperature, using daily remotely-sensed products as reference datasets. Once we build confidence on the model, we use the hyperresolution soil moisture simulations to calibrate a statistical algorithm that is able to downscale coarse satellite soil moisture products up to scales representative of ground measurements. To do so, the algorithm reproduces scale invariance properties of soil moisture, which are found over regimes extending from a satellite footprint to 100 m. We test the downscaling approach against 1-km aircraft remote sensing products and through comparisons of downscaled satellite products to ground observations. We demonstrate that one of the opportunities of hyperresolution DHMs is the ability to support satellite soil moisture downscaling for local applications such as agricultural irrigation, flood event prediction, and drought and fire management.

For more information contact: Peter Molnar (molnar@ifu.baug.ethz.ch)