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Understanding tradeoffs between complexity and transferability in hydrologic prediction

Date: Wednesday, Sep 2nd, 2020
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Zoom link: https://cuboulder.zoom.us/j/96625614493
Zoom password: water

Abstract:

Confronted with a need for actionable, data-driven science to inform water resources policy and development in a position of incomplete observational data, a critical pursuit in hydrologic science has been the improvement of model transferability in space and time. Two opposing philosophies for achieving transferability emerge: additional detail in process representation—for example, adding a module or subroutine to capture some additional process—or a more scale-appropriate reframing of the model with an emphasis on parsimony. While more complex models may yield stronger results in the contexts to which they are applied, this approach invariably leads to a fragmented landscape of models calibrated to the specific application for which they were developed. On the other hand, an approach focusing on model parsimony necessitates a deeper understanding of the physical underpinnings of hydrologic models through confrontation of their core assumptions, conceptualizations, and parameterizations. This dissertation proposal will explore three applications of the interplay between complexity and transferability in the context of hydrologic prediction. First, an investigation into the spatio-temporally varying relationship between peak SWE and the date of snow disappearance (DSD), used as the basis in many snow reconstructions, will be conducted, culminating in a hierarchical, observationally-driven peak SWE model. Second, an application of the model will be made across the entirety of the western U.S. and Alaska to produce a spatially continuous dataset of annual peak SWE for 2000-2019, accompanied by a multi-scale evaluation among existing SWE datasets. Finally, a sensitivity analysis of channel geometry parameters in the National Water Model (NWM) in 12 hydrologically distinct basins across the US, will be made to support the development of a scale-appropriate regionalization scheme for a new channel geometry dataset.

Aaron is a Ph.D. Student in Civil, Environmental and Architectural Engineering advised by Professor Ben Livneh. After moving from Florida to Colorado in 2009, he completed his B.S. in Environmental Engineering at the Colorado School of Mines in 2014. Aaron joined the graduate school at CU in 2016, where he has focused on large-scale land surface modeling and hydrology.