Geophysical Research Abstracts
Vol. 19, EGU2017-4123, 2017
EGU General Assembly 2017

On modeling complex interplay in small-scale self-organized socio-hydrological systems

Rachata Muneepeerakul
University of Florida, Agricultural & Biological Engineering, United States (rmuneepe@ufl.edu)

Successful and sustainable socio-hydrological systems, as in any coupled natural human-systems, require effective governance, which depends on the existence of proper infrastructure (both hard and soft). Recent work has addressed systems in which resource users and the organization responsible for maintaining the infrastructure are separate entities. However, many socio-hydrological systems, especially in developing countries, are small and without such formal division of labor; rather, such division of labor typically arises from self-organization within the population. In this work, we modify and mathematically operationalize a conceptual framework by developing a system of differential equations that capture the strategic behavior within such a self-organized population, its interplay with infrastructure characteristics and hydrological dynamics, and feedbacks between these elements. The model yields a number of insightful conditions related to long-term sustainability and collapse of the socio-hydrological system in the form of relationships between biophysical and social factors. These relationships encapsulate nonlinear interactions of these factors. The modeling framework is grounded in a solid conceptual foundation upon which additional modifications and realism can be built for potential reconciliation between socio-hydrology with other related fields and further applications.