CONNECTIVITY AND GRAPH THEORY IN EARTH-SURFACE DYNAMICS:

STUDYING PROCESS, FORM AND VULNERABILITY TO CHANGE

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Networks and graphs provide a framework that allows a convenient representation of interrelations in complex systems by mapping interactions among a large number of individual components and studying their feedbacks and dynamics: nodes (vertices) identify the elements of the system and links (edges) represent the presence or strength of a relationship among those elements. Such network-type representations are common in hydrology, geomorphology, ecology, population dynamics, plant physiology, soil science, food webs, epidemiology, social sciences and transportation, to name a few. Graph theory provides a formal framework by which to study networks.

The STRESS 5 workshop focuses on exploring innovative ways for studying a suite of hydro-geomorpho-ecological problems in earth surface dynamics via graph and information theoretic approaches by exploring structural (spatially explicit) connectivity or process-based connectivity. Of special interest is the understanding of how connectivity relates to system response to change (system vulnerability), methodologies for quantifying system complexity, system typology via metrics that capture how relevant physics are projected into patterns, as well as information theoretic concepts for unraveling nonlinear dependencies and strengths among processes.

This working group meeting aims to bring together hydrologists, geomorphologists, ecologists/ biologists, as well as dynamical system theorists to brainstorm ideas on how theoretical frameworks from network dynamics and graph theory can be used to advance our understanding of many complex natural systems around us undergoing change. This is the second working group sponsored by an international virtual institute funded by NSF, Linked Institutions for Future Earth (LIFE). It is also co-sponsored by the Belmont Forum project BF-DELTAS, and by the National Center for Earth-surface Dynamics (NCED2).

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