



## **Dynamic River Networks (DRNs): a new conceptual framework for modeling spatially explicit and temporally dynamic fluxes connecting channels and landscapes**

Efi Foufoula (1), Ilya Zaliapin (2), Stefano Zanardo (3), Michael Ghil (4), Mary Power (5), and Bill Dietrich (6)  
(1) University of Minnesota, St. Anthony Falls Laboratory, Minneapolis MN, United States (efi@umn.edu), (2) University of Nevada, Reno, NV, United States (zal@unr.edu), (3) University of Minnesota, Minneapolis, MN, United States (stefano.zanardo@unipd.it), (4) University of California, Los Angeles, CA, United States (ghil@atmos.ucla.edu), (5) University of California, Berkeley, CA, United States (mepower@berkeley.edu), (6) University of California, Berkeley, CA, United States (bill@eps.berkeley.edu)

Recently, the dynamic river networks (DRNs) were proposed as a conceptual framework for modeling environmental fluxes in a river network [Zaliapin et al, JGR-ES, 2010]. In this work, we extend this framework in two directions. First, we show that the topological diversity of self-similar sub-basins of same Horton order and Tokunaga parameters does lead to extreme variability in the shape of the sub-basin width functions, which makes averaged, order-based up-scaling techniques inapplicable for the description of flux in individual basins. To further illustrate and understand this variability we perform a detailed spatio-temporal analysis of flux propagation over simulated and real fractal basins. The analysis is facilitated by the hierarchically linked width functions computed at every stream joint. This approach allows one to clearly visualize the basin's "vulnerable links" that are prone to flooding or exceed a threshold flux. Second, we demonstrate that the proposed conceptual framework opens a way for more detailed investigations related to incorporating spatially explicit dynamics, various degrees of hydrologic connectivity, and transient hydrologic conditions, all important conditions in modeling biogeochemical processing and transport in river basins.