"Spatial Ecohydrology: Pathogens, Patterns and Prospects"

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Refreshments Served

The interactions between vegetation, ecosystems and water span a multitude of temporal and spatial scales, and have implications for the sustainable use of ecosystems and management landscapes. The signatures of these interactions may also provide useful information that can be used to constrain the significant parameter estimation problems that continue to plague hydrology. In this seminar I will look at three problems that broadly relate to the spatio-temporal interactions of hydrology with ecological systems, and which are the subject of ongoing research.

In the first, hydrological fluctuations in time and space appear to pose a significant control on the spatial and temporal dynamics of a generalist plant pathogen, *Phytophthora cinnamomi* (aka 'the plant destroyer'). Are there opportunities for using ecohydrological theory to improve risk assessment, disease forecasting and management approaches?

In the second example, the morphology of vegetation spatial distributions in arid ecosystems can be reasonably well predicted using dynamical systems models that draw upon both ecological and hydrological representations. The feasibility of inverting such models in order to obtain estimates of ecological and hydrological parameters is demonstrated using a phenomenological representation, and the plausibility of extending this approach to increasingly realistic models is discussed.

The final example identifies one of the most common spatial morphologies of vegetation at landscape scales, namely organization around a geomorphological template. A minimal network model is used to explore the potential implications of a two-way feedback between water and vegetation on the upscaling of hydrological fluxes in such a landscape. Although undoubtedly a simplification, the model allows an identification of important process controls and non-trivial spatial scaling of water balances arises due to this spatial organization.