



What are the scales of variability in coupled biosphere-hydrosphere systems?

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Both hydrometeorological and hydroclimatological predictions are strongly determined by the coupling between the biological system and the moisture movement. Both these systems are controlled by processes at a variety of scales. For example, moisture uptake by roots from soil micro-pores; transpiration resulting from stomatal opening in response to photosynthesis; organization and composition of vegetation patches resulting from competition for water, nutrients, and light; and organization of ecosystems resulting from feedback between vegetation, water cycle, and the climate system. Modeling efforts have to choose the cut-off scales at both the lower and upper end of the space-time scales of these processes. The processes outside these cutoff scales are accounted for in models in a variety of ways such as parameterizations and spatio-temporal heterogeneities and trends. These lead to model and prediction errors further compounded by inherent non-linearity in the systems. In this talk I will explore the inter-linkages between the scales of variability in the coupled biosphere-hydrosphere system in order to begin addressing some basic questions regarding the relationship between process complexity and model complexity, structure and function, optimality and equifinality, etc. Illustration will be derived from new generation of vegetation modeling effort in our research group.