Hydropedology—A Perspective on Current Research

The November 2013 issue of *Vadose Zone Journal* features a special section entitled “Frontiers of Hydropedology in Vadose Zone Research,” a set of 17 peer-reviewed papers that were developed based on the presentations given at the second International Conference on Hydropedology held in Leipzig, Germany in July 2012. The papers cover a wide spectrum of topics ranging from geophysical exploration to soil–plant interactions and from soil structure formation to new modeling of water and solute transport within the heterogeneous subsurface. On the one hand, this wide spectrum reflects one of the key aspects of hydropedology, which is the bridging of various disciplines to arrive at an improved understanding of diverse soil functions mediated by water dynamics and how these are related to structure-forming processes within soils and landscapes. On the other hand, one may ask what actually is the essence of hydropedology given this broad range of topics?

In the preface of the special issue that grew out of the first International Conference on Hydropedology, it was noted that “… hydropedology has emerged in recent years as a viable interdisciplinary field of study that emphasizes interactive pedologic and hydrologic processes and their feedback mechanisms across space and time” (Lin et al., 2010). Indeed, there is a huge potential along this avenue, and the papers in this special issue attempt to build on this.

Modeling water dynamics at large scales from fields to catchments using “physically based” or more conceptual models is less and less limited by computing power. The bottleneck is to parameterize and link the required hydraulic processes and properties, including their heterogeneous spatial structure and underlying controls. This is required to provide predictive power to the models. However, it remains challenging to capture complex subsurface structure and processes, and measuring vadose zone properties directly at the required resolution is prohibitive.

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