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Hydrological and water quality system processes in soil can be accurately characterized and modeled only with the knowledge of the thermodynamic al status of the soil medium where these processes take place. Current soil water models do not fully characterize the soil structure or the thermodynamical state of the soil structure and soil water interactions. This presentation describes a new approach in characterizing and modeling soil medium and its hydro-structural behavior. A new mapping of the basic concept of Representative Elementary Volume (REV) into the concept of Structure Representative Elementary Volume (SREV) will be presented. The paradigm allows for a thermodynamic characterization of the structured soil medium and bridges the gap “between” Pedology, soil physics and hydrology. Other scale processes such as cracks and preferential paths and how they are integrated into the new paradigm will be also discussed.