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What is Hydrology?

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What is hydrology? Is it a Science, a Technology, or an Art? What makes hydrology different from hydraulics or from fluid dynamics? Hydrology is not just about the flow of water, it is about water flowing though a complex and ill-defined medium. A medium that the water itself has created and which forms the boundary condition for its circulation. Water creates its own boundary conditions in cooperation with the ecosystem that thrives on it. Understanding hydrology is understanding the interaction between water and the medium through which it flows and understanding the processes that shaped this medium. These processes have created patterns and resulted in emerging behaviour. Discovering the physical laws behind this emerging behaviour is one of the key research questions for understanding how hydrology works and why sometimes relatively simple laws apply within a highly heterogeneous and complex system. Examples are presented of emerging behaviour constraining the solution space of hydrological processes, in rivers, estuaries and in soil atmosphere interaction.

In hydrological science, models are not merely tools that people use to mimic or predict hydrological behaviour, they are the codifications of our hypotheses on the system's functioning. In the process of rejecting and accepting hypotheses, the model structure should continuously be adjusted, in line with our increased understanding. The formulation and adjustment of hypotheses, and the design of experiments in an ill-defined medium, requires creativity, inspiration and experience, which is Art as much as Science. It also implies that for research purposes we need flexible open-source models, which the researcher can create and modify himself. Consequently, established models are often useless as research tools.