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On doing Hydrology with Lions

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Humanity has always been uncomfortable with knowledge gaps. When John Cabot left Bristol harbour in 1497 to find a new route to Asia, he was trying to fill one of those knowledge gaps. World maps available to him at the time seemingly described the world in great detail. However, when inspecting such maps more closely, one could see that much of this information were just drawings of lions and other monsters, reflecting areas that were actually unexplored. It is claimed that ancient mapmakers demarcated such unknown areas with the phrase HIC SUNT LEONES, "here be lions", suggesting that exploring such areas was dangerous and undesirable. But, less than a hundred years later, such maps had changed. They now revealed large areas of white space to reflect a lack of knowledge, thus inviting exploration to discover what was beyond the edge of current knowledge. Acknowledging the unknown became a scientific goal in itself.

Hydrology is rapidly developing into a global science where both mechanistic and data-based models assimilate global datasets to predict hydrologic behaviour across continental and even global domains. Model outputs showing global maps of hydrologic variables like streamflow, soil moisture or groundwater recharge have become increasingly common. However, such maps rarely contain information about where model predictions are made with more or less confidence. Where are models producing trustworthy information and where are we showing (hydrologic) lions? What are the reasons for variability in confidence that should be considered? How can we overcome these reasons? I will explore these questions with different examples drawn from large-scale hydrologic modelling.