A better understanding of model uncertainties is possible

Mathematical models have become essential tools to quantify and manage natural risk. Model predictions are routinely used to inform decisions by policy makers, public authorities and companies - from water utilities to (re)insurers. Ever growing computing power and data availability enable the construction of increasingly complex and coupled models of human-environment interactions. Yet while these progresses make models capable (in principle) of addressing new questions, they rarely help reducing the uncertainties associated with model responses. Indeed, gaps and errors in input data and epistemic uncertainty about the best way to characterise many natural and anthropogenic processes, keeps challenging our ability to establish if a model is "valid" and trustworthy - even more so with increasing model complexity. In this talk I will review some of the methods in use to analyse the propagation of uncertainty in models, quantify uncertainty in model outputs, and attribute it to its sources (so called global sensitivity analysis). I will use example applications for floods and droughts, and other natural hazards such as landslides. I will also reflect on the methodological challenges when applying these methods to increasingly complex models, and on the practical challenges we confronted with in bringing these methods to practitioners - particularly in the water and insurance sector.