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An illustrative 'plug & play' catastrophe model for groundwater flooding

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Economic losses from natural catastrophes are substantial; e.g., US$130 billion in 2010. 'Catastrophe models' are stochastic event-set based models that simulate these risks and underpin their assessment in the insurance industry. Most catastrophe models are proprietary 'black boxes', which limit the level of user interaction, but new regulations (Solvency II) require firms to understand better the assumptions upon which the calculations ultimately rest. Part of this greater transparency requires constraining where uncertainty originates, perhaps by interchanging components provided by rival model vendors in 'plug and play' catastrophe models. The objective of this paper is to demonstrate a practical, accessible way in which this may be made possible. Specifically to do this the first, illustrative 'plug and play' model was created efficiently and effectively using OpenMI, a free 'open-source' model linking standard. In about 100 man-hours climate, groundwater flow, vulnerability, exposure and loss components were linked to output financial losses, i.e. occurrence exceedance probability (OEP) curves. Groundwater flooding near Marlborough (UK) is used for this proof of concept. Losses from this example dataset are small, about £.8 million for a 33 yr OEP, but groundwater is an important compounding factor in UK flooding and this is the first, albeit rudimentary, attempt to probabilistically model loss for this hazard. Selected components are swopped, and losses calculated to show how insights into the origin of uncertainty can be gained. Crucially, OpenMI has the future potential to operate online and shield valuable data within components whilst allowing them to be swopped. So, it has the potential to underpin a secure, open-source, practical framework of use to the insurance industry.