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The role of flooding in the occurrence of sinkholes in mantled karst setting, Orléans area (France)

Gildas Noury (1), Jerome Perrin (1), Li-Hua Luu (2), and Pierre Philippe (2)
(1) BRGM, Orléans, France, www.brgm.fr, (2) IRSTEA, Aix-en-Provence, France, www.irstea.fr

The Loire River basin is regularly impacted by sinkholes because of its specific geological context constituted of karstic limestone overlain by soft materials. Intense rainfall and associated flooding that occurred in this area in May and June 2016 triggered the collapse of tens of sinkholes. At least 20 houses, one high-traffic road, one levee of the Loire River and one highway were directly threatened. This event highlights not only the vulnerability of the area, especially in the case of a disastrous flood of the Loire River, but also an unexpected kinetic of the process. Two different types of sinkholes occurred in flooded areas: on the plateau, spectacular drop out of former natural caves is suspected; in the Loire valley, flooding is supposed to have accelerated the suffosion of alluvium by a factor of 10 000 to 20 000. This feedback bring new insights on the process dynamics that is currently being analysed in more details using an innovative internal erosion numerical modeling approach, based on Discrete Element - DEM and Lattice Boltzmann methods - LBM. A better understanding of the sinkhole formation is crucial for adequate risk management, especially in the case of a large flooding event.