

AGU FALL MEETING

San Francisco | 14 – 18 December 2015

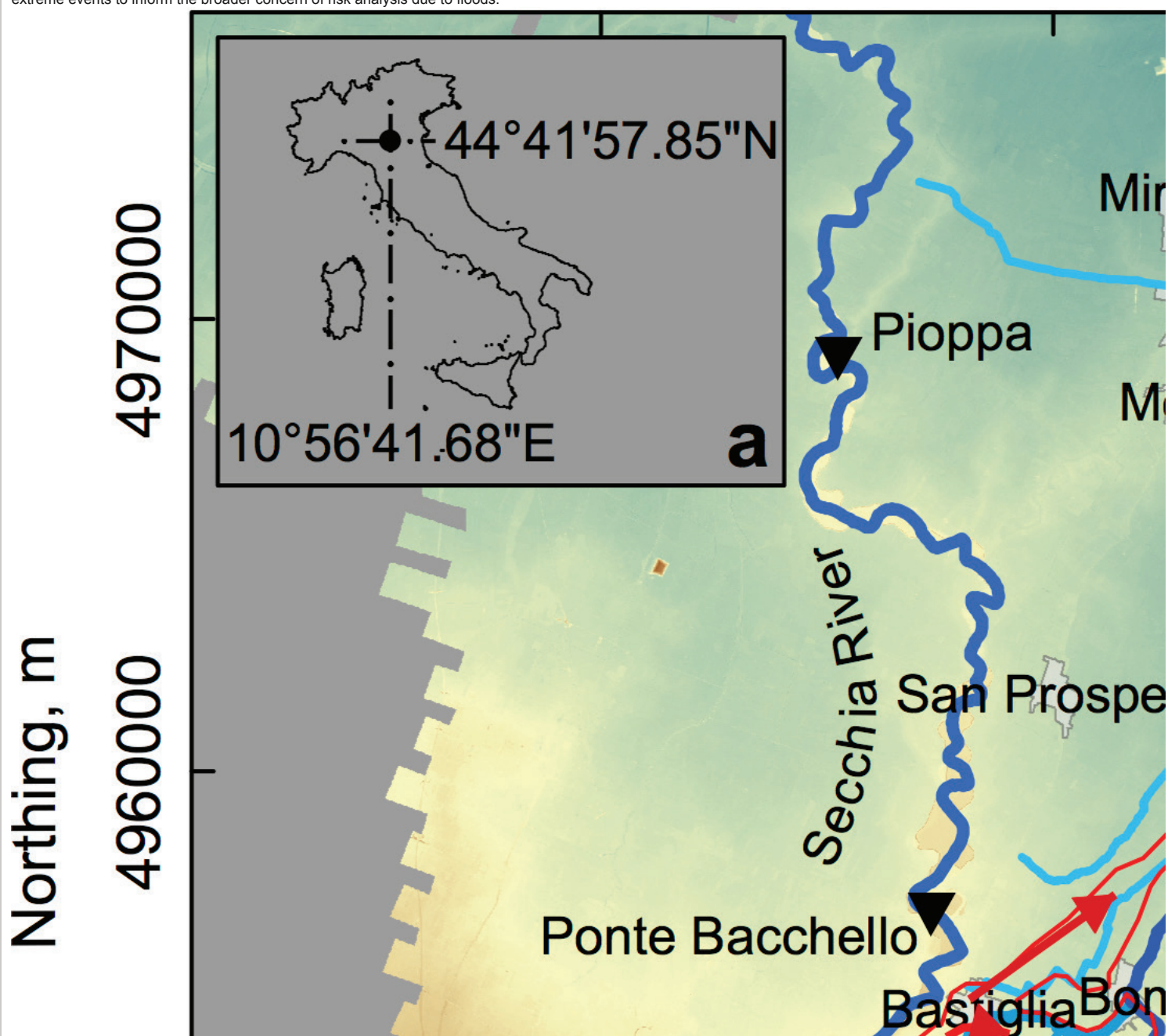
H33K-01
Evidence of an Emerging Disturbance of Earthen Levees Causing Disastrous Floods in Italy

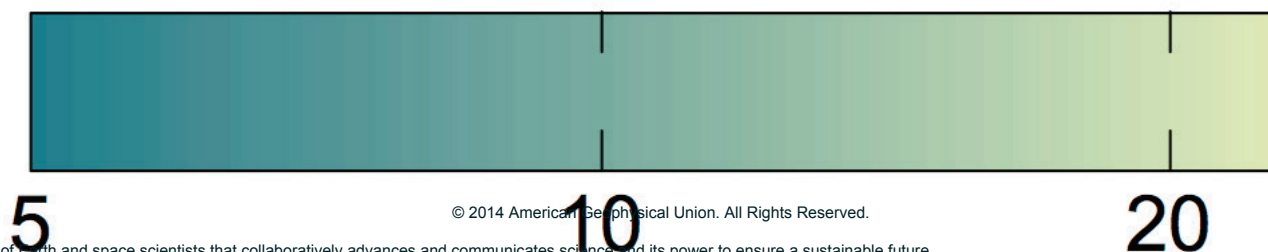
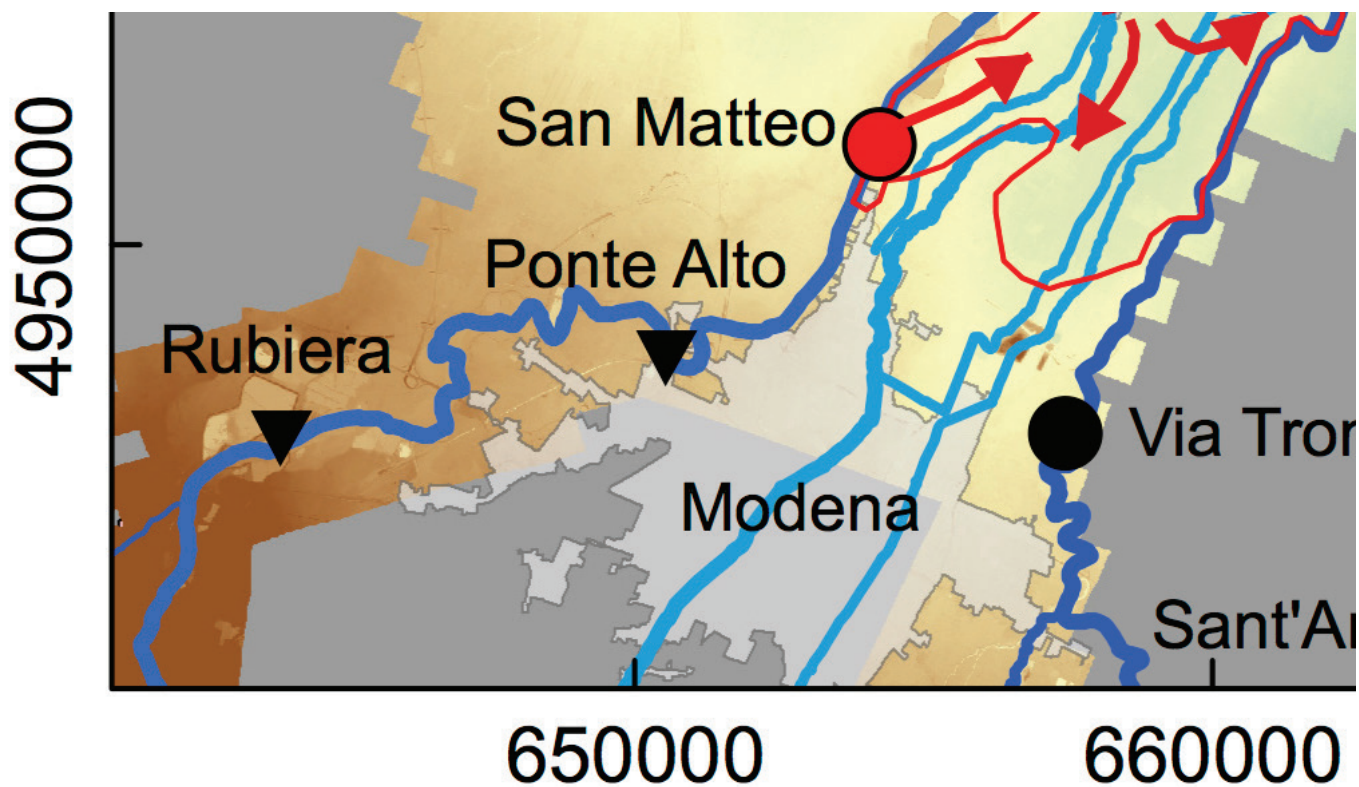
Wednesday, 16 December 2015: 13:40
3016 (Moscone West)

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Abstract:

A levee failure occurred along the Secchia River, Northern Italy, on January 19, 2014, resulting in flood damage in excess of \$500 Million (Figure). In response to this failure, immediate surveillance of other levees in the region led to the identification of a second breach developing on the neighboring Panaro River, where rapid mitigation efforts were successful in averting a full levee failure. The paired breach events that occurred along the Secchia and Panaro Rivers provided an excellent window on an emerging disturbance of levees and related failure mechanism. In the Secchia River, by combining the information content of photographs taken from helicopters in the early stage of breach development and 10-cm resolution aerial photographs taken in 2010 and 2012, animal burrows were found to exist in the precise levee location where the breach originated. In the Panaro River, internal erosion was observed to occur at a location where a crested porcupine den was known to exist and this erosion led to the collapse of the levee top. Evidence collected suggested that it is quite likely that the levee failure of the Secchia River was of a similar mechanism as the observed failure of the Panaro River. Detailed numerical modeling of rainfall, river flow, and variably saturated flow occurring in disturbed levees in response to complex hydroclimatic forcing indicated that the levee failure of the Secchia River may have been triggered by direct river inflow into the den system or collapse of a hypothetical den separated by a 1-m earthen wall from the levee riverside, which saturated during the hydroclimatic event. It is important to bring these processes to the attention of hydrologists and geotechnical engineers as well as to trigger an interdisciplinary discussion on habitat fragmentation and wildlife shifts due to development and climate pressures. These disturbances come together with changes in extreme events to inform the broader concern of risk analysis due to floods.





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