Sedimentary reconstructions of coastal flooding in the Bungo Channel by the 1707 CE Hoei tsunami

*Jonathan D Woodruff[1], Hannah Baranes[1], Kinuyo Kanamaru[1], Davin Wallace[2], John Loveless[3], Robert Weiss[4], Wei Chen[4], Timothy Cook[5]

1.University of Massachusetts Amherst, USA, 2.University of Southern Mississippi, USA, 3.Smith College, USA, 4.Virginia Polytechnic Institute and State University, USA, 5.Worcester State University, USA

A tsunami generated by the C.E. 1707 Hoei earthquake is largely thought to be the flood event of record for southwestern Japan, yet historical documentation of the event is scarce. This is particularly true within the Bungo Channel, where significant inconsistencies exist between historical records and model-derived tsunami heights. To independently assess flooding from the Hoei tsunami in this region we present complementary reconstructions of extreme coastal inundation from three back-barrier lakes in the northern Bungo Channel: Lake Ryuuoo, Lake Amida, and Lake Kamega. At all sites the most prominent marine overwash deposit of the past ~1,000 years, as defined by grain size, density, and geochemical indicators, is consistent with the timing of the 1707 tsunami, providing strong evidence that the event caused the most significant flooding of the last millennium in this region. At Lake Ryuuoo, modern barrier beach elevations and grain sizes in the tsunami's resultant deposit provide ~4 m as the first physically based height constraint for the 1707 tsunami in the northern Bungo Channel. A newly developed rupture and tsunami simulation for the 1707 event produces inundation patterns more consistent with historical and sedimentological observations in the Hyuga-nada area, including flows over the Lake Ryuuoo barrier capable of transporting the maximum grain size observed in the lake’s 1707 deposit.

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