

Geologic evidence of tsunamis in Kujukuri Geologic evidence of tsunamis in Kujukuri

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Along the northern part of the Japan Trench, the subduction of the Pacific plate under the North American plate has frequently generated tsunamigenic-earthquakes up to ~M 8.0. In contrast, the middle and southern parts of the Japan Trench were considered relatively inactive until the 2011 Tohoku-oki (M 9.0) event generated one of the largest tsunamis in recorded history. Geologic evidence from the Sendai plain revealed an event in A.D. 869 that could have forecast the severity of the Tohoku-oki tsunami in 2011. Seismic models indicate that the Tohoku-oki earthquake may have transferred stress southwards down the fault to the potentially locked southern segment of the Japan Trench (Simons et al., 2011 Nature). This scenario could produce an earthquake in the near future that would be comparable in magnitude to the Tohoku-oki event. Reconstructing the history of individual great earthquakes and accompanying tsunamis from the coastal zone adjacent to the southern trench provides an assessment of the seismic hazard for several metropolitan areas.

We have found two anomalous marine sand layers preserved in low-energy freshwater environments where they would not normally occur (i.e., present day rice paddies). The medium to coarse sand layers range in thickness from 3-10 cm, are intercalated with muddy peat, and the two upper layers can be traced 3.8 km inland and ~5 km along the present Kujukuri coastline near Sanmu City. The sand layers have features consistent with tsunami deposits found elsewhere, such as a distinct erosional base, marine geochemical signature, offshore foraminifera, rip-up clasts, normal grading, and a mud drape. Preliminary radiocarbon dating of seeds, charcoal and insect cuticles constrain the age of the upper sand to A.D. 1613 ? 1651. Possible candidates for the upper sand are the Genroku tsunami of A.D. 1703 and the Empo tsunami of A.D. 1677. The age of the bottom sand is A.D. 971 ? 1047, an age that coincides with an 11th century gap in the historical record.

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