Historical Nankai-Suruga megathrust earthquakes recorded by tsunami and landslide deposits on the Shirasuka coastal lowlands, Shizuoka Prefecture

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Future megathrust earthquakes and consequential tsunamis pose exceptional hazards to densely populated and highly industrialised coastlines facing the Nankai-Suruga megathrust. Geological investigations of coastal sedimentary sequences play a key role in understanding megathrust behaviour and developing appropriate seismic and tsunami hazard assessments. In this study, we present a multi-proxy investigation of a coastal lowland in Shizuoka Prefecture, appraising evidence for tsunamis and earthquake-triggered landslides over the last 800 years. We present the most compelling geological evidence to date for the 1361 CE Kōan tsunami, a finding consistent with either of two recent hypotheses: a single larger rupture of both the Nankai and Tōnankai regions or two smaller ruptures separated by a few days. We verify previously documented evidence for the 1498 Meiō tsunami at the site, enhancing the existing chronology with new radiocarbon dates analysed within a Bayesian framework. While previous studies documented evidence for extreme waves in 1605, 1680 or 1699, 1707 and 1854 CE, we encountered a thick sand layer rather than discrete event deposits. Lateral variability in the deposits and the occurrence of overprinting of evidence in some locations highlights the potential for geological records to underestimate the frequency of these events. We attribute the uppermost sand layer at the site to a coseismically-triggered terrestrial mass movement in 1944, a finding supported by radiometric dating and aerial photographs.

