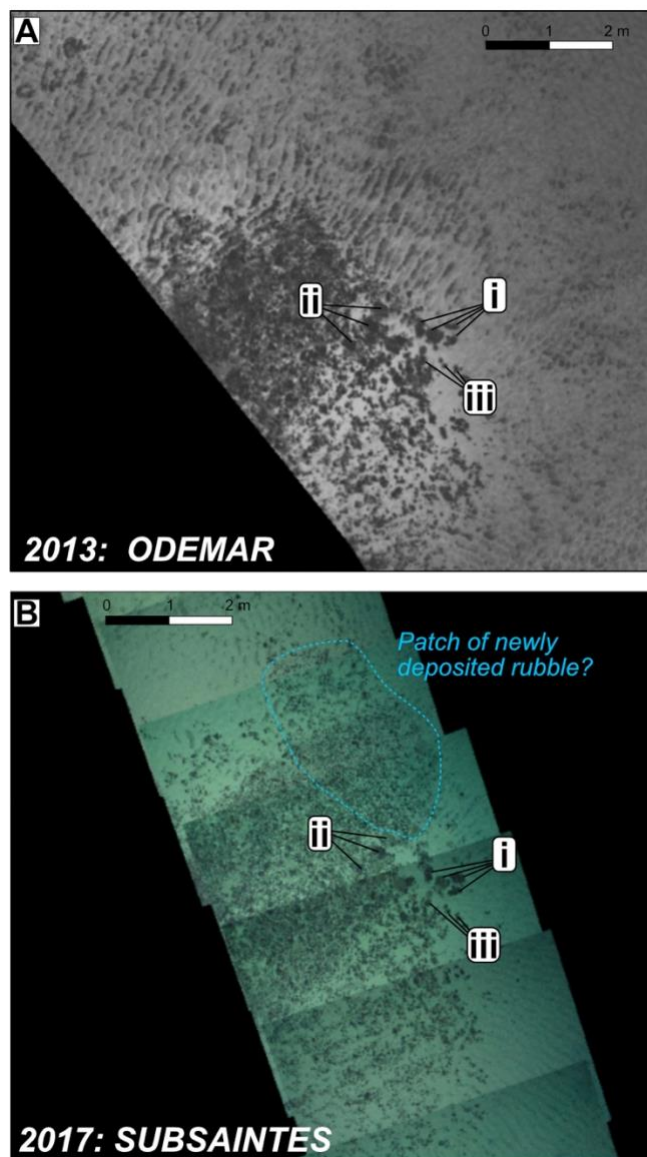
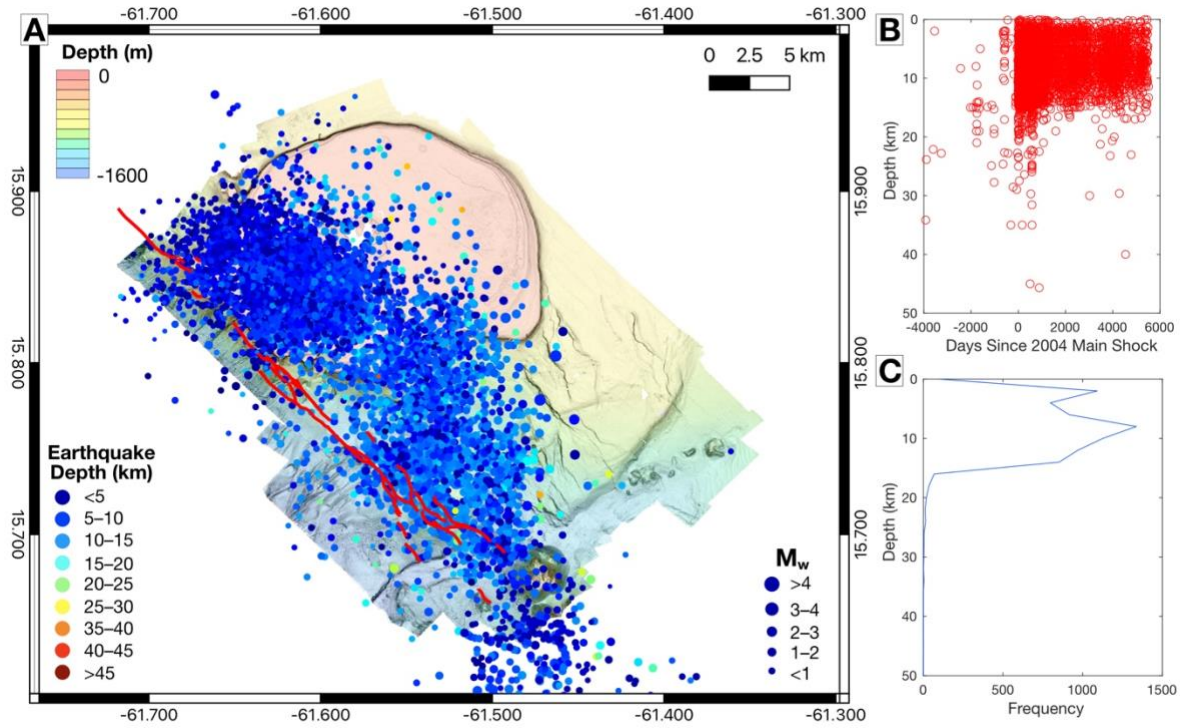


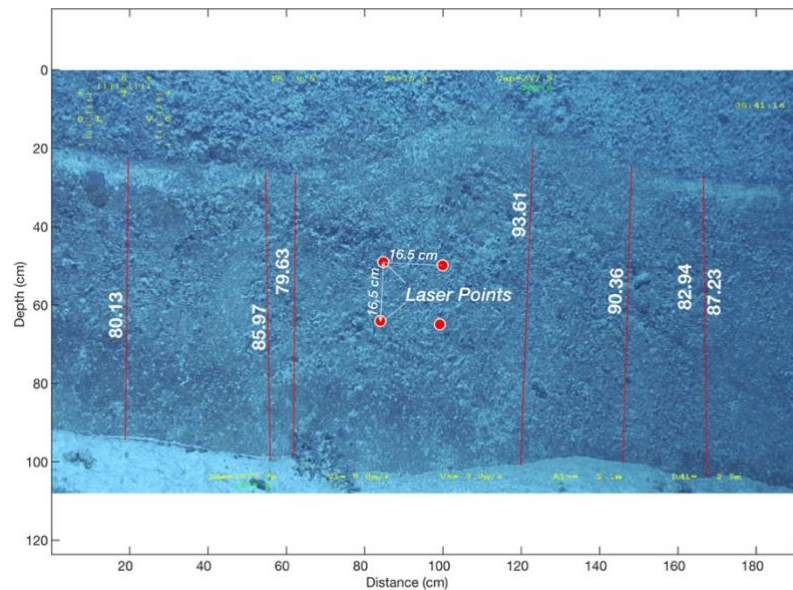
Supplementary Figure 1. Hanging wall deformation along the Roseau fault. Photomosaics from the 2013 ODEMAR cruise^{33,72} showing sediment cracks (A and B) and possible antithetic faulting (C) in the hanging wall of the Roseau fault. The white arrows in C denote the crest of a possible antithetic sediment scarp. Images are located in Figure 1C and the photomosaic is available at doi: 10.17882/95243⁷².



Supplementary Figure 2. Change in rubble location from 2013 to 2017. A) Photomosaic from the 2013 ODEMAR cruise³³ showing the location of cobbles at a catchment outlet. Roman numerals highlight individual cobbles that are also visible in B. The ODEMAR Photomosaic is available at doi: 10.17882/95243⁷². B) A photomosaic from the same area as part A from the 2017 SUBSAINTES cruise³⁴. The cobbles highlighted in A appear to be unmoved whereas a new section of rubble is visible (highlighted in the blue polygon) which is covered in rippled sediment in 2013. The SUBSAINTES photomosaic is available at doi: 10.17882/95242⁷³ and the images are located in Figure 1C.



Supplementary Figure 3. Map summarizing seismicity in the study area. A) Map of the Roseau fault (red line) showing the location, magnitude, and depth of seismicity for the earthquakes in Figure 7. Earthquakes are from the Centre de Données Sismologiques des Antilles catalogue and the seismic catalog generated by the Institut de Physique du Globe de Paris at volcanological and seismological observatories in Martinique and Guadeloupe. B) Earthquake depth evolution with time relative to the 21st of November 2004 main shock (time 0) for the earthquakes in A. C) Frequency of earthquakes with depth for the earthquakes in A.



Supplementary Figure 4. Example of displacement measured using a laser caliper. The image is a screen grab from remotely operated vehicle video footage from the SUBSAINTES cruise³⁴. A laser mounted on the remotely operated vehicle projects a square with sides of 16.5 x 16.5 cm onto the outcrop (red dots). The square is used as a reference scale for individual measurements of vertical displacement (red lines with value in white text). We report the average value of all individual measurements on one rupture and errors of one standard deviation.