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An upper bound on the rate of strain across the Messina Straits, southern Italy, from triangulation measurements between 1971 and 2004

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The earthquake (M_w 7.1) that struck the Messina Straits in 1908 was one of the largest events recorded in the central Mediterranean region. Although geodetic studies aimed at monitoring crustal motion across the Messina Straits started as early as the 1970s, evidence of active extension have since remained elusive. Recent GPS velocities results suggest that up to 80% of the observed 3.6 ± 0.6 mm/yr relative motion between the Sicilian and Calabrian domains may be absorbed in the Messina Straits region, while geological estimates of horizontal slip rate along the Messina fault show rates of about 1 mm/yr. In this study we use data from repeated measurements of a 5 km-wide triangulation network across the Messina Strait to place an upper bound on the local rate of accumulation of strain.The data used in this study are the horizontal observations of direction made in triangulation surveys conducted between 1971 and 2004 on the Messina Straits triangulation network by the I.G.M.I. (Istituto Geografico Militare Italiano). The network was surveyed in 1971, 1973, 1986 and 2004. The observed rate of angular changes was obtained from least-squares fits to the angular values at each epoch. We compared the observed angular change rates of each triangle of the network with the predicted angular change rates calculated by using the formulation of *Frank* [1966] which includes only the shear strain rates as model parameters. We sought the best-fitting values by systematically searching in the parameters space the values which minimizes the misfit function. Although the best-fit values do not differ significantly from zero, they can be used to place an upper bound on the maximum rate of strain accumulation. An upper bound of about 200 nanostrain/yr of extensional strain rate perpendicular to the Messina Straits is consistent with strain rate estimates from the wide-aperture GPS network measurements.