

Boulder accumulations produced by the 20th of February, 1743 tsunami along the coast of southeastern Salento (Apulia region, Italy)

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Abstract

The detachment of large boulders in the nearshore zone and their deposition farther inland are the main morphological effects of tsunamis on rocky coasts. Along the Otranto–Leuca coast (southeastern Apulia, Italy), two boulder accumulations have been recognized and studied. At the Torre Sasso locality, boulders weighing up to 31 t are scattered from sea level to about 5 m of elevation and clustered in groups of several imbricated elements. At Torre S. Emiliano an impressive accumulation made of large boulders has been recognized and studied. The accumulation is about 30 m wide and follows the present coastline for about 2.5 km at a variable distance of 15 to 40 m. Looking closer, it is compounded by two ridges. The ridge closer to the coastline shows a very steep slope seaward made of very large boulders emplaced in a vertical position; its top reaches about 11 m above m.s.l. The inner belt is lower than the outer one and consists of smaller boulders; it partly covers a 2 m thick colluvial deposit made of reddish sands. Huge blocks, weighing up to 70 t, cover the carved surface stretching from the coastline to the front of the first ridge. Analysis of the imbrication axes indicates that the catastrophic waves responsible for the development of the boulder accumulations most likely propagated from SSE to NNW direction.

Karstic features occurring on the surface of the innermost boulders indicate a very recent age for their deposition as no differences have been found between the aerial-exposed surface and the soil-covered one. Three AMS radiocarbon age determinations performed on marine shells found landward the boulders have accumulated recently, i.e. within the last three centuries. Moreover, archeological remains in the top layers of the colluvial deposits covered by the boulders can be referenced to 16th–17th centuries. This evidence suggests that the 20th of February, 1743 earthquake was responsible for the generation of two large tsunami waves which caused the boulder accumulations to deposit. This earthquake was particularly violent in the Salento region where it reached grade IX on the MCS scale. Interestingly, chronicles of this event record a withdrawal of the sea in the Brindisi harbour, north of the study area. This study highlights the tsunamigenic potential offshore the southeastern Salento coast requiring that further strategies be devoted to mitigate the tsunami risk.

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1. Introduction

The 2004 tsunami in southeastern Asia has tragically put in perspective how much the risk of tsunami has been neglected in coastal planning in recent centuries. Recent

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catalogues of tsunami events in different regions of the world have been compiled (e.g. for the Mediterranean area: Ambraseys, 1962; Antonopoulos, 1979; Soloviev, 1990; Tinti and Maramai, 1996; Tinti et al., 2004); they comprise more than 2000 events from the past 4000 years (Scheffers and Kelletat, 2003). Present-day research has mainly been focused on tsunami-generative mechanisms, on propagation and deformation of tsunami waves, or on the physics of tsunami run-up and inundation. In contrast, there are still few studies compiling field evidence for tsunamis throughout the late Holocene. Most of this geological research has focused on the signature of tsunamis represented by anomalous sand layers contained within lagoonal muds (e.g. Atwater, 1987). However, palaeotsunamis can also be detected by the presence of unusually sized coastal landforms, i.e. huge washover fans at the back of a sandy coastal barrier (i.e. Andrade, 1992; Gianfreda et al., 2001) or accumula-

tions of large boulders near the coastline (i.e. Mastronuzzi and Sansò, 2000, 2004). This paper attempts to infer the occurrence of past tsunamis in the southeastern Apulian region from a detailed morphological analysis of coastal boulder deposits.

2. Geological and geomorphological setting of the Apulian region

The Apulian region stretches for 350 km in the southern part of Italy, between the Adriatic and the Ionian Seas (Fig. 1). It represents the emerged part of the foreland domain of both the Apenninic and Dinaric orogens. It is constituted by a 3 to 5 km Variscan basement covered by a Mesozoic carbonate sequence thick which is overlain by thin Tertiary and Quaternary deposits. The Apulian foreland is slightly deformed and it is affected by Apenninic and anti-Apenninic trending

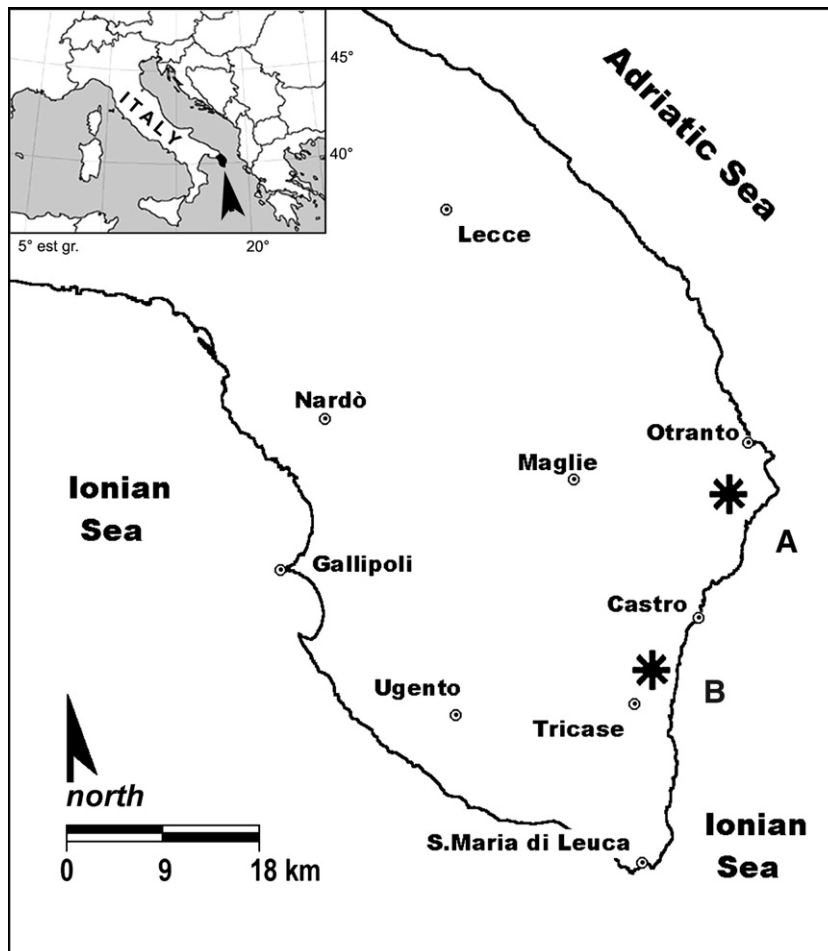


Fig. 1. Geographical position of southern Apulia. Legend: A — The Torre S. Emiliano boulder accumulation; B — The Torre Sasso boulder accumulation.

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