

Reappraising the 25 February 1695 Asolano Earthquake

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Abstract

The 1695 M_w 6.4 Asolano earthquake is the southernmost of the six largest earthquakes to have occurred in northeast Italy or nearby (the others being 1348 M_w 6.6 Eastern Alps; 1511 M_w 6.3 Friuli-Slovenia; 1873 M_w 6.2 Alpago-Cansiglio; 1936 M_w 6.1 Alpago-Cansiglio; 1976 M_w 6.4 Friuli). The 1695 earthquake is generally associated with the Montello thrust, with most recent studies locating it on the eastern slope of Montello Hill. A full-scale reappraisal of all available historical data leads this study to a more robust macroseismic localization of the 1695 earthquake and to open toward other possible locations of the seismic source that produced it. In particular, it becomes feasible to place its epicenter at the foothills of the Monte Grappa massif, the major morphological expression of the Bassano–Valdobbiadene thrust fault. Here, we describe the reasons that make this fault a possible alternative to previous hypotheses.

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[Supplemental Material](#)

Introduction

The seismic history of northeastern Italy includes several strong earthquakes that are concentrated in the Friulian sector of the Venetian Prealps and were studied in depth by several authors in the wake of the 1976 Friuli earthquake. In the Treviso sector of the Venetian Prealps, knowledge of the seismic history is limited to several earthquakes of moderate energy (which occurred mostly in the 1800s) and a single strong earthquake (M_w 6.4), which occurred in 1695. The latter is the second largest of three $M_w > 6.0$ earthquakes located by the Italian catalog (Rovida *et al.*, 2022) in Regione Veneto, one of the main administrative districts of northeastern Italy (Fig. 1).

The area most damaged by the 1695 earthquake was a hilly strip between the Prealps foothills and the Venetian plain, along an active fold-and-thrust belt where a large part of the Adria-Alps approximately north–south convergence is accommodated (Serpelloni *et al.*, 2016). A rural backwater in 1695, this territory became attractive for foreign tourists in the late 1800s (British poet Robert Browning and explorer Freya Stark settled there), and since the 1960s it has turned into one of the foremost manufacturing and industrial districts of northern Italy. The achievement of reliable seismic hazard assessments and seismic risk estimates for this area makes it advisable to improve our understanding of its main earthquake, the epicentral location of which is still debated. For this reason, we carried out a deep study of the 1695 earthquake, starting with a revision of its previous studies and of the local history publications of the last 20 yr. By systematically assembling and critically analyzing all references and quoted sources,

we retrieved a number of contemporary records that had not been taken into account by previous studies. We assembled all available data in an updated database from which we were able to reassess intensities in a homogenous way, draw up a new macroseismic map, and derive a new set of epicentral parameters for the 1695 earthquake.

Seismological and Geological Context

The study area (box in Fig. 2 inset) belongs to the Venetian Eastern Southern Alps. It is part of the south-southeast-verging fold-and-thrust belt, named the Southern Alps, formed during Neogene times by indenting one continent into another (continent–continent collision). The geometry of the fold-and-thrust belt is that of an imbricate fan with a shortening of at least 30 km (Doglioni, 1990, 1992). The main thrusts, from the internal parts to the foreland, are the Valsugana, Belluno, and Bassano–Valdobbiadene thrusts (VS, BL, and BVT in Fig. 2), the latter being associated with a morphological relief of ~1200 m above the plain known as the Pedemountain flexure.

The southernmost front of the Venetian Eastern Southern Alps—now mainly buried under the alluvial deposits of the Venetian plain and sealed by Late Miocene to Quaternary deposits (~7–2.5 Ma; Fantoni *et al.*, 2002)—consists of the Thiene–Bassano–Cornuda thrust (TBC in Fig. 2) and the

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