



Vesuvius: Earthquakes from 1600 up to the 1631 eruption

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ARTICLE INFO

Article history:

Received 28 May 2010

Accepted 25 November 2010

Available online 7 December 2010

Keywords:

Vesuvius

earthquakes

1631 eruption

seismic long-term precursors

ABSTRACT

This study examines the seismicity of Vesuvius in the decades leading up to the great eruption of 16th December 1631. The period 1600–1631 is analyzed with the aims to point out any long-term seismic precursor of the eruption. The historical research has focused on contemporary Neapolitan memoirs and a large screening of diplomatic correspondence from the main Italian courts of the age (Florence, Mantua, Parma, Venice and the Vatican). Information was gathered on 18 earthquakes that were felt in Naples between 1601 and 1630. These data were listed with the sequence of 34 shocks that took place in November and December 1631, that preceded the beginning of the eruption. The 52 seismic events that have been highlighted overall are unknown in the parametric catalogues of Italian historical seismicity and 17 are unknown even in the scientific literature. The authors' view is that it makes little sense to talk of one single previous seismic precursor in this case, given the frequent seismic sequences and tremors noted by contemporaries from January 1616 onwards. The present state of knowledge suggests that seismic activity is a strong, early and persistent warning sign of an eruption of Vesuvius, of the same type as that of December 1631.

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1. Introduction

In this study we consider the problem of the seismicity of Vesuvius. By and large it is a neglected topic and puzzling to the historian in view of the Neapolitan cultural context. We focused on seismic events between 1600 and 1631 originating in the Vesuvian area, mentioned in historical sources of the day and leading up to the 16th December 1631 eruption.

The most famous earthquake connected to an eruption of Vesuvius occurred in 62 AD. Several authors (Marturano and Rinaldis, 1995, 1998; Scandone and Giacomelli, 2007; Cubellis et al., 2007) have taken it to be a long-term precursor of a Plinian eruption in 79 AD. Ancient sources recall that the earthquake did severe damage to the cities around Vesuvius, especially in Pompeii and Herculaneum, and minor damage in Naples and Nocera (see Guidoboni et al., 1994, pp. 196–210; CFTI4Med: Guidoboni et al., 2007). Pliny the Younger (1st century AD, ed. 1963) also reported that many other minor tremors were felt just prior to the 79 AD eruption, to the extent that people became injured to the shocks.

We wondered whether a similar earthquake, as yet unknown in the literature, might have preceded another major Vesuvian eruption, that of 16th December 1631, which has been fully studied from a volcanological and historical standpoint (Rosi et al., 1993; Rolandi

et al., 1993; Marturano and Scaramella, 1997; Bertagnini et al., 2006; Guidoboni, 2008) and taken as a model for Vesuvian activity to come.

The seismic activity that preceded the eruption on 16th December 1631 is known from treatises of the time, but accounts only refer to events shortly before the eruption started (Bertagnini et al., 2006; Guidoboni, 2008; Sandri et al., 2009; Nazzaro, 2009; Ricciardi, 2009). What about the years before that? Did earthquakes occur, and if so, of what type? Our research aimed to reconstruct the seismic pattern of the area around Vesuvius over the three decades leading up to the 1631 eruption.

2. Research aim and method

The purpose of this study is to highlight, from a historical point of view, the seismic events occurring in the Vesuvian area from 1600 up to the eruption of 16th December 1631, unknown in current catalogues and studies. We asked ourselves the following questions: was there significant, prolonged seismicity before the eruption? Was there a stronger earthquake which could be identified as a long-term “precursor” of the 1631 eruption? The studies available on the 1631 eruption (in particular Bertagnini et al., 2006; Guidoboni, 2008) have examined the phenomena which occurred up to six months before the eruption. Was there, however, any relevant seismicity in the years leading up to the eruption? We chose this period to get a broad sweep of Vesuvian seismicity, screening out the local effects of distant earthquakes.

The first sources to be examined were Neapolitan memoirs written at the time by eye-witnesses. We restricted the search to authoritative,

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contemporary texts. Over the first thirty years of the 17th century in Naples there was a vast production of political and institutional reports, but not that many private diaries or local memoirs. Where the latter existed they nearly always remained in manuscript form, confined to noble families or written by clergymen. Hence many such texts have gone astray. Some, however, were copied into the work by Bonito (1691a,b,c). However this great work was too erudite, complex and intricate to be properly used by Baratta or later earthquake cataloguers. For the years that concern us Bonito's work contains data of exceptional interest, especially regarding the small Neapolitan earthquakes, given that he himself was from Naples. He had access to manuscript diaries and family memoirs penned by noblemen and churchmen – sources that have now vanished but which were in some cases copied faithfully into his repertoire. For a number of earthquakes this enabled us to adopt his dating and use it as a starting point to seek confirmation in other records and archival sources.

With regard to archival sources, we conducted extensive screening of unpublished documentation regarding the correspondence of ambassadors and diplomatic agents resident in Naples who worked for the main Italian courts of the age. The broad object of the search was earthquakes and volcano activity in the region of Campania. Our research extended to correspondence kept in the State Archives at

Florence, Mantua, Parma and Venice, as well as the Vatican Secret Archives (Fig. 1). This material was not only fresh, but also authoritative. In all, many hundreds of hand-written letters were perused before two were selected as pertaining to our study.

3. Results

Information was gathered on 18 earthquakes felt in Naples between 1601 and 1630. In order to complete the outline of knowledge, the 34 shocks felt in November and December 1631 were also listed (known in the literature, Guidoboni, 2008) – events that referred to the area of Vesuvius and which led up to the eruption that started on December 16th.

The earthquakes we examined are unknown in the parametric catalogues of historical Italian seismicity as abridged in today's reference catalogue (CPTI, 2004). The thresholds of epicentre intensity and magnitude of this catalogue are: $I_0 \geq V-VI$ grade MCS, $M_s \geq 4.0$. Nevertheless, even within these thresholds the catalogue is not complete, and in terms of the specific details for the period and area examined by us here, this catalogue lists only one earthquake, that of 17th December 1631 (I_0 VII MCS) hence after the eruption had started (perhaps a mistake in the date of the day). No specific



Fig. 1. Places of the archives where the unpublished diplomatic correspondence written from Naples and sent to the chancelleries of the main Italian courts of the 17th century is preserved.

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