

# The 1748 Montesa (southeast Spain) earthquake – A singular event



E. Buforn <sup>a,b,\*</sup>, A. Udías <sup>a</sup>, C. Sanz de Galdeano <sup>c</sup>, S. Cesca <sup>d</sup>

<sup>a</sup> Dpto de Geofísica y Meteorología, Universidad Complutense, 28040 Madrid, Spain

<sup>b</sup> IGEO, UCM-CSIC, Madrid, Spain

<sup>c</sup> Instituto Andaluz de Ciencias de la Tierra (CSIC - Univ. Granada). Fac. de Ciencias, 18071 Granada, Spain

<sup>d</sup> GFZ German Research Centre for Geosciences, Potsdam, Helmholtzstrasse 7, 14467 Potsdam, Germany

## ARTICLE INFO

### Article history:

Received 8 June 2015

Received in revised form 31 August 2015

Accepted 4 September 2015

Available online 18 September 2015

### Keywords:

Historical seismicity

Damages

Intensity

Synthetic accelerations

SE Spain

## ABSTRACT

The Montesa earthquake of 23 March 1748 in southeast Spain caused heavy damage and was felt over a wide area. It occurred in a region considered of low seismic hazard where few large earthquakes have happened. The abundant contemporary documentation about the damage caused by the earthquake, especially to the castle of Montesa and the city of Játiva, allows a re-evaluation of the seismic intensity distribution giving a maximum intensity  $I = IX$  (EMS-1998). The focal parameters are estimated as: origin time 6 h 30 m local time, epicentre 39.00°N 0.64°W, and magnitude 6. The spatial distribution of ground acceleration derived from intensity values is modelled on a very shallow bilateral rupture of 10 km length with strike 60°, dip 45°, and rake 90°. This source orientation agrees with the faults present in the area.

© 2015 Elsevier B.V. All rights reserved.

## 1. Introduction

The traditionally known as “The Montesa earthquake of 1748” took place in the south-eastern region of Spain, caused heavy damage, and was felt over a wide area (Fig. 1). The name refers to the famous Castle-Convent of Montesa which was totally destroyed by the quakes. The main shock occurred on the 23rd of March and was followed by a series of aftershocks, the largest on the 2nd of April. Despite the many contemporary documents with descriptions about this earthquake, the only detailed seismological study is that by Bisbal Cervelló (1984, 1995) which only analyses the damage it caused. Most earthquakes in the Iberian Peninsula are of moderate magnitude ( $M < 5$ ), and large shocks ( $M > 6$ ) occur separated by very long time intervals (Buforn et al., 1988). Studies of historical earthquakes are therefore very important to be able to assess seismic hazard. In southern Spain, the three best studied large historical earthquakes are those of Málaga (1680) (Goded et al., 2008), Torre Vieja (1829) (Canales-Martínez, 1999; Muñoz and Udías, 1991), and Arenas del Rey (1884) (Udías and Muñoz, 1979). These earthquakes had maximum intensities of IX or X. They were all located south of the Cádiz-Alicante fault system (Fig. 2a). The Montesa earthquakes occurred outside this system, to the northeast. Today, the area affected by the earthquake has a high level of industrial and tourist

development, including the city of Valencia and other important towns such as Alcoy, Gandía, Játiva/Xátiva and Onteniente/Ontinyent (double names correspond to the Spanish and Valencian languages) (Fig. 1a, b).

We consider the Montesa earthquake to be a singular event because it occurred in an area with low seismicity, where in the past very few large earthquakes had occurred. According to the Spanish Seismic Code (Norma, 2002) this area is considered to be of low seismic hazard with a characteristic acceleration of 0.07 g for a return period of 500 years. Recently, the Instituto Geográfico Nacional (IGN) has re-evaluated this figure using probabilistic seismic hazard assessment (PSHA), assigning the PGA a value of 0.16 g at Montesa, Játiva, and Estubeny, the places suffering the greatest damage in the 1748 earthquake (Martínez Solares et al., 2013). The occurrence of recent damaging earthquakes, such as those of L'Aquila (2009) or Haiti (2010), in regions considered to be of low seismic risk, but where in the past large shocks have occurred, highlights the importance of carrying out detailed studies of historical seismicity in this type of regions. In this paper, we present a re-assessment of the damage caused by the 1748 Montesa earthquake using contemporary documents with a detailed study of the damage caused at the Castle of Montesa and in Játiva, the largest town affected by the quake, and a re-evaluation of the seismic intensities. We estimated the focal parameters from known geological features and the intensity distribution and, using an empirical correlation, the distribution of ground acceleration in the region. Finally, we propose a rupture source model based on the intensity distribution and geological features.

\* Corresponding author at: Dpto de Geofísica y Meteorología, Universidad Complutense, 28040 Madrid, Spain.

E-mail address: [ebufornp@ucm.es](mailto:ebufornp@ucm.es) (E. Buforn).

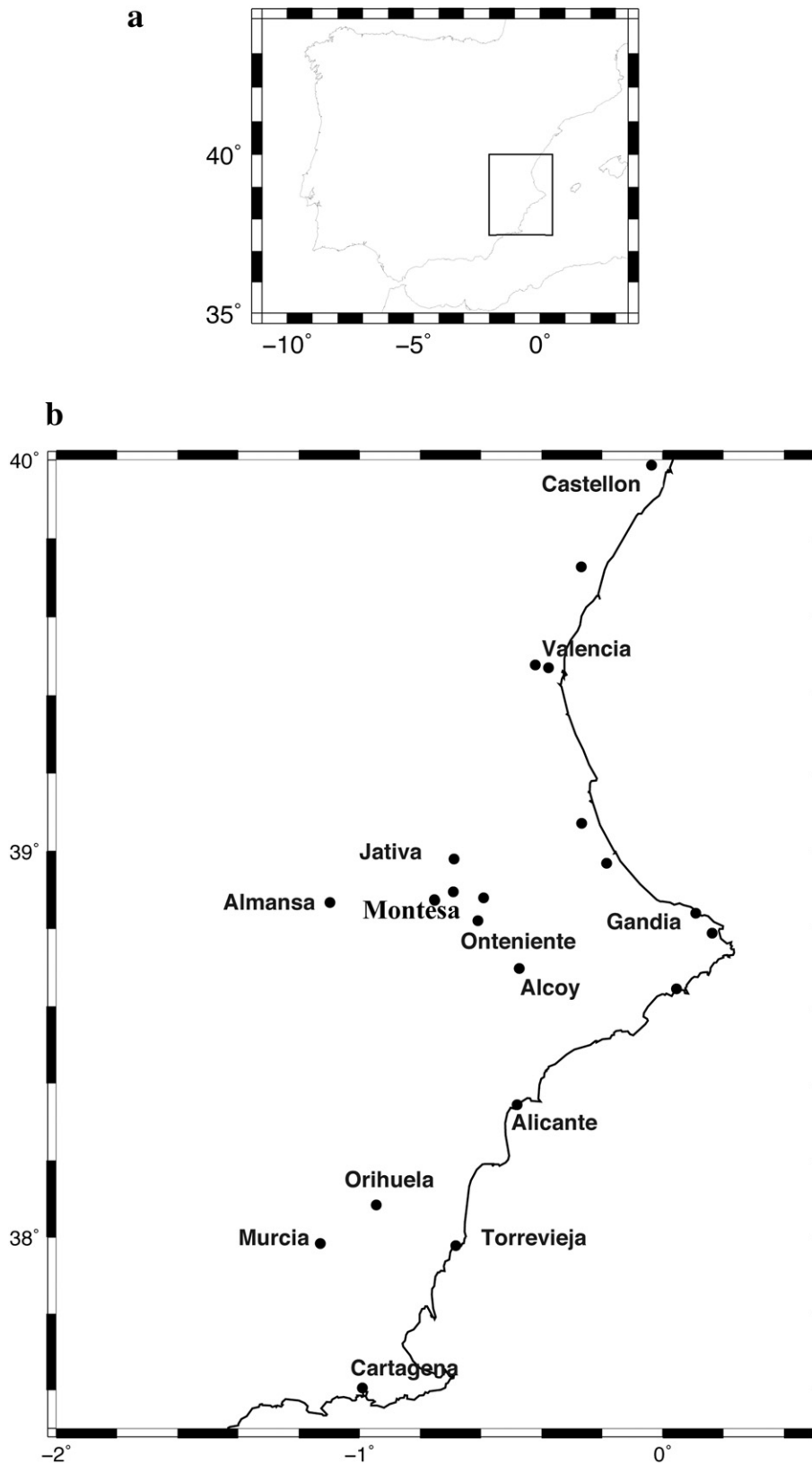


Fig. 1. Map of Spain. The studied region is marked as a square (a). Location of cities, towns and villages affected by the earthquake of 1748 (b).

## 2. Geological setting

The area affected by the Montesa earthquake is located in the SE part of the Iberian Chain, near the Pre-Betic Domain (External Zone of the

Betic Cordillera). For this reason the southern part of the sector presents structures, mainly folds, of NE–SW to ENE–WSW direction, while in the northern part there are folds of predominantly NNW–SSE direction corresponding to the Iberian Chain Domain (Fig. 2a). Besides the cited

Download English Version:

<https://daneshyari.com/en/article/6433590>

Download Persian Version:

<https://daneshyari.com/article/6433590>

[Daneshyari.com](https://daneshyari.com)