We present an archaeoseismological study in La Tira del Lienzo (Totana, Spain), that the Argar archaeological group (2200–1550 BC). It is located on the Alhama de Murcia fault zone (AMF), responsible for the 11/05/2011 Lorca earthquake.

ARCHAEOLOGICAL DATA

The first human presence in the site is dated 2050 cal BC and the final abandonment of the village took place around 1600/1550 cal BC (Lull 1983; Lull et al., 2011a). We focus on the second phase of occupation of the site (1900-1550 cal BC). The architectural features consist of rectangular rooms with walls made up of irregular stones blocks of decimetric size (figs 2 and 3 Lull et al., 2011b).

GEOLOGICAL SETTING

The AMF is a N45°-50° sinistral strike-slip fault with a reverse component, coherent with the NW-SE convergence between the Eurasian and the African plates (Silva, 1994; Martínez-Díaz, 1998). Several historical earthquakes of intensities VII occurred in the zone. The stronger instrumentally recorded event occurred in Lorca on 11th May 2011 (Mw = 5.2; López-Comino et al., 2012). Palaeoseismic studies on this fault have characterized its activity, reporting estimated lateral slip-rates of 0.21 mm/yr for the last 130 ka (Martínez-Díaz et al., 2003).

INTRODUCTION

The type of construction used in the studied site is not considered in the classification of Earthquake Archaeological Effects (EAEs) proposed by Rodriguez-Pascua et al. (2011), but we have used it as a guide to describe those recorded in the site. As a result, we describe new types of EAEs according to the constructive typology. Moreover, we suggest a potential earthquake occurred between the start of the second archaeological phase of occupation (1900 BC) and the present and we obtain an slip rate of c. 0.03 mm/yr for the AMF based on the observed displacements in the archaeological remains.

RESULTS AND DISCUSSION

Proposed new EAE using Rodríguez-Pascua et al. (2011) classification as a guide:

1. Fractures on the rocky floor
2. Fractured blocks in the walls

EAE according to Rodríguez-Pascua et al. (2011) classification:

1. Seismic uplift
2. Displaced wall

Wall's age = 1900 cal ANE


Measured offset = 12 mm (fig. 2)

Minimum lateral displacement = 0.03 mm/yr aprox.

Observations:

Fractures on the rocky floor and in the blocks conforming the walls, have two main dominant orientations of fracturing (NE-SW and NW-SE; fig. 3). The main orientation of fracturing (NE-SW) coincides with AMF direction (fig 3).

One floor-fracture continues towards the NE as a ground uplift (classified as seismic uplift). Both features are aligned with the lateral displacement of the wall, leaving one part of the wall at each side of the fracture (fig. 2a).

Although the direction of the fractures in the blocks follow the same pattern as mentioned above, fractured blocks alone cannot be considered a robust evidence of coseismic deformation. For a coseismic origin, several fractured blocks assembled in the vertical plane would be expected.

Thus, when the position of the fractured blocks do not coincide with fractures on the floor and/or ground uplift, other natural causes cannot be rejected (e.g. gravitational collapse of the hill or thermic contrast).

Alhama de Murcia fault