



Lichenometry dating of rock collapse related to the great Lisbon Earthquake (1755) at the SE part of Spain

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ABSTRACT: “De una montaña, se desprendió una parte” (A large part of a mountain has fallen down). This sentence was extracted from an ancient text written at the end of the 18th Century, in relation with the great Earthquake of Lisbon in 1755 (Martínez-Solares, 2001), and describing the rock collapse recorded near the small town of Agramón, 50 km southeastward of Albacete city (SE of Spain). Up to now, archaeologists have suggested this rock collapse to the archaeological site of “El Tolmo de Minateda”, a small butte (420 m long) of calcarenitic sandstone bedrock with a flat top and scarp cliffs (20m high) bordering the butte. This ancient city was habited by several civilizations from Bronze Ages to modern times (i.e. Iberians, Roman, Visigoths, Muslims, Medieval ages, etc.). The landscape of this area is characterized by a flat terrain with isolated relict structural buttes consisting of Late Neogene marine sandstones created by differential erosion. The site exhibits three different stages of massive rock collapse. The oldest is located at the north of the site while the younger is located at the south part of the site and affecting Visigothic stone carved tombs. Archaeologists have postulated that the youngest of these was triggered by the Lisbon earthquake of 1755. We have carried out a lichenometric analysis over the free-faces of the rock blocks, with the aim of testing the postulate. For our purpose, we have calculated the calibrated growth curve for *Aspicilia Radiosa* (Hoff.), which yields a linear growth of 0.2425 mm per yr ($R^2 = 0.97$, $N=20$). This growth rate was determined for the time interval from 800 BP yrs to the present by two different approaches: (1) rates obtained from cemetery measurements (200 yrs BP) and (2) rates determined from well-dated archaeological monuments (200-800 yrs BP). Our analysis revealed that the age of the rock-falling was in the year 1754 AD ± 4 . Thus, our results confirm that this collapse of ca. 5000 m³ of volume was triggered by the great Lisbon Earthquake of 1755, suggesting an ESI macroseismic intensity ranging between VII and VIII (Michetti et al., 2007) from a locality located 660 km eastward away from the city of Lisbon. This value is in contrast with the EMS intensity of V-VI estimated by Martínez-Solares (2001).

Martínez-Solares, J. M. (2001): Los efectos en España del Terremoto de Lisboa (1 de noviembre de 1755). Ed. Dirección General del Instituto Geográfico Nacional. Madrid. 756 p. (In Spanish).

Michetti, et al. (2007): Intensity Scale ESI 2007. Memoria Descriptiva Carta Geologica Italiana, 74: 41.