

## ***Interactive comment on “Tsunamis boulders on the rocky shores of Minorca (Balearic Islands)” by Francesc X. Roig-Munar et al.***

**Anonymous Referee #2**

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### General comments

The Authors show several data on boulders deposits on Minorca Island concluding that they were emplaced by tsunamis. The paper could be interesting but methods and results are not well presented, and there are some observations contradicting the conclusion. Therefore, I suggest improving the manuscript showing missing information and reformulating the conclusion.

My first remark regards data presentation. The Authors do not describe the study sites and their surroundings: a map with western Mediterranean area showing seismogenic sources and earthquake distribution would help to understand the location of tsunamigenic areas around Balearic Islands. Moreover, why do you exclude Iberian earthquakes from tsunamigenic sources? No information is shown on tidal range, wave

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regime, geology and tectonic setting (did your sites undergo to uplift or subsidence?).

My second remark concerns the data on the maximum wave heights related to historical tsunamis that hit the Minorca Island. Authors show in Table 1 tsunamis observed in the Balearic Islands and their surroundings in the last four centuries, while in Figure 2 tsunami from northern Algeria affecting Balearic Islands modelled by Roger and Hebert (2008). Both show maximum wave heights of 2 m and the May 21, 2003 tsunami was 3 m high; it had the highest tsunami waves recorded in recent years in the Balearic Islands. With reference to the studied boulders, Authors affirm that “Our findings along the higher cliffs of the W coastline, requires tsunamis run-ups 13 m high and / or storm run-ups of 18.6 m”. Therefore, neither tsunamis nor storms can have emplaced the boulders you observed in the present coast profile, because in your historical data no tsunami caused waves 13 m high. Probably boulders were deposited when the shoreline was lower than today is. On the other hand, it is possible that storms had higher waves than you observed or that the deposition of boulders by tsunami/s occurred before your historical observation period.

The last remark regards your dating methods. How did you date with 14C boulders 1964 AD and 1856 AD? Usually the last three centuries are uncertain in 14C dating. These boulders seem to have been recently emplaced, because are among the “five of the analysed boulders showing marine fauna”, therefore they are likely storm boulders. Please show your dating results with calibration and error. Also dating with post-depositional dissolution pans (Fig. 4b) seems not to be very careful. In fact, dissolution rate is not uniform and the range of dispersion of calculated ages makes the values overlapping.

### Specific comments

Page 1. Lines 25: “Sedimentary records of tsunamis generated off the North African coast have been identified along the rocky coastline of Minorca, as inland boulders, in most cases, ripped off a cliff edge. ...” by whom? Page 2. Line 1: “Historical and

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instrumental seismicity indicates that North of Algeria is exposed to relevant seismic hazard and risk". You are not dealing with Algeria but with Minorca Island. Describe the seimotectonic setting of your study area at local scale and in the general western Mediterranean background. Page 2. Line 9: "Alvarez et al. (2011) modelled tsunamis generated near the Balearic Islands". What does it mean "near the Balearic Islands"? Page 2. Line 15: "Tsunami generated by these sources arrive in 30 minutes to Formentera, . . . and 45 minutes to Minorca". This information can be useful for tsunami alert system but not for your study. What about run-up heights predicted on the Minorca coasts? This information can help you to understand if boulders were deposited by tsunamis. Page 3. Lines 26-27. "Transport age of 145 boulders from 12 locations was determined using a combination of these methods." You have just two radiocarbon dating. How did you use this combination? It is not clear what boulders were dated with radiocarbon and the age of the same boulders resulting from dating surface post-transport features. Page 4. Line 9. "Since the boulders do not record a single tsunami run-up", what do you mean? Page 4. Line15. "In many areas, their origin must be established by a confluence of different criteria", what do you mean? Page 4. Line 25. "The average boulder height is 16 m and 40 m from the edge of the cliff", do you mean distance from the edge? Page 4. Line 33. "The heights of the boulders of this coastal sector are out of the reach of storm waves, and should be interpreted as tsunami deposits". Why? You have not tsunami run-up so high and it is possible that storm data are incomplete. Page 5. Paragraph 3.4 Biggest boulders. No boulders described in this section could have been deposited by storms and tsunamis. How do you explain them? Maybe they were emplaced when littoral platform was lower or the sea level was higher. Page 6. Lines 13-15. "Among the historical records of huge wave phenomena that have affected the Balearic Islands, there are some episodes that can be attributed to tsunamis. In 1654, the chronicles written by Fontseré (1918), record a hurricane in the sea that crossed the island of Minorca, destroying the foundations of buildings and uprooting trees." I do not understand the 1654 is not a tsunami but a hurricane; therefore, it is likely that in the Balearic Islands some meteorological events

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was bigger than the storms about you should discuss (?) in the paper. Use always Majorca or Mallorca Kellelal, Keletat = Kellelal check please Please show in a map all the locations mentioned in the text.

In addition, I agree with the reviewer1 comments and found them very helpful. If addressed appropriately, the paper could be improved significantly. Finally, a revision of written English would be welcomed.

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