



## ***Interactive comment on “Earth’s rotation variations and earthquakes 2010–2011” by L. Ostríhanský***

**Anonymous Referee #2**

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Revision of the manuscript

Title: Earth’s rotation variations and earthquakes of 2010-2011 Author(s): L. Ostríhanský Journal: SE MS No.: se-2011-36 MS Type: Research Article

The manuscript does not introduce new ideas or new data but shows interesting statistical analysis. The results give important indications about the relationship between the occurrence of strong earthquakes and the relative position of Earth, Sun and Moon. However, the conclusions are not adequately supported by discussed results. References are also not sufficient because many are very old publications (some are older than a century, the most are older than 30 years) and most of the newer are abstract/poster/presentations at meetings. In my opinion the paper is not publishable in the present form but needs some important revisions, as described below.

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First of all, the described results are important indications of the effects of Earth-Moon-Sun motion on the triggering of earthquakes, but no definitive proofs are given. I think the author should say this clearly in his paper, and modify or remove several sentences in the text. For example in the abstract, lines 27-30 page 34, "... earthquake, proving that not only sidereal 13.66 days variations but also the 19 years Metons cycle is the period of earthquake occurrence." I don't believe that results shown in this paper prove anything. Establishing a 19 years cycle in the earthquake occurrence requires the analysis of centuries of global earthquake catalogs. The case of Sumatra-Andaman may be very simply a chance. Similarly, I don't agree with the strong statement "... is unequivocally proven by histograms showing ..." given in the first two lines of the Conclusions.

In many points the paper is not enough clear, and references are insufficient. For example on page 37, lines 10-14: "... the summer acceleration (), caused by the heating of the Northern () hemisphere and corresponding volume expansion in summer..." Is the author saying that the summer heating of the northern hemisphere has a role in the occurrence of earthquakes? If so, this alone requires a paper to describe the phenomena, data, observations, and references (possibly in English and available on the internet). In the following paragraph, lines 19-21 on page 37: "Therefore, it is sensitive to deceleration of the Earth’s rotation and ..." This is not obvious to me, and probably to the most of readers of the Journal, and the given reference is only an abstract to a meeting. On page 38, lines 20-25: "Variations of the Earth’s rotation are not negligible if  $1 \text{ ms} = 0.015'' = 46 \text{ cm shift on equator. ...}$ " This shift involves the entire planet, not only a tectonic plate with respect to the next one. Therefore the relationship with earthquakes is not obvious. On page 38, line 1: "Repeating Earth’s rotation accelerations triggered this huge earthquake and tsunamis." The tsunami was caused by the earthquake, not by the acceleration of Earth’s rotation. Page 38, line 29: the equation  $s = t_1 t_2 / t_2 - t_1$  needs parentheses at the denominator. Page 39, lines 20-21: "It is not due to chance the similarity of these two dates during the 19 years time span because the Metonic cycle governs the earthquake triggering." This is only one example

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of two earthquakes occurred 19 years after each other. It does not prove any role of the Metonic cycle in the earthquake triggering. It may be simply a coincidence, and I am sure there are more cases like this (by chance) if one analyzes for example one century of global earthquake events of magnitude greater than say 6. Page 40, line 7: "In the mountain area of Alaska, the 19 year cycle is evident, however ..." The author should provide at least good references supporting this sentence, or show convincing data. Page 40, line 20: "In Fig. 3C an earthquake is at minimum 20 February 1986 in Fig. 3B is missing." I don't understand what is missing here, a datum in the plot or an expected earthquake?

The section 3.2, pages 42-44, is the less convincing of the paper. Page 42, lines 22-23: 56 earthquakes of 349 means only 16%, not a very high amount. I think the earthquakes analyzed in this section do not show any relationship with Earth rotation. Page 43, lines 13-14: "This is final proof that the South American plate overrides the oceanic lithosphere of the Nazca plate, ..." I believe that the overriding of South American plate above the Nazca plate is well known since many decades, established by the well documented subduction zone along Chile-Peru coast. I don't think we need the Maule earthquake of February 2010 with its coseismic and postseismic displacements to say that. Page 43, lines from 26 to line 13 of page 44. This part of the paper is very questionable. The author discuss a relationship between earthquakes which occur in the Mid Atlantic ridge with those occurring in Chile, several thousands of kilometers away. Such relationship is not supported adequately by the data shown in Figures 4f and 4g, and no references are provided. I think this discussion should be removed from the paper. On the other hand, if the author has more convincing data/results/argument concerning this hypothetical relationship, he should write a paper focused on this topic. Page 44, lines 4-7. "Mid-ocean ridge reacts first on Earth's variations; however, after the continent overthrust the subduction zone is released by melted magma and the reverse process occurs. The subduction zone reacts first on Earth's variation at that moment of LOD minimum. ..." These strong statements regard a very large scale dynamics, but are not supported by any references. I think the most of readers of

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the Journal would not understand this discussion. Another similar discussion is found at page 52, lines 20-23: "The subduction zone of very old oceanic lithosphere of the Pacific plate is less sensitive or delayed on LOD variations ...".

All figures describing the length of day show a line with big diamonds (one for each day evidently, but never described or justified in the captions. I am referring to Figures 1, 2, 3, 4acfilm, 8). In my opinion such symbols should be removed from the plots because they do not contain more information than the line and in some way mask the other more important data. Moreover, some of those figures are very hard to decipher (4i, 4l, 4m). Many figures showing histograms are unnecessary and should be removed from the paper. For example 7b1, 7b2, 7b3, 7b4, show data already shown in Figure 7b. The same holds for figures 7d1, 7d2, 7e1, 7e2, 7e3, 7e4, 7f1, 7f2, 7f3, 7f4, 7g1, 7g2, 7h1, 7h2, 7h3, 7h4, 7i1, 7i2, 7j1, 7j2, 7k1, 7k2, 7k3, 7k4, 7l1, 7l2, 7m1, 7m2, 7n1, 7n2: all of them can be removed.

Please also note the supplement to this comment:

<http://www.solid-earth-discuss.net/4/C28/2012/sed-4-C28-2012-supplement.pdf>

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Interactive comment on Solid Earth Discuss., 4, 33, 2012.

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