Solid Earth Discuss., 5, C631–C633, 2013
www.solid-earth-discuss.net/5/C631/2013/

Solid Earth
Discussions
Open Access

Interactive comment on "The enigmatic Zerelia twin-lakes (Thessaly, Central Greece): two potential meteorite impact Craters" *by* V. J. Dietrich et al.

M. Schmieder (Referee)

martin.schmieder@uwa.edu.au

Received and published: 31 October 2013

The manuscript by Dietrich et al. brings into focus two enigmatic circular geologic depressions covered by the Zerelia lakes that the authors ascribe to the possible impact of a meteorite.

Overall, the manuscript is well structured and I find the results on the two presented structures of POSSIBLE impact origin worth publishing in an international journal, especially as a lot of multidisciplinary field work has been done - provided the authors address some fundamental issues. The manuscript could also be shortened.

At the moment, evidence for impact is poor. The only viable approach to publish this

paper on a pair of “suspected impact structures” is, in my opinion, to consequently stick to the hypothetical model, i.e., calling the Zerelia Lakes "possible", "suspected", "likely", or "candidate" impact craters whenever unequivocal evidence for shock metamorphism and/or traces of the meteorite are missing (as the authors mostly do). A number of interesting papers with discussions on possible impact structures exist in the literature, and the lack of conclusive evidence for meteorite impact does not necessarily rule out publication. The authors present a wealth of petrographic, geochemical and geophysical information but, unfortunately, despite all their efforts fail to prove compelling evidence for impact in the rocks and minerals studied. They describe and discuss exotic polymict breccias that contain quartz with a conspicuous set of (sub-?)planar and (sub?)parallel lamellar deformation features of possible shock metamorphic origin (their Fig. 5c) but don’t go into any further detail here, although this could be really interesting. From the photomicrographs presented, I can’t see evidence for the melting of quartz as the authors suggest in, e.g., their section 7.2.3. (this would typically generate lechatelierite with a characteristic fluidal-vesicular and schlieren-rich texture, as well as commonly “ballen” texture from the retrograde cristobalite transformation). The “granular zircon” the authors present looks very different from granular zircons from known terrestrial impact structures. Using feathery calcite as an impact indicator has always been difficult. The authors state that the rocks and minerals were probably not (if at all) affected by higher shock pressures (assuming an impact origin), so a focused search for shatter cones as a low-pressure shock feature might be reasonable (for example, nice shatter cones in limestone were recently discovered at Agoudal in Morocco, the site of the relatively small Imilchil iron meteorite impact). Finally, I doubt that the observed Fe-Ni-Cr-Mg enrichment in the target rocks/soil is a trace of the suspected iron meteorite; iron meteorites usually have a very high internal Ni/Cr ratio. I guess these elements might also be derived from the ophiolitic clast component (serpentinites) in the local sedimentary target; this should be briefly discussed.

To further substantiate the impact theory, it would be necessary to rule out all endogenic models for the formation of the lakes. At least one earlier paper stated that there

SED
5, C631–C633, 2013

is a major fault in the Zerelia region and that the two lakes are “evidently connected with the presence of this fault” [1]. This tectonic model should also be addressed to give the reader the full picture of possible endogenic versus exogenic formation mechanisms for the two lakes in Greece.

I recommend publication of the manuscript only as paper strictly and clearly about a pair of “possible” impact structures, after major revision. Additional comments are included in the pdf file attached.

Reference: [1] Reinders H. R. 2003. Earthquakes in the Almyrós Plain and the Abandonment of New Halos. In: Reinders H. R. and Prummel W. (eds.) Housing in New Halos - A Hellenistic Town in Thessaly, Greece. Taylor & Francis, p. 234-240.

Please also note the supplement to this comment:
http://www.solid-earth-discuss.net/5/C631/2013/sed-5-C631-2013-supplement.pdf

---

Interactive comment on Solid Earth Discuss., 5, 1511, 2013.