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Interactive comment on "Observation of a local gravity isosurface by airborne LIDAR of Lake Balaton, Hungary" *by* A. Zlinszky et al.

Anonymous Referee #3

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The paper deals with a topic which has been discussed recently but only a few publications yet exist. Using Lidar for measuring the lake surface for a local geoid (or a lake equipotential surface) determination is an interesting idea to improve geoid determination accuracy. The research was made from the data which originally was taken for a totally different purpose, and therefore the observing procedure was not optimal. Some of the comments below may raise from this fact. There are some topics which I would like to mention here, and hope that the authors are able to comment them and take into account where appropriate:

1) The paper itself is well written and on technical point of view there are no comments.

2) Connection to the existing geodetic infrastructure and geoid model around the Lake Balaton. Description of existing geoid models is included but to me it remained a bit

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unclear how the connection to the existing geodetic infrastructure was made. Any GPS-levelling points or such connections? Also the sentence “In our case the lake itself serves as a leveling instrument providing a vast area where elevations relative to the geoid are shown to be constant.” (page l32, line 24) needs more clarification. The lake surface may not follow the geoid due to the lake surface topography (flows, prevailing winds, . . .). One needs a more detailed analysis (perhaps a hydrological model) to better understand such deviations. Perhaps the authors can a bit open these items.

3) Error budget in general. Throughout the text there are error analysis, and especially Ch 4, but all these should be put together (a table?) to better show the full error budget and the total uncertainty of the observations.

4) Contribution of this research to the more accurate geoid determination. Please clarify this item because from this text it is difficult to see the improvement (where and how much) of this determination to the geoid model. Can this assumption be justified based on analysis in 3) of the total error budget of the observations? If the Hungarian geoid model accuracy is 2 cm, as mentioned, what is the total error budget of the Lidar determination?

The topic itself is actual. There are quite large comments concerning the contents of the paper. I hope the authors will be able to improve the manuscript, after which I can recommend that it can be published.

Interactive comment on Solid Earth Discuss., 6, 119, 2014.