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Interactive comment on "Using the Nordic Geodetic Observing System for land uplift studies" *by* M. Nordman et al.

Anonymous Referee #1

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I would like to congratulate the authors on their manuscript "Using the Nordic Geodetic Observing System for land uplift studies". Although it does not present new research results it introduces the Nordic Geodetic Observing System (NGOS) to interested readers and shows the application of it to study vertical land motions in Fennoscandia. The manuscript refers to a number of data sets (GNSS, absolute gravity and tide gauge) for which either direct or indirect estimates of vertical land movements are compared to the widely used land uplift model NKG2005LU. Hence it is certainly worthwhile to be published in Solid Earth.

I have no major concerns. The manuscript is well written and reads well. There are a few grammatical issues that need to be addressed before final publication.

Most comments are on the PDF, but here are a few:

P383: Eq 1: how valid is this conversion for Fennoscandia. Please give a range of conversions previously published for this region with references.

P384: How consistent are the AG results from Gitlein and Breili (different instrument, time spans, modeling)? In your later analysis you use both but you do not comment on potential effects from this.

P384: The PSMSL long-term trends were updated last in January 2013. Why do you use a dataset from 2004? Better would be to consider Woodworth and Player (2004) as a reference to PSMSL and use the updated trends. It should also be mentioned that these trends stem from the revised local reference (RLR) database.

P385: How does Ekman's value of 0.2mm/yr for the uncertainty in the sea level trends compare to the uncertainties given by PSMSL? Why do you use Ekman's and not the PSMSL uncertainties?

P385: indicate Karelian area on Fig 1.

P387: Different reference levels is a little vague here. I do understand that the details of these cannot be discussed here but a little more effort could be made. For GNSS, critical is the ability of the reference frame to determine and track the center of mass of the Earth consistently over long periods. The big advantage of absolute gravity measurements is that they do not need a reference frame. Gravimeters measure gravity with respect to the centre of mass. Sea level fundamentally follows gravity changes as well (apart from other effects). So these have no reference frame dependency. Furthermore, with the higher latitude of Fennoscandia, a large uncertainty in the z-translation rate of the reference frame has a larger impact on the vertical than for mid-latitudes.

P387, l25: This seems a bit low. If you would use a more recent reference for their sea level rise estimate you would see that best estimates for the globally –averaged 20th century sea level rise agree to be around 1.8 mm/yr.

P388, l15: it might be worthwhile to actually say something about the length of the AG

time series when these are introduced. Then it could be referred here when discussing this issue.

P388, l 25: the authors must be careful discussing the “usefulness” of the AG measurements. They are highly useful and give information GNSS cannot. What may be the issue here is that the Fennoscandian AG measurements and the time series derived from them to date may need more observations and better modeling of local effects.

P389, l5: By introducing published values for the conversion of gravity to height changes earlier, a more detailed discussion could be given here.

P389, l15-20: probably one of the most important points made in the paper. To highlight this further, this issue could be raised much earlier and then returned to during the paper. This was the dominant feeling when reading through the manuscript the first time.

Please also note the supplement to this comment:
http://www.solid-earth-discuss.net/6/C175/2014/sed-6-C175-2014-supplement.pdf

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Interactive comment on Solid Earth Discuss., 6, 377, 2014.