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Solid Earth Discussions

Interactive comment on "Geophysical characterisation of two segments of the Møre-Trøndelag Fault Complex, Mid-Norway" *by* A. Nasuti et al.

H. Zeyen (Referee)

hermann.zeyen@u-psud.fr

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The authors use gravity, magnetic, refraction-seismic and geoelectric data to determine the structure of the uppermost 100-200m around one of the important fault zone in central Norway. The manuscript is written in good English, well structured and presents an interesting piece of interdisciplinary work, which is certainly worth publishing. However, I would have quite a few suggestions for increasing the quality:

1. The measurements should be better described. A reference to an NGU report is not very helpful. Specifically, the geoelectric and refraction seismic lines were certainly not acquired in a single piece. What was the length of each piece and the overlap?

2. Concerning the presentation of the results: For the seismic profile (Fig. 6), measured and calculated travel times have to be given together with shot point positions. If not, the reader cannot judge the presented model. For the resistivity profiles, the misfit has to be indicated (Res2DInv gives a value in %). Why is no quantitative interpretation of the magnetic data given in Figs. 6 and 8 (however in Fig. 7)? Such a quantitative model would certainly show that the slightly simplistic interpretation of the anomaly over the fault zone is not really tenable, for anomalies M1 and M3 even less. Although the gravity data across the Tjellefonna fault have been acquired about 1km West of the interpreted line, I think they should be presented in Fig. 6 as well, together with a model.

3. The interpretation of the magnetic data in Fig. 6 is in my opinion not consistent. The authors say on p. 167-168 that contacts between rocks with contrasting magnetic properties are commonly associated with positive (better than "up") and negative (instead of "down") magnetic anomalies. This is true, but if the fault zone as such is magnetized, the maximum in the N would not appear at Norwegian latitudes. So, if magnetics sees the fault zone, the higher magnetization would be concentrated along the northern and southern limits and be more or less normal in its centre. Compare with Fig. 7 where a more standard effect of a magnetized fault zone has been modelled. However, does magnetics see the fault zone on Fig. 6? The anomalies are located clearly N of the areas where seismics and resistivity see them (50-100 m with respect to seismics for M2; no relation with seismics and resistivity for M3; M1 is in between seismics and resistivity, where the resistivity effect is not obvious). For such a high resolution data set, this difference is not negligible. How could this be explained? How can the higher magnetization in the fault zone be explained? What produced the higher magnetization in these samples? Is the statistics based on four samples significant? By the way, the large variability of susceptibility values makes that their distribution is better described by an exponential probability distribution than by a Gaussian one, which implies that the median is a better measure of the "average" than the mean. Please indicate the median in Tab. 1.

4. Concerning the resistivity profiles, I would have some questions as well: First of all: can you be sure that the anomalies you see near the base of your models are real and not an artifact of the 2D interpretation of a 3D structure? We get this kind of undulations very often with Res2DInv, which has a tendency to introduce them in the areas of low resolution. This happens especially in the areas of missing deep data due to the shift between line segments. A few resolution tests would be welcome. On the other hand, I do not really agree with the claim that the resistivity on Fig. 6 shows a southward dip of the fault zone. Also the southern limit seems to have a slight dip, but to the North. Here again, some tests with synthetic models would be necessary in order to clarify whether a southward dip could really produce this resistivity image (the southern limit) and/or whether the image could be due to an effect of the asymmetric overburden shown in the seismic model and/or simply a reduction of the width of the fault zone with depth.

5. Purely formal aspects: In several places, it is difficult to follow the arguments because information is missing or comes much later in the paper. E.g. * p.161: "abrupt change in elevation": in which sense? where is the elevation higher, N or S of the fault? This is not clearly visible on the map. * still p.161: A reference to a paper "in preparation" (Nasuti et al., 2011) is not very helpful. * p. 164, lines 9-10: "Such high-amplitude noise ... had to be removed..." - how was this done? * p. 164: The samples are referenced by letters A-L. These letters are given on Fig. 5, but this figure is only mentioned much later. It should be indicated already here. On the other hand, the reference to Fig; 4 is not useful here. * p. 170, lines 27-28: the faults are not visible on the topographic map. Please mark them. * Fig. 2: what are the thin black lines (e.g. just north of the letter "d" in Langfjorden)? It is difficult to distinguish between the different data sets. Especially refraction and reflection seismics have too similar colors, as well as gravity stations and magnetics. * Fig. 3: color scale might be shifted to distinguish between on- and offshore. * Fig. 6: It is not clear what R1 and R3 refer to. My impression is that R1 refers to the lower resistivities below the letters, whereas R3 refer to those above the letters.

Spelling & grammar: p.165, l. 7: calculate - a - series p.165, l.27: not "according to" but "with" ("Lund system" means the instrument, not a method) p.166, l.8: the word "also" is not necessary. p.167, l.18: don't use the word "strongly" here p.168, l.11: admittedly p.169, l.9: the same ... lineament as (not than) p.170, l.4: southward (without "s") p.170, l.22: in the centre (not "by") p.171, l.5: similar ... as the indurated fault (not "than") p.173, l.3: northward (without "s")

In conclusion, I feel that with a bit more work and a bit better description, the work would be easily publishable.

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