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Discussions

Interactive comment on "Electrical resistivity tomography for studying liquefaction induced by the May 2012 Emilia-Romagna earthquake ($M_w = 6.1$, North Italy)" *by* A. Giocoli et al.

A. Giocoli et al.

alessandro.giocoli@enea.it

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1) Referee: authors collected the data for resistivity tomography using three different arrays: why they did not perform a cumulative inversion of all gathered data?

1) Authors: in other work we have verified that the joint inversion of data obtained from different array (Dipole-Dipole + Wnner + Wenner Schlumberger): - improves the result; - the obtained resistivity model became instable and unrealistic. In this work, we compared the Wenner Schlumberger resistivity model with the result obtained from the joint inversion of data (Dipole-Dipole + Wenner + Wenner Schlumberger) and we did

not notice an improvement. Thus, we present the 2D resistivity model obtained from array coniňĄguration that allowed to acquire data with the higher signal-to-noise (s/n) ratio, a larger investigation depth and a better sensitivity pattern to both horizontal and vertical changes in the subsurface resistivity.

2) Referee: I do not understand why FCU is characterized by >15 Ohm.m values, while it is composed of "medium to fine gray sands". In alluvial ambient, this formation, when saturated, is generally characterized by much greater values (usually around 50 Ohm.m and more). Ranges selected by authors are confusing. On the other hand, from figs. 3 and 4 much greater values of resistivity pertaining to FCU are inferred (>30 Ohm.m).

2) Authors: we used data gathered through geological surveys and borehole data to directly correlate resistivity values with the lithostratigraphic characteristics. In particular, the Fluvial Channel Unit (FCU) consists prevalently of paleo-riverbank deposits (20-80 ohm.m), paleo-riverbed deposits (from 50 to more than 128 ohm.m) and anthropogenic backfills or reworked material (20-50 ohm.m). At the bottom, the FCU consists of lenses of medium to ïňĄne gray sands (MFGS) (15-25 ohm.m). All this is also in agreement with bibliographic data (see Loke, 2001; etc.). Thus, it was possible to assign the resistivity values (> 15 ohm.m) to the FCU.

3) Referee: Moreover, by watching the same figures (figs. 3 and 4) and calibrating direct information added, I argue that MU unit (essentially clays, locally with peat added) is characterized by resistivities lower than 15 Ohm.m.

3) Authors: correlating the borehole data with the ERT, we observed that in some cases the lithological boundary between MU and FCU is related to the 15 ohm.m iso-resistivity line (for example see the ERT3 in Fig.4). In other cases the lithological boundary between MU and FCU is related to the 20 ohm.m iso-resistivity line (for example see the ERT2 in Fig.3). This is due to the same resistivity values between MU and MFGF.

4) Referee: in Conclusions they claim that “ERT has proved to be an effective reconnaissance technique for characterizing the subsoil affected by coseismic liquefaction, providing valuable data for understanding the liquefaction phenomenon and assessing the associated hazard”: I do not understand where and how ERT provided “valuable data for understanding the liquefaction phenomenon and assessing the associated hazard”. The contribution of ERT to resolve MFGS is nil, both because of the intermediate resistivity values of this formation between FCU and MU lithologies and of its relatively small thickness as compared to its depth. This is an at least partly unsatisfying, although relatively well understood, result.

4)Authors: reading all comments, we understand that we have to improve the text. In particular, the resistivity values related to the diagonal and dotted patterns (T1) are common only to the MFGS and MU (Figs. 3, 4 and 5). The MFGS is the bottom part of the FCU. Thus, the diagonal and dotted pattern (T1) shows: - the uncertainty of the FCU-MU boundary location; - the sectors in the which it is possible to find the MFGS. In addition, the ERT results allowed us to obtained the first rapid and valuable geological information, such as: the lithostratigraphy setting, the depth at which it was possible to find the MFGS, etc. On the bases of ERT results, it was possible to design further investigations (e.g. complementary geophysical surveys, drill holes, etc.) for a better understanding of the liquefaction phenomenon. Thus, taking into account all the above inferences, we think that the ERT has proved to be effective as a reconnaissance technique to detect the first rapid and valuable geological information in areas affected by coseismic liquefaction.

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