

In order to evaluate the dependence of the solution proposed in the manuscript from the *a-priori* model two tests, deeply modifying the *a-priori* information have been carried out.

In the first test we suppose a completely non informative prior. So we change the *a-priori* model supposing our 3D volume to be made by a unique label with a constant average density (2930 kg/m^3) and a variability (in terms of standard deviation) of 50 kg/m^3 , and a constant susceptibility (0.3 S.I.) with a variability (in terms of standard deviation) of 0.1 S.I. These values have been chosen in order to span all the admissible densities and susceptibilities we obtained in the solution presented in the manuscript.

The results in terms of density and susceptibility at different depths (225 m, 1000 m, 2000 m, 3000 m, 4500 m and 7500 m) are reported in Figures 1 and 2.

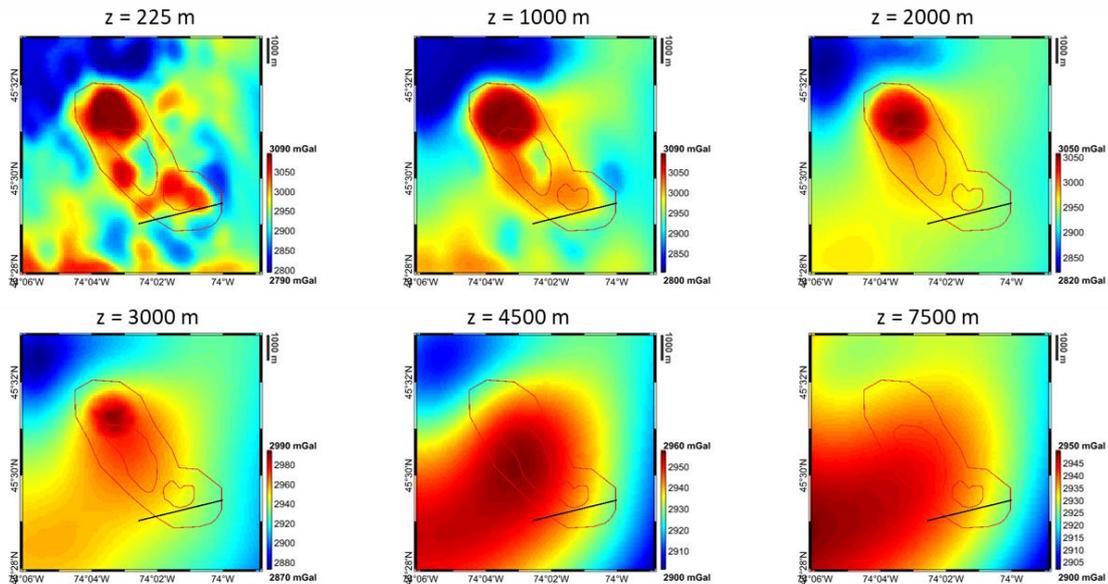


Figure S1 density distribution at different depths with uninformative *a-priori* model

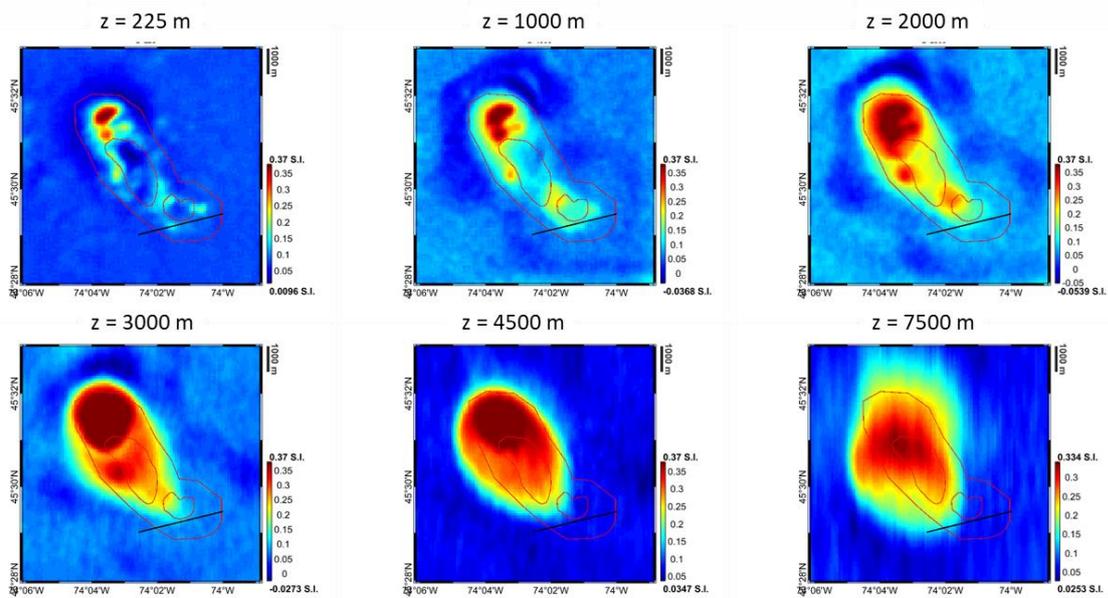


Figure S2 susceptibility distribution at different depths with uninformative *a-priori* model.

We can observe from the figures that, up to a depth of 3000 m, the results shows an almost cylindrical anomaly with densities and susceptibility shapes somehow coherent with the shape of the main geological units. Below the 3000 m depth the density distribution seems to lose its focus with only low frequencies

basically due to the background. This is not reflected in the magnetic distribution, which shows the presence of an anomalous body up to 7500 m depth. As for the magnetic anomaly it is harder to say if below the 3000 m level the anomaly starts to enlarge or if, also in this case, the inversion starts to lose its focus. We think that this latter is the most probable hypothesis, since when going to the 4500 m and 7500 m maps the enlargement of the shape is strictly related to a smoothing in the variation of magnetic susceptibility.

What we can also observe is that this more free-of-constraints solution violate several geological information which are available about the complex (e.g. a priori knowledge about densities and susceptibilities of different rocks in the region). This is the reason why we prefer the solution proposed in the paper.

In the second test, we use the a-priori model presented in the paper, apart from “cutting” the maximum depth of the silicate before the end of the model, thus *de-facto* simulating a non-cylindrical geometry of the complex. *A-priori* and *a-posteriori* labels *A-priori* and *a-posteriori* labels on a North-West South-East profile for this test together with the *a-posteriori* density map at 1 km depth are shown in Figure 3.

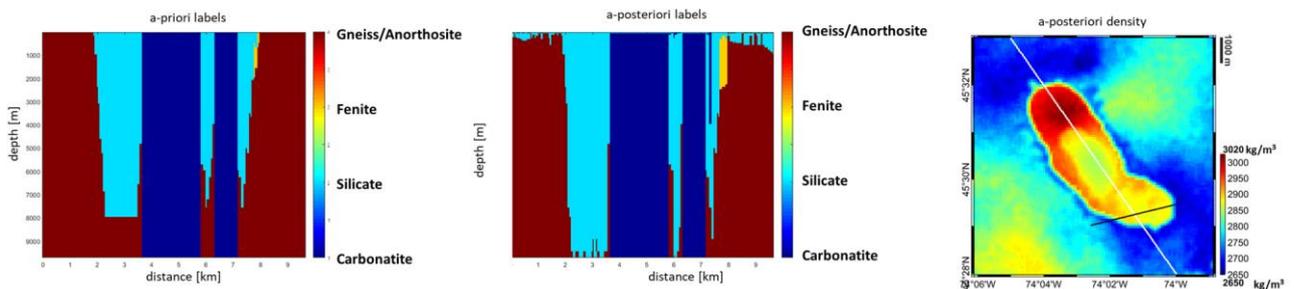


Figure S3 *a-priori* and *a-posteriori* labels for the non-cylindrical test. Maps of *a-posteriori* density at 1km depth

What we can observe is that the inversion tends to recreate the almost cylindrical shape by continuing the silicate rings up to the base of the model, thus retrieving a final result very close to the one reported in the paper in terms of density and susceptibility, as well as in terms of labels.