APPLICATIONS TO SYNTHETIC DATA - NUMBER OF CONSTRAINTS

We tested the method using different combinations of the constraints and show the results of only Step 2. Parameters defining the interpretation model are shown in Table 1. We used the same parameters for inversion used in the synthetic applications of the paper.

Figure 1 and Figure 2 show the estimated model obtained at the Step 2 and Step 3 of our algorithm using the four constraints described in the Inverse problem formulation section of the paper. The parameters $\tilde{\alpha}_0$, $\tilde{\alpha}_1$, $\tilde{\alpha}_2$ and $\tilde{\alpha}_3$ used to estimate the parameter vectors $\mathbf{p}^{(2)}$ and $\mathbf{p}^{(3)}$ have values 10^2, 10^1, 10^1 and 10^2, respectively.

Figure 3 (equality constraints), Figure 4 (smoothness constraint), Figure 5 (isostatic constraint), Figure 6 (isostatic and smoothness constraints) and Figure 7 (smoothness and equality constraints) show the estimated model obtained at the end of Step 2 using different combinations of the constraints at the solution of the inverse problem. These models presented estimated basement and Moho reliefs with different geometries, however show predicted gravity disturbance with the same behavior that true one. We can observe smoothness in the lithostatic stress curve when the isostatic constraint is applied.

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7 Application to synthetic data using only smoothness and equality constraints ($\tilde{\alpha}_1 = 10^1$, $\tilde{\alpha}_2 = 10^1$ and $\tilde{\alpha}_3 = 10^2$). Results obtained in Step 2. The remaining informations are the same shown in the caption of Figure 1.

Geological meaning	$\rho^{(\alpha)}$ (kg/m^3)	$\Delta\rho^{(\alpha)}$ (kg/m^3)	α
water	1030	-1840	w
sediments	2350	-520	1
SDR	2855	-15	2
continental crust	2870	0	cc
oceanic crust	2885	15	oc
mantle	3240	370	m

Table 1: Properties of the volcanic margin model. The model extends from $y = 0$ km to $y = 383$ km, the Continent-Ocean Transition (COT) is located at $y_{COT} = 350$ km and the reference Moho is located at $S_0 + \Delta S = 43.2$ km, where $\Delta S = 2.2$ km. The density contrasts $\Delta\rho^{(\alpha)}$ are defined with respect to the reference value $\rho^{(r)} = 2870$ kg/m^3, which coincides with the density $\rho^{(cc)}$ attributed to the continental crust.

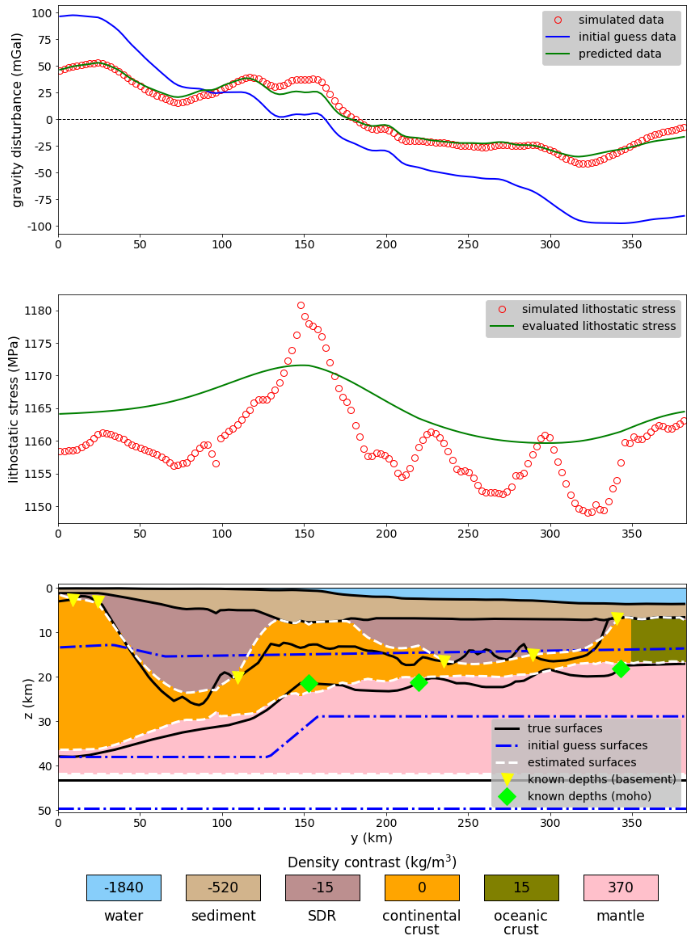

Figure 1: Application to synthetic data. Results obtained in Step 2. (Bottom panel) Estimated and true surfaces, initial basement and Moho used in the inversion (initial guess) and known depths at basement and Moho. (Middle panel) True and estimated lithostatic stress curves computed by using equation **??**. The values are multiplied by a constant gravity value equal to 9.81 m/s^2. (Upper panel) Gravity disturbance data produced by the volcanic margin model (simulated data), by the estimated model (predicted data) and by the model used as initial guess in the inversion (initial guess data). The contour of the prisms forming the interpretation model were omitted. The density contrasts were defined according to Table 1.

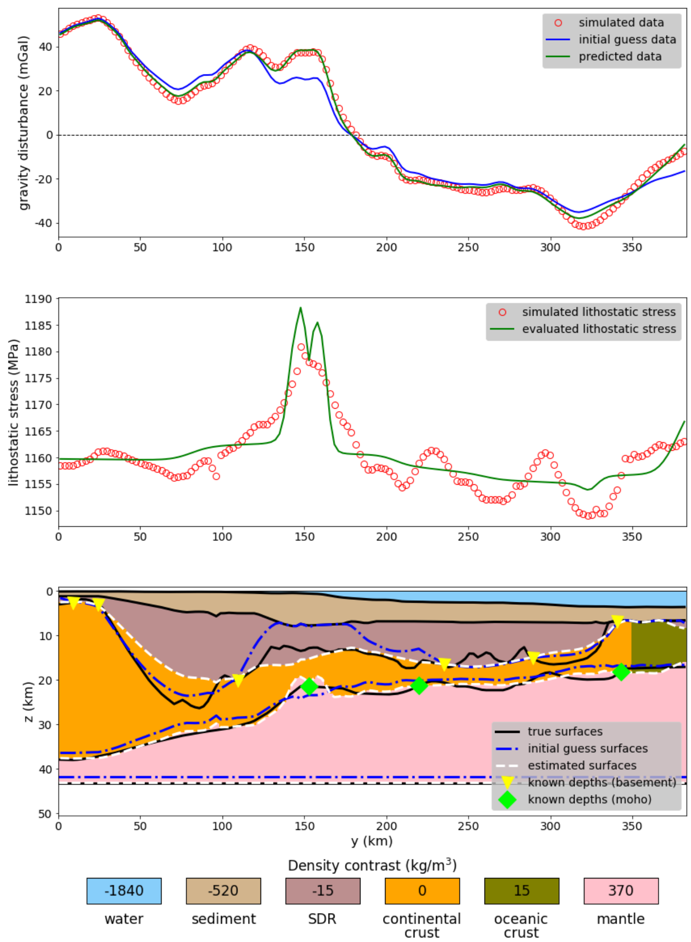

Figure 2: Application to synthetic data. Results obtained in Step 3 by using $\sigma = 22$ (equation **??**). The remaining informations are the same shown in the caption of Figure 1.

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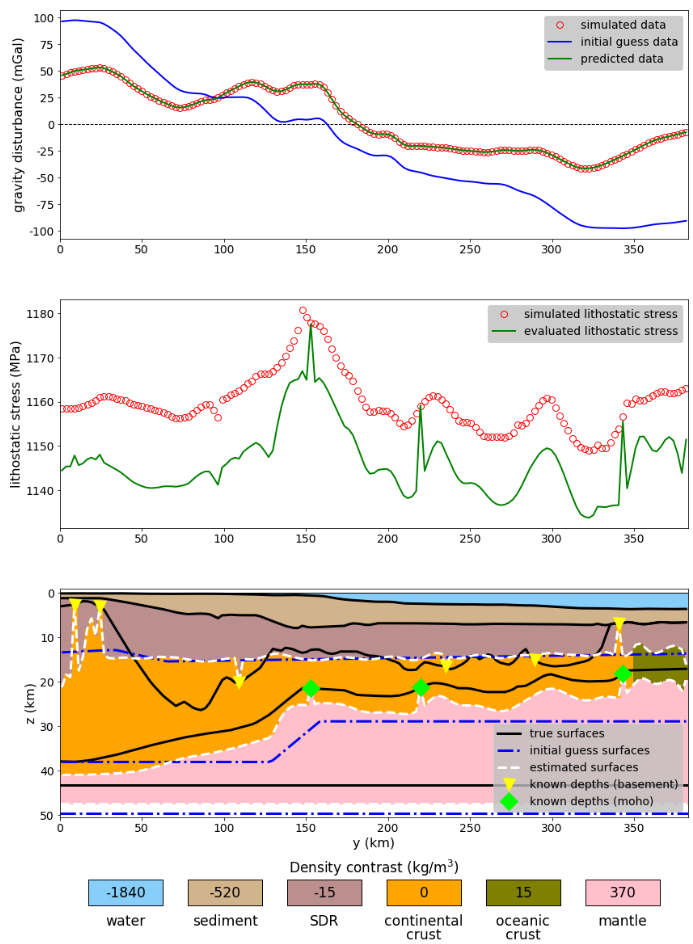

Figure 3: Application to synthetic data using only equality constraints ($\tilde{\alpha}_2 = 10^1$ and $\tilde{\alpha}_3 = 10^2$). Results obtained in Step 2. The remaining informations are the same shown in the caption of Figure 1.

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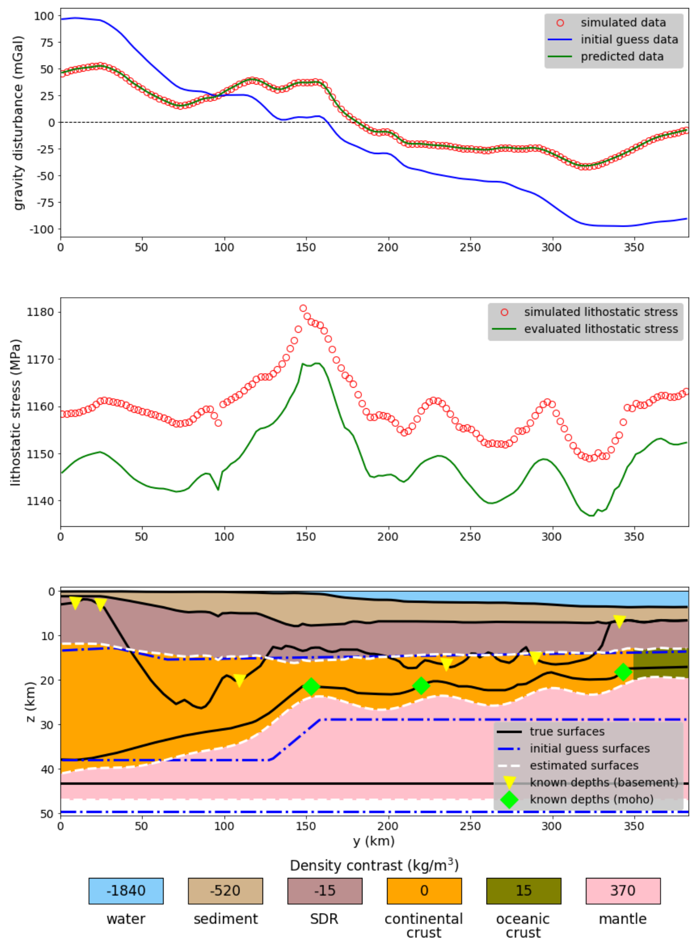

Figure 4: Application to synthetic data using only smoothness constraint ($\tilde{\alpha}_1 = 10^1$). Results obtained in Step 2. The remaining informations are the same shown in the caption of Figure 1.

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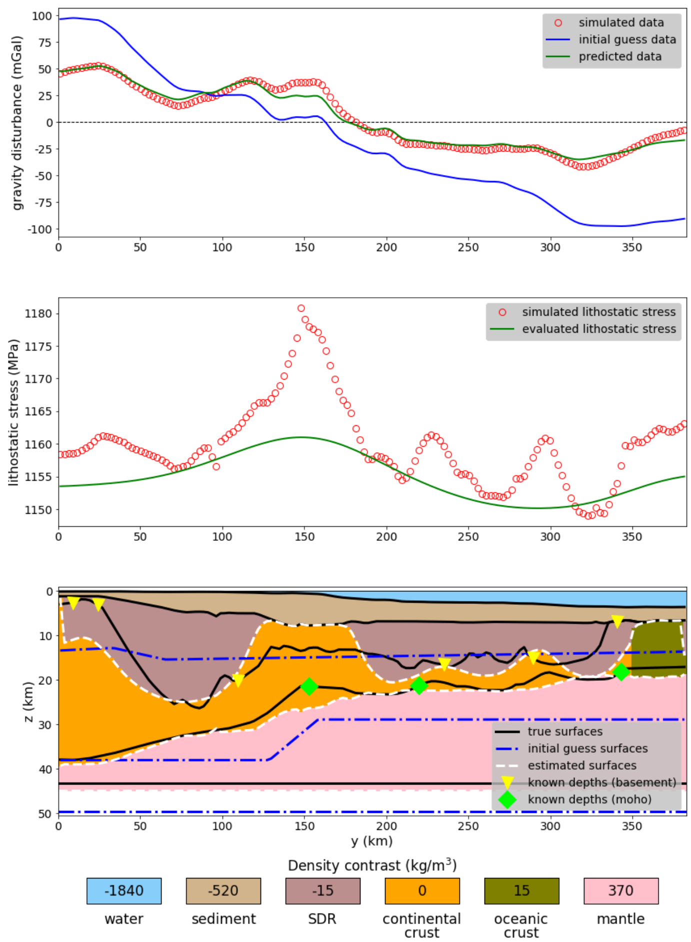

Figure 5: Application to synthetic data using only isostatic constraint ($\tilde{\alpha}_0 = 10^2$). Results obtained in Step 2. The remaining informations are the same shown in the caption of Figure 1.

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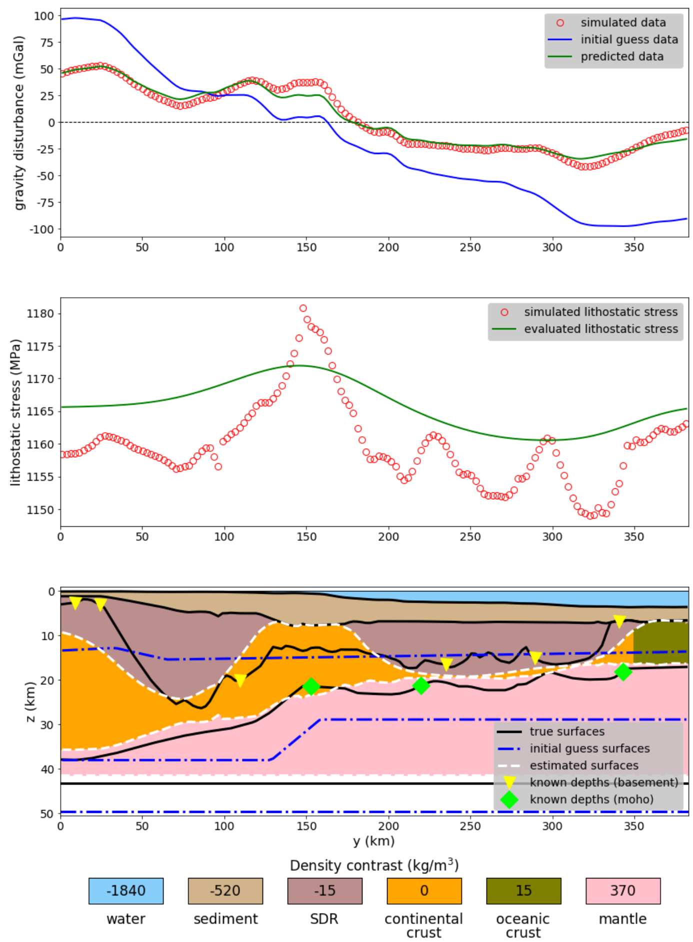

Figure 6: Application to synthetic data using only isostatic and smoothness constraints ($\tilde{\alpha}_0 = 10^2$ and $\tilde{\alpha}_1 = 10^1$). Results obtained in Step 2. The remaining informations are the same shown in the caption of Figure 1.

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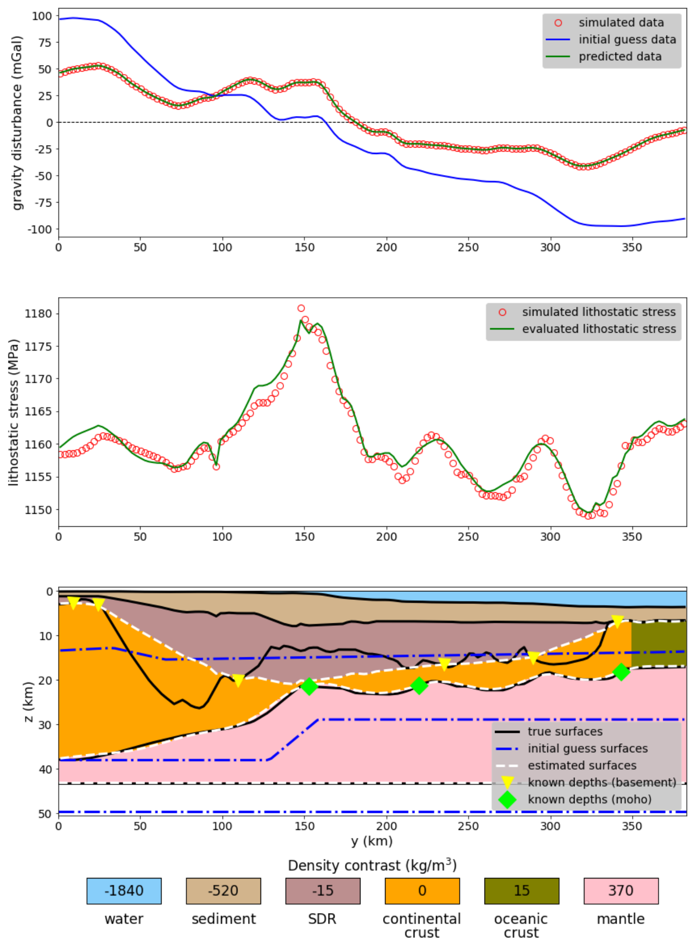

Figure 7: Application to synthetic data using only smoothness and equality constraints ($\tilde{\alpha}_1 = 10^1$, $\tilde{\alpha}_2 = 10^1$ and $\tilde{\alpha}_3 = 10^2$). Results obtained in Step 2. The remaining informations are the same shown in the caption of Figure 1.

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