



Crustal Thickness and Magnetization beneath Crisium and Moscoviense Lunar Impact Basins

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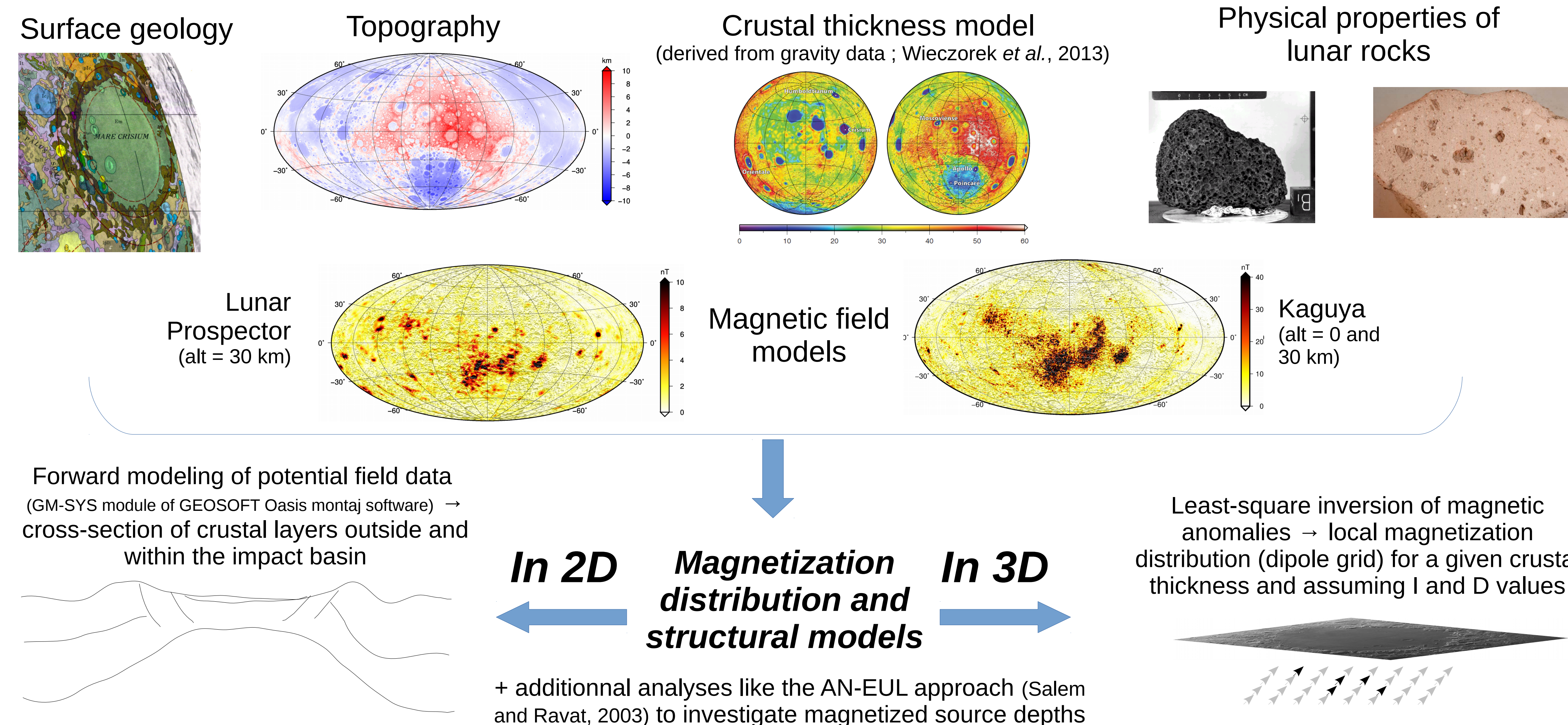
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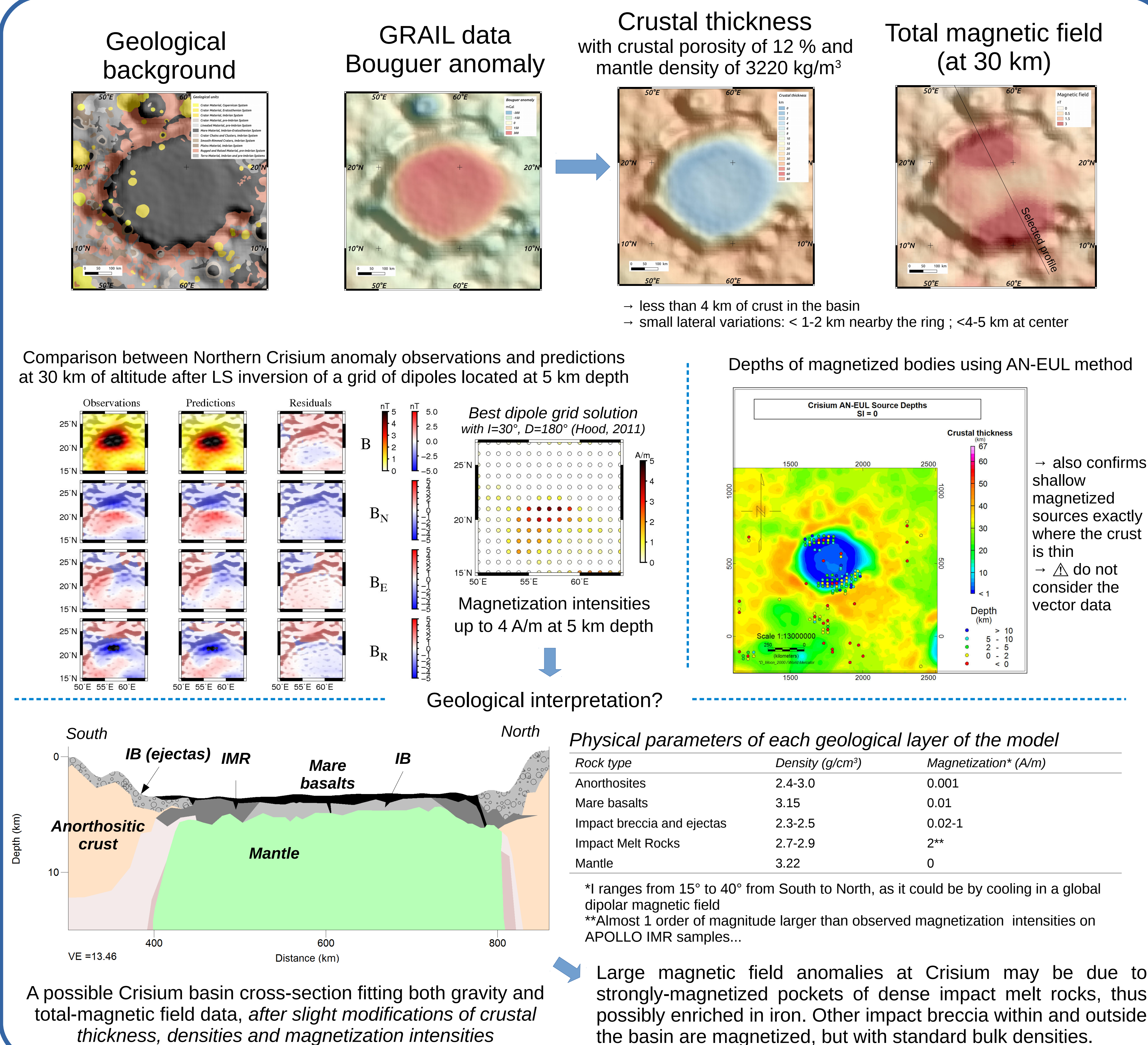
ABSTRACT

GRAIL data recently confirmed that the Crisium and Moscoviense large impact basins have the thinnest (< 5 km) crust of the Moon. Crisium also shows two localized intense magnetic fields located nearby its North and South borders, while Moscoviense shows a relatively-intense central magnetic field anomaly. In details, these magnetic fields are exactly located where the thinnest (<1-3 km) crust within these basins is predicted by the crustal thickness models. Here we investigate this apparent anti-correlation by modeling the sources of these potential field data using several approaches in 2D and 3D. Our results show that, beneath the very thin Mare basalt layer, a strongly-magnetized layer with laterally-varying thickness – but still thin (~2-3 km) – and density can be present. This layer may correspond to an impact melt sheet with large magnetization due to accumulation of iron-rich fluids during the impact event and/or to post-impact processes.

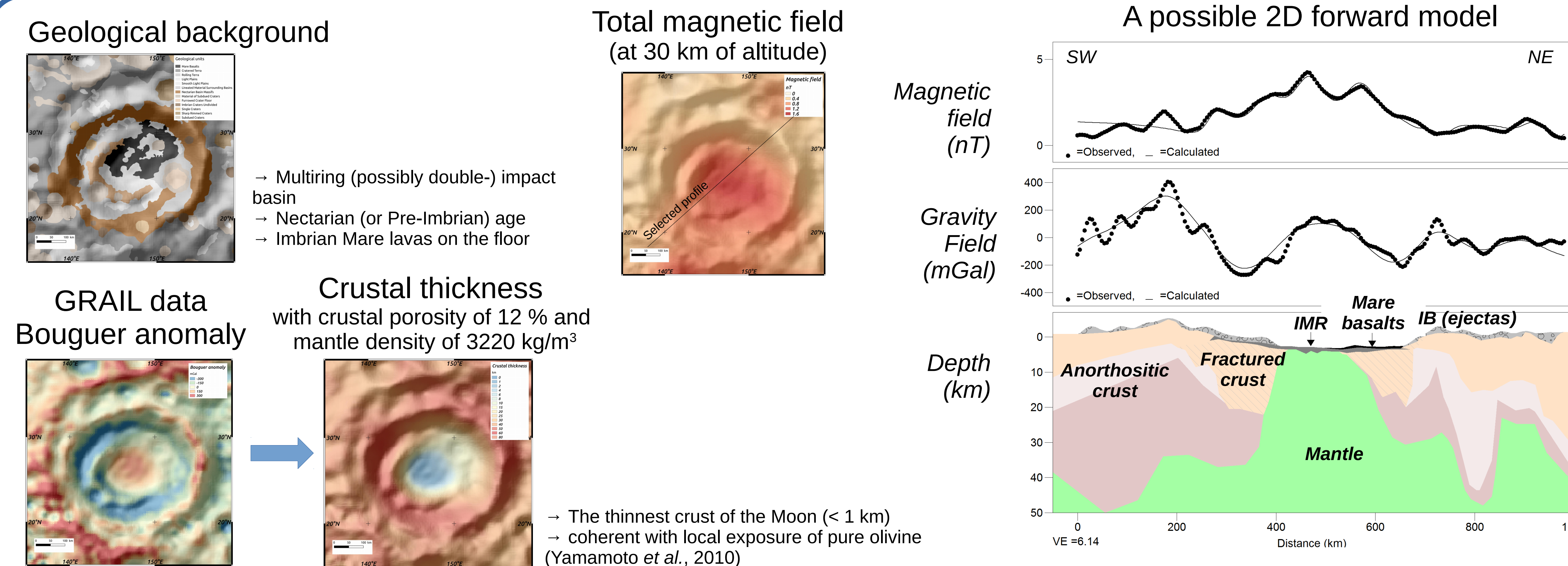
Constraints, Data and Method



Application to the Crisium impact basin



Application to the Moscoviense impact basin



Conclusions and perspectives

→ the Crisium Basin magnetic field anomalies can be explained by a 2 km-thick crust assuming 'standard' lunar magnetizations plus some 'pockets' of local iron-rich impact (melt) rock, and a amagnetic mantle

→ the Moscoviense basin central magnetic field anomaly can be explained by a 2 km – thick layer of highly-fractured impact breccia (with standard relatively intense magnetizations), and fracturation/brecciation that also occurs at depths beneath and between the rings

→ both models agree with a recent local model of the crust/mantle density contrast beneath the Orientale Basin (Zuber *et al.*, 2016), that requires larger crustal densities (impact melt sheet?) at center, as well as listric faults reaching the mantle (thus decreasing density):

A recent crustal model for Orientale Basin

→ further tests will be performed using joint inversion of gravity and magnetic field data, assuming different mantle density values, over some Nectarian impact basins associated with a magnetic anomaly

References: Hood, 2011, Icarus, doi:10.1016/j.icarus.2010.08.012; Salem and Ravat, 2003, Geophysics, doi:10.1190/1.1635049; Wiczeorek *et al.*, 2013, Science, doi:10.1126/science.1231530; Yamamoto *et al.*, 2010, Nature Geoscience, doi:10.1038/ngeo897; Zuber *et al.*, 2016, doi:10.1126/science.aag0519

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