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Post-eruptive volcano inflation following major magma drainage: Interplay between models of viscoelastic response influence and models of magma inflow at Bárðarbunga caldera, Iceland,2015-2018

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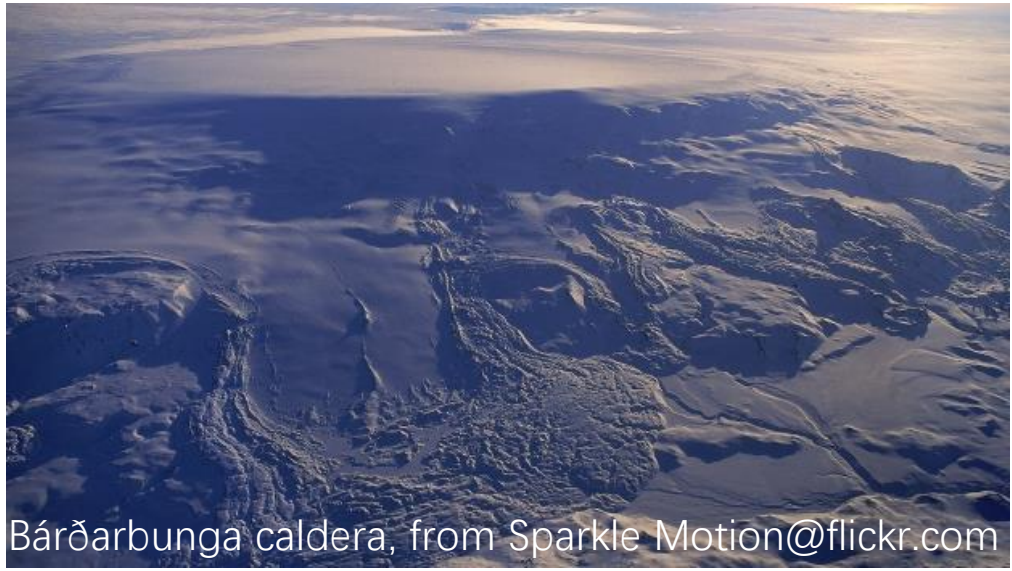
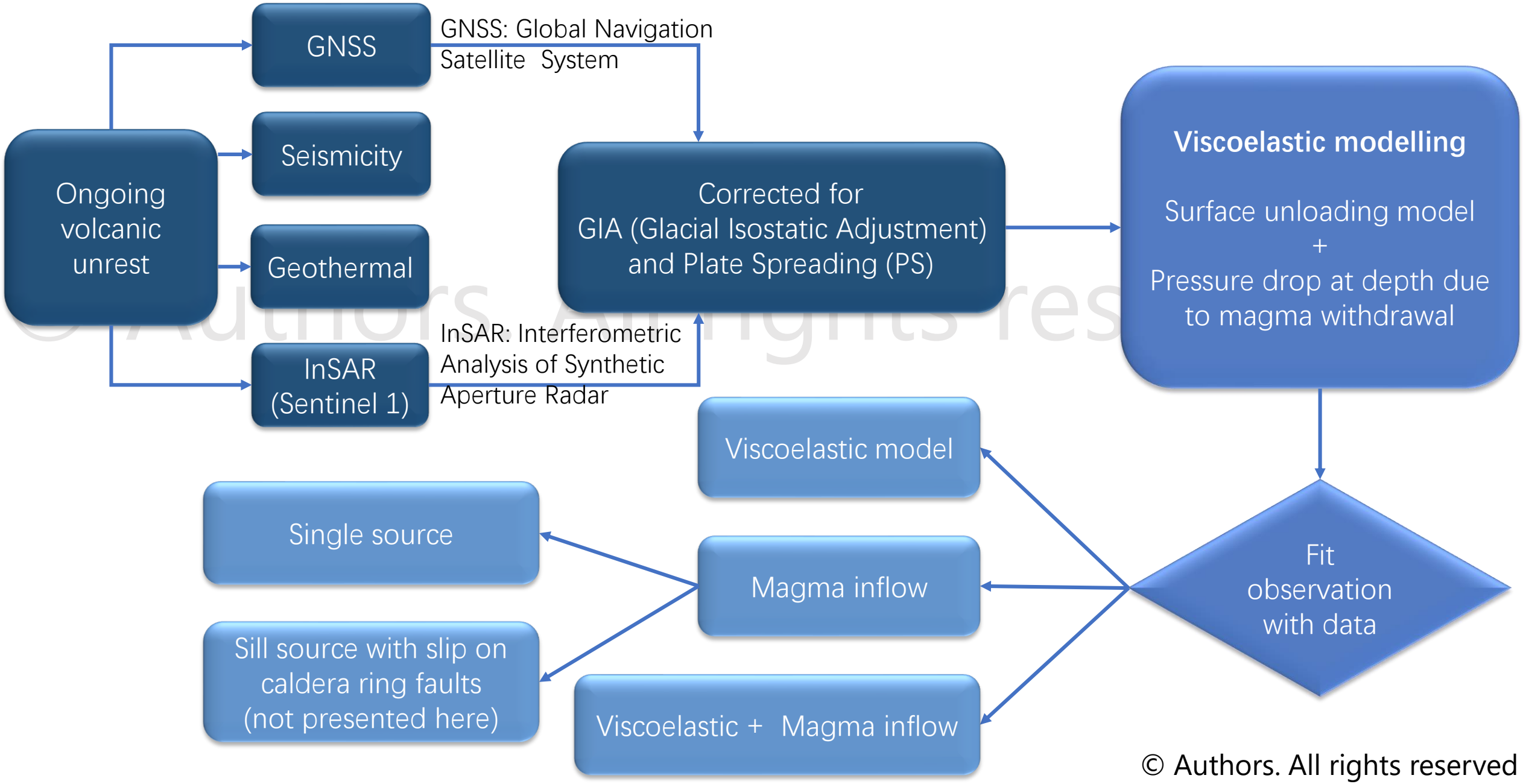
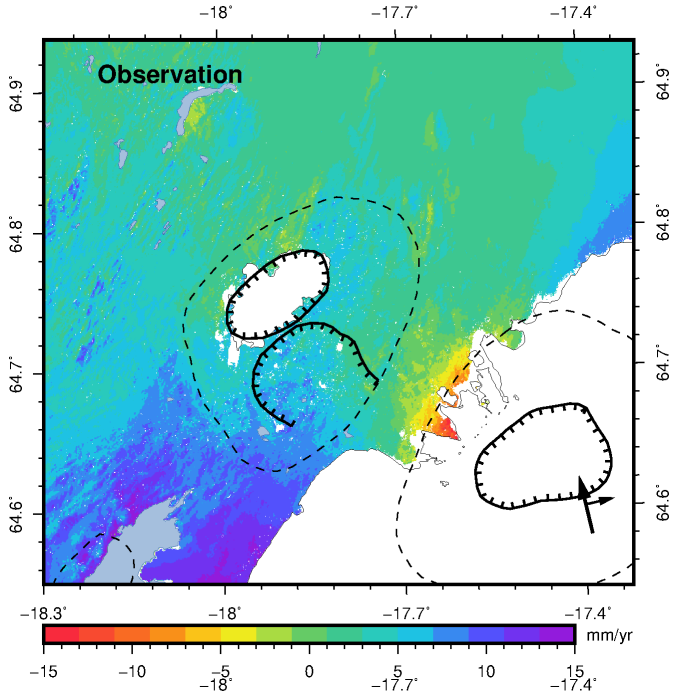


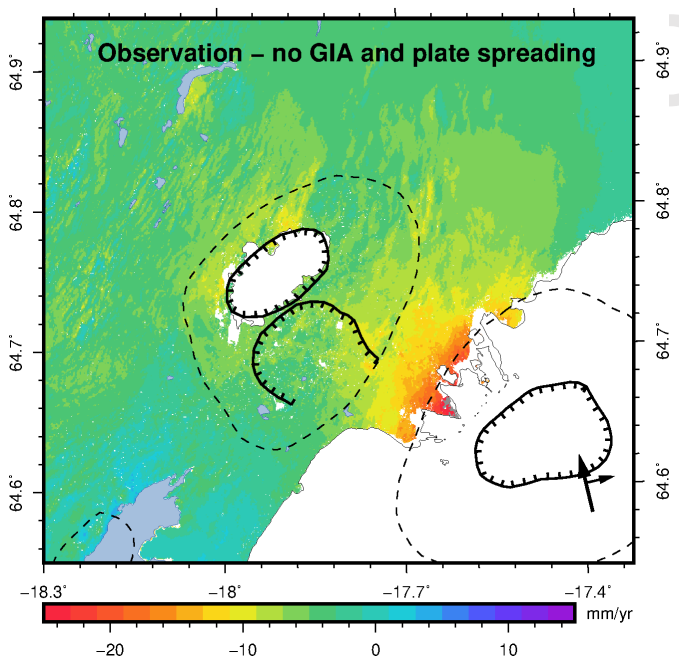
Bárðarbunga caldera, from Sparkle Motion@flickr.com

Question: can viscoelastic response explain the unrest of Bárðarbunga volcano?



Results





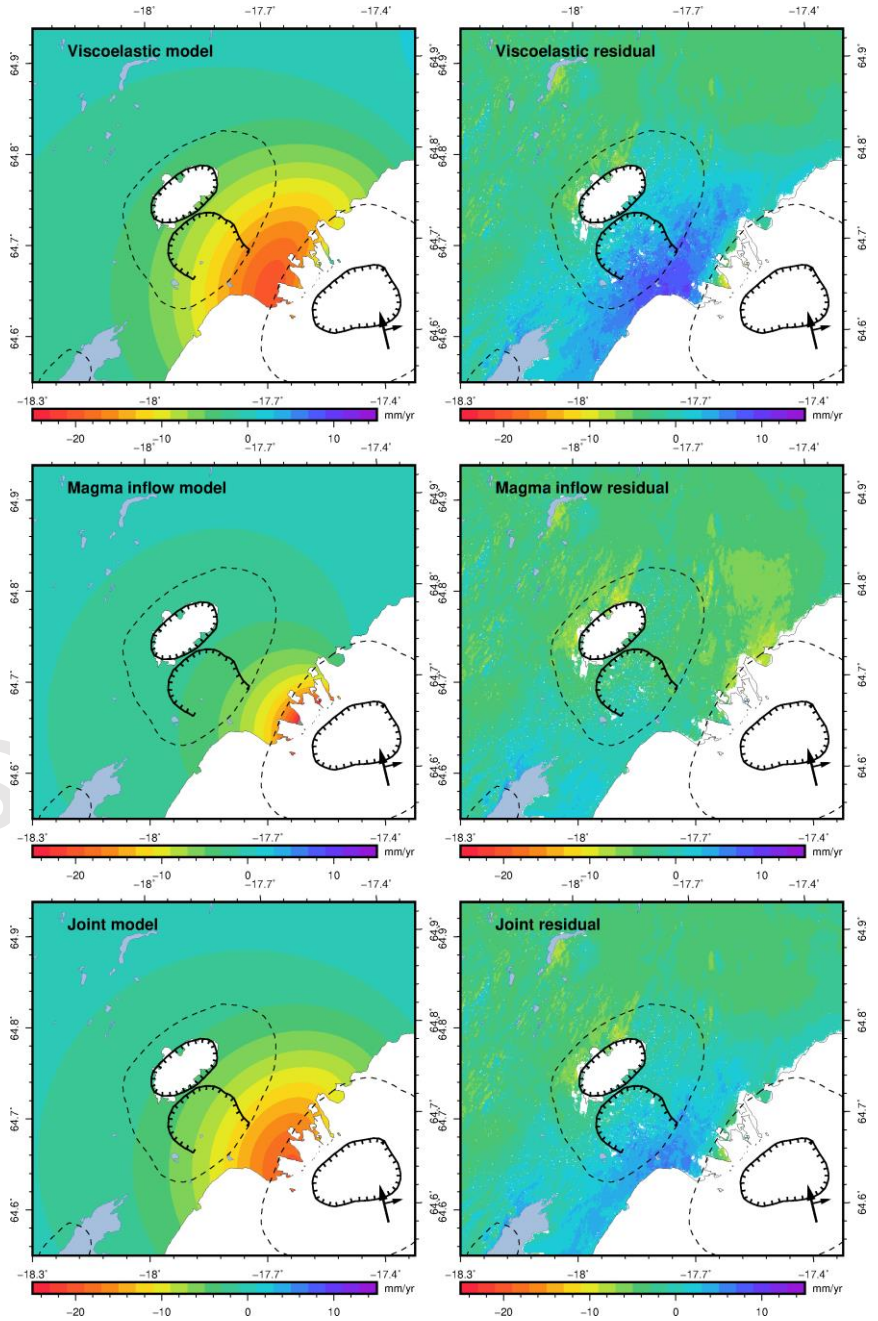
Viscoelastic model
Optimal viscosity 3.1 x 10^{18} Pa s
magma withdrawal volume: 0.4 km^3

Elastic model
Source depth: 0.7 km
Source volume: 10^7 m^3/yr

Joint model (example)
Viscoelastic deformation contribution
Viscosity 5 x 10^{18} Pa s
Magma withdrawal volume: 0.4 km^3

Magma inflow contribution
Source depth: 0.5 km
Source volume: 2.2 x 10^7 m^3/yr

model residual



Conclusion

GPS and InSAR between 2015 and 2018 indicate:

- horizontal displacement away from the caldera, maximum 110 mm/yr.
- minor vertical displacement (<12 mm/yr), except the nearest GPS site (3 km away from caldera, 20 mm/yr).

We correct the background deformation signal, GIA and plate spreading, before modeling

Viscoelastic model or magma inflow model alone can explain majority of the signal.

Combination of viscoelastic deformation and magma inflow models in the post-eruptive period further improves the fit to the observed deformation field.

Future work will focus on understanding the model complexities and evaluate the stresses in the model.