



Determining scaling laws from geodynamic simulations using adjoint gradients.

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Whereas significant progress has been made in modelling of lithospheric and crustal scale processes in recent years, it often remains a challenge to understand which of the many model parameters is of key importance for a particular simulation. Determining this is usually done by manually changing the model input parameters and performing new simulations. For a few cases, such as for crustal-scale folding instabilities (with viscous rheologies, e.g. [1]) or for Rayleigh-Taylor instabilities, one can use existing scaling laws to obtain such insights. Yet, for a more general case, it is not straightforward to do this (apart from running many simulations). Here, we test a different approach which computes gradients of the model parameters using adjoint based methods, which has the advantage that we can test the influence of an independent number of parameters on the system by computing and analysing the covariance matrix and the gradient of the parameter space. This method might give us the chance to get insights on which parameters affect for example subduction processes and how strong the system depends on their influence.

[1] Fernandez, N., & Kaus, B. J. (2014). Fold interaction and wavelength selection in 3D models of multi-layer detachment folding. *Tectonophysics*, 632, 199-217.