

Accepted Manuscript

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PII: S1342-937X(17)30212-5
DOI: doi: [10.1016/j.gr.2017.04.027](https://doi.org/10.1016/j.gr.2017.04.027)
Reference: GR 1799

To appear in:

Received date: 1 November 2016
Revised date: 7 April 2017
Accepted date: 10 April 2017

Please cite this article as: L. Colli, S. Ghelichkhan, H.-P. Bunge, J. Oeser , Retrodictions of Mid Paleogene mantle flow and dynamic topography in the Atlantic region from compressible high resolution adjoint mantle convection models: Sensitivity to deep mantle viscosity and tomographic input model, (2017), doi: [10.1016/j.gr.2017.04.027](https://doi.org/10.1016/j.gr.2017.04.027)

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Retrodictions of Mid Paleogene mantle flow and dynamic topography in the Atlantic region from compressible high resolution adjoint mantle convection models: sensitivity to deep mantle viscosity and tomographic input model

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Abstract

Although mantle convection at Earth-like vigor is a chaotic process, it has been shown by conceptual studies that one can constrain its flow history back in time for periods comparable to a mantle overturn, ≈ 100 million years, if knowledge of the tangential surface velocity field and estimates on the present-day heterogeneity state are available. Such retrodictions, enabled through computationally demanding adjoint methods, are a promising tool to improve our understanding of deep Earth processes, and to link uncertain geodynamic modelling parameters to geologic observables. Here we present the first mantle flow retrodictions for geodynamically plausible, compressible, high resolution Earth models with ≈ 670 million finite elements, going back in time to the Mid Paleogene. Our retrodictions involve the dynamic

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