Title:
Lithospheric structure and mantle flow at the Eastern North American Margin identified from a suite of seismic data types

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Abstract:
The Eastern North America Margin (ENAM) has tectonic boundaries marking several Wilson cycles, and rifted during the breakup of Pangea. Many key tectonic boundaries have only been roughly inferred, such as the Grenville front inherited from a previous supercontinent. Further, the complex topography of the lithosphere-asthenosphere boundary (LAB) influences mantle flow, and may explain sites of enigmatic 50 Ma intraplate volcanism. Finally, mid-lithospheric velocity discontinuities (MLDs) are linked to ancient accretion or more recent processes. We inverted seismic velocity profiles at ENAM using Rayleigh and Love wave phase velocity, Rayleigh wave ellipticity, and *Sp* and *Ps* receiver functions. This combination of data provides resolution from the crust into the asthenosphere, constraining both absolute velocity and the depths of velocity discontinuities. We used a Markov-Chain Monte-Carlo inversion to generate suites of models. We find that the Grenville front is demarcated by a substantial change in lithospheric velocity structure. A low velocity feature in the Appalachians that underlies intraplate volcanism is imaged dipping toward the ocean, which may clarify the cause of local mantle upwelling. While few previous models simultaneously image MLDs and the LAB, our model clearly shows both. The new models illuminate aspects of continental assembly and how continents continue to evolve as passive margins.

Figure: