Supporting Information for “Regional-Scale Lithospheric Recycling on Venus via Peel-Back Delamination”

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Introduction This supporting information contains a more detailed description of the topographic evolution of the reference model.

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Text S1.

Surface topography evolution was plotted in Supplementary Fig. 1 (A-E) over a section of the domain for the reference model. All delamination models exhibited similar changes in topographic features. For each model, we tracked the height and location of the forebulge and the depth and location of the trench over time. Initially, there was a topographic high over the surface of the gap as is expected due to the density contrast with adjacent lithosphere. Early in the model evolution (0.2 Myr), the edge of the thickest plate h_L bent downward into the mantle, creating a small trench (Supplementary Fig. 1A). As the slab continued to sink, a topographic low formed in association with the location of the trench and a topographic high formed on the surface of the down-going plate over the flexural bulge. The peak over the forebulge increased in height as both the forebulge and trench retreated steadily away from the initial gap zone (Supplementary Fig. 1B-D). The topography over the gap decreased in height compared to the initial stages and remained near zero elevation for the duration of the model evolution. A topographic high marked the edge of the non-delaminating plate with thickness h_{L-min}. The end of steady-state delamination was punctuated by the start of slab break-off at the surface. As the plate began to break-off at the surface, the magnitude of the trench depth and forebulge height decreased sharply. The trench and forebulge movement also suddenly changed directions from moving away from the gap to being pulled back toward the site of break-off. The timings of these changes in trench depth, forebulge height, and forebulge location were used to define the end of steady-state delamination for each model (see Fig. 9).

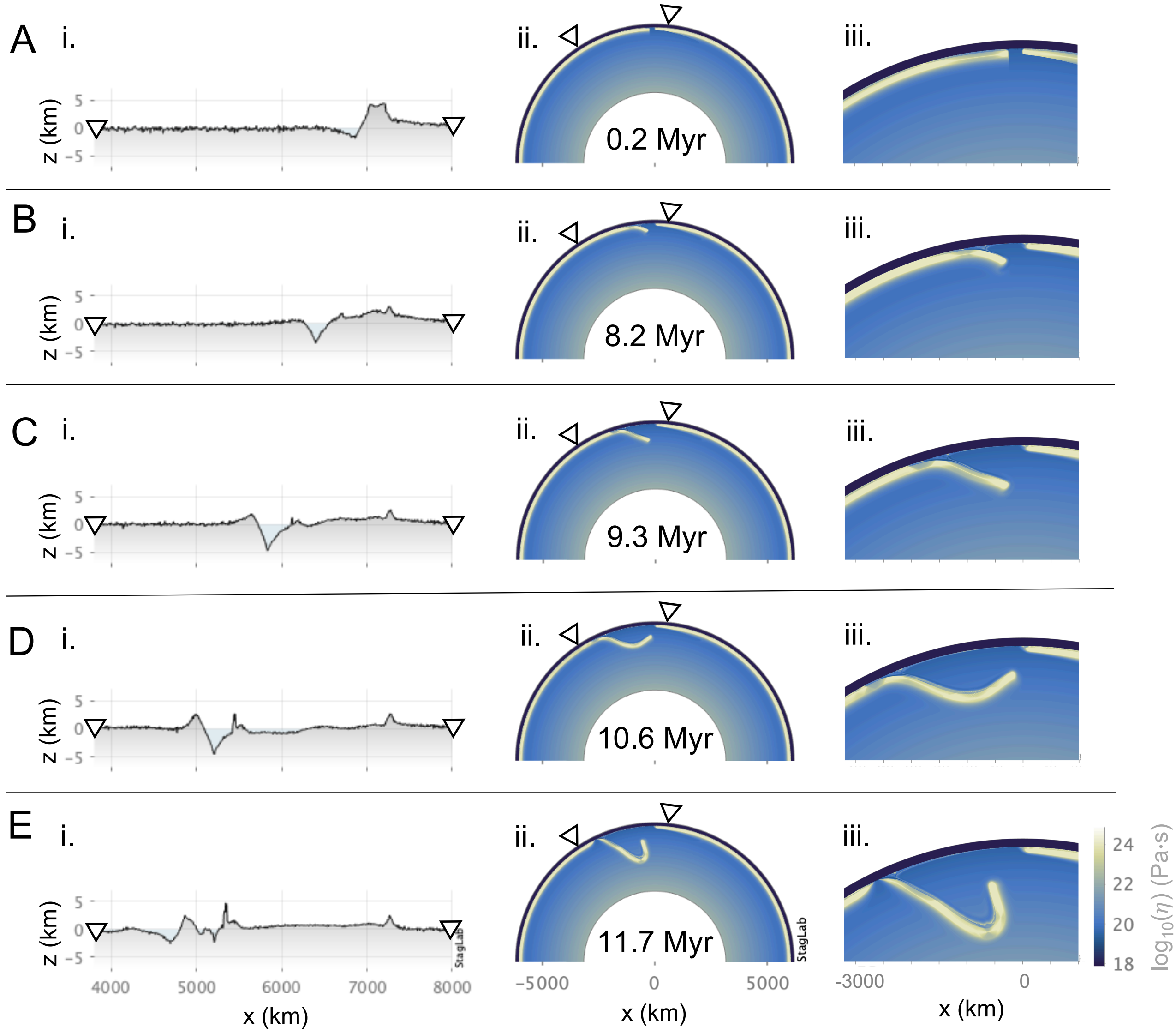

Figure S1. Typical evolution of a peel-back delamination event shown in the (i) topography field, (ii) global viscosity field, and (iii) local viscosity field of the reference model (B_{crust} = -300 kg/m^3, h_L = 250 km, η_{max} = 10^{24} Pa·s). Timing of model stages (A-E) correspond to Figure 5.