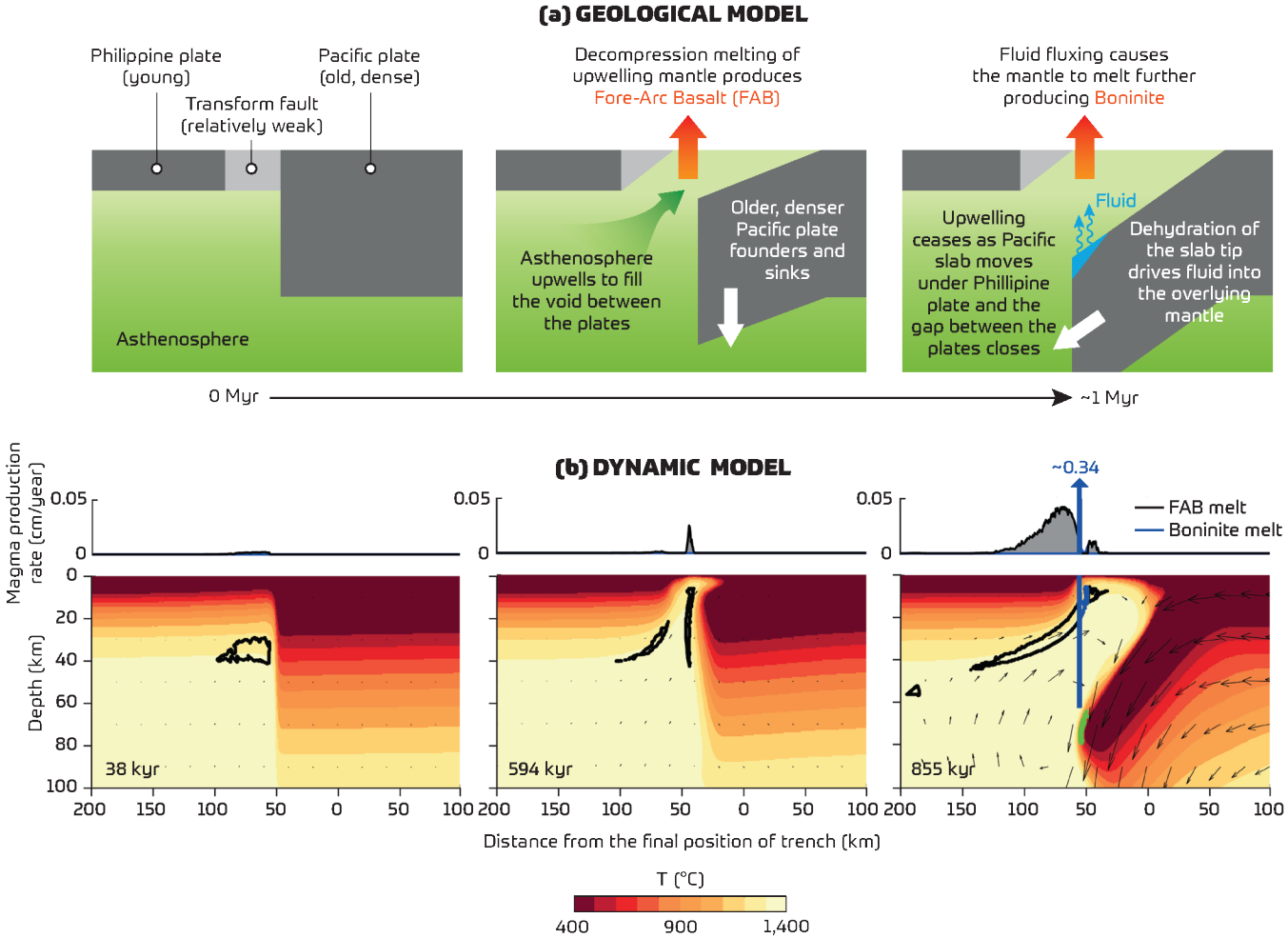

Drilling results allow us to test subduction initiation models. International Ocean Discovery Program Expedition 352 recovered a continuous, in situ record of subduction initiation from a segment of the forearc of the Izu-Bonin-Mariana subduction system. (a) Cores show a distinct magmatic progression from mid-ocean ridge-like forearc basalts (FAB) to volatile-rich "boninite" lavas took place over approximately 1 million years (Reagan et al., 2019, https://doi.org/10.1016/j.epsl.2018.11.020). (b) Dynamic numerical modeling reveals that subduction initiation driven by internal, vertical (buoyancy) forces is needed to reproduce both the temporal and spatial distribution of magmatic products observed in the Expedition 352 cores. Previously models invoking horizontal external forces are unable to generate the lava types or their distributions. Overlain on the dynamic model results are: regions where decompression melting is occurring (black outline), regions where melting is occurring in the presence of slab fluid (blue outline), and the region of the subducting crust that has crossed its solidus (green outline). *Modified from Maunder et al. (2020), https://doi.org/10.1038/s41467-020-15737-4*