Fig. 31: a) basemap of the Philippine Sea Plate showijng the geometry at the time of IBM subduction initiation, after Leng and Gurnis (2015). b) Zoom in of the region drilled during IODP Expedition 351 (U1438, shown by star), the ASB (Amami Sankaku Basin) and the relic ridges AP (Amami Plateau), DR (Saito Ridge), and ODR (Oki-Daito Ridge). The black arrow locates the presumed transform fault or fracture zone along which subduction initiation occured. c) Reconstruction at 50 Ma of the present-day topography. d) Outlines of the relic arcs (in grey) indicating the location of the new trench (in blue) at 50Ma.
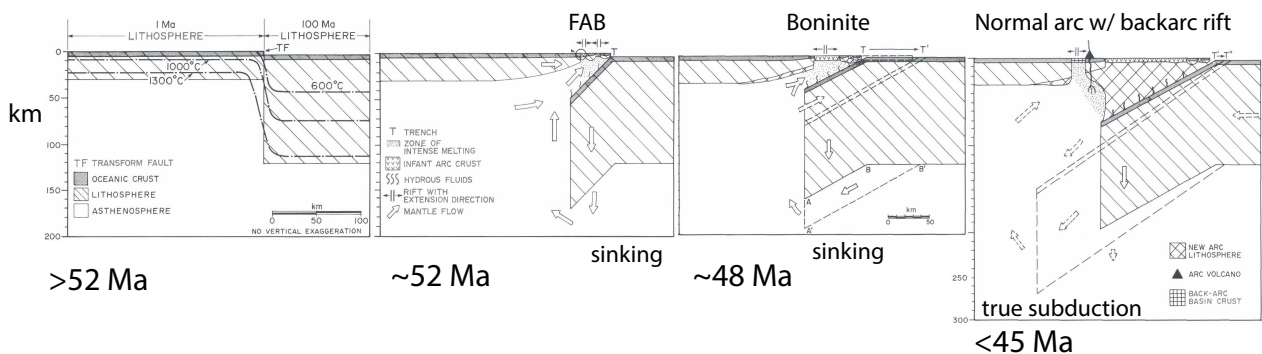
Spontaneous collapse along transform fault to cause new subduction zone to form the Izu-Bonin-Mariana arc in western Pacific (Stern and Bloomer, 1992). Section perpendicular to the transform fault/trench through the crust and upper mantle just prior to (1), and just after (2), initiation of subduction. (3) Section perpendicular to the arc showing why spreading in the fore arc might cease. Original lithosphere and mantle motions are outlined in solid lines, whereas new position and motions are outlined by dashed lines. (A) Continued subsidence of lithosphere results in fore-arc extension, with trench moving from T to T' as the base of the lithosphere moves from A to A'. Retreat of subsidence hinge from T to T' involves removal of asthenospheric material in trapezoid AA'BB'; further retreat involves removal of material progressively farther from the tip of the lithosphere (at B'), while progressive subsidence (from A to A', and beyond) progressively cuts off route of asthenospheric transfer (shown by arrows). (4) Eventually, lithosphere begins to move with a downdip component, and true subduction begins. This results in a greatly reduced rate of trench migration, which leads to a corresponding reduction in fore-arc extensional stress, allowing the forearc to cool and form thick lithosphere, forcing the magmatic axis to migrate away from the trench. Extensional strain resulting from trench rollback (T'-T") is taken up in back-arc spreading.