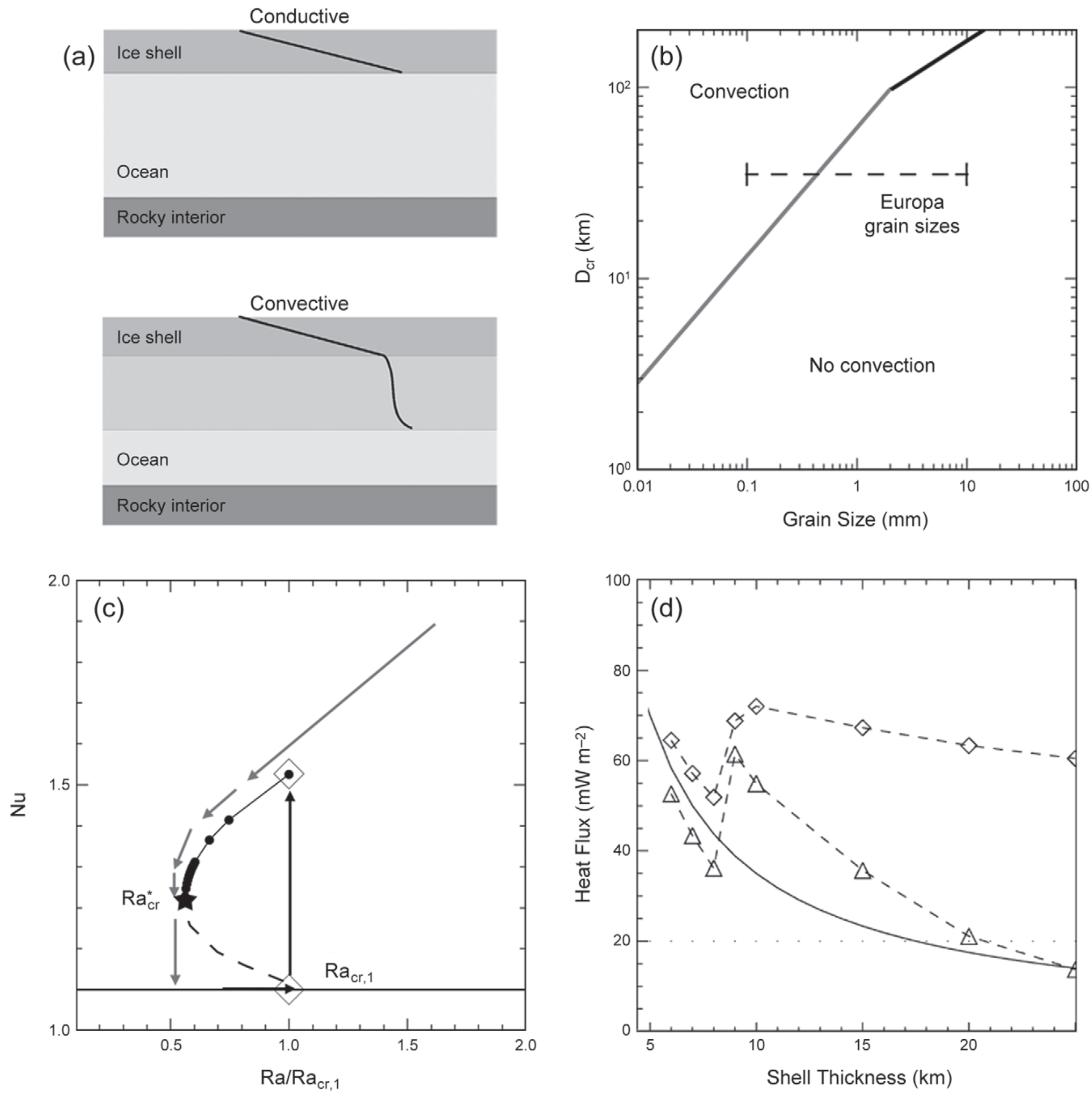

Fig. 1. **(a)** Schematic temperature structures for a conductive (top) and convective (bottom) ice shell on Europa from *Mitri and Showman* (2005). **(b)** Values of ice shell thickness where convection is possible in Europa as a function of grain size. For ice grain sizes d > 2 mm, deformation during the onset of convection is accommodated largely by GSS creep (black), but for smaller grain sizes, deformation is accommodated by volume diffusion (gray). After *Barr and Pappalardo* (2005). **(c)** Behavior of an ice shell in Ra-Nu space during the onset of convection in a basally heated fluid with $\theta = 18$ ($\Delta\eta = 10^8$) (black arrows) and decay of convection (gray arrows). Diamonds illustrate location of simulations of the onset of convection by *Mitri and Showman* (2005), points, solid, dashed lines show locations of simulations of the decay of convection by *Solomatov and Barr* (2007). When convection begins, Nu jumps from 1 to ~1.6–1.7 (see section 4.2.3), depending on the form of temperature perturbation used. When convection stops, Nu can achieve very low values for $Ra < Ra_{cr,1}$, but ultimately stops when $Ra < Ra^*_{cr}$, when Nu ~ 1.1–1.3 for rheological parameters for ice. **(d)** Heat flux as a function of ice shell thickness for equilibrium configurations of Europa's icy shell, illustrating the jump in heat flux at the convective/conductive transition D ~ 9 km. Tidal heating with a tidal-flexing strain amplitude 2×10^{-5} is assumed, and a Newtonian rheology is used with a melting-temperature viscosity of 10^{13} Pa s and a viscosity contrast of 10^6. Triangles and diamonds show heat flux into the bottom and out the top of the ice shell, respectively. Solid curve shows relationship between flux and thickness for a conductive solution with no tidal heating. From *Mitri and Showman* (2005).