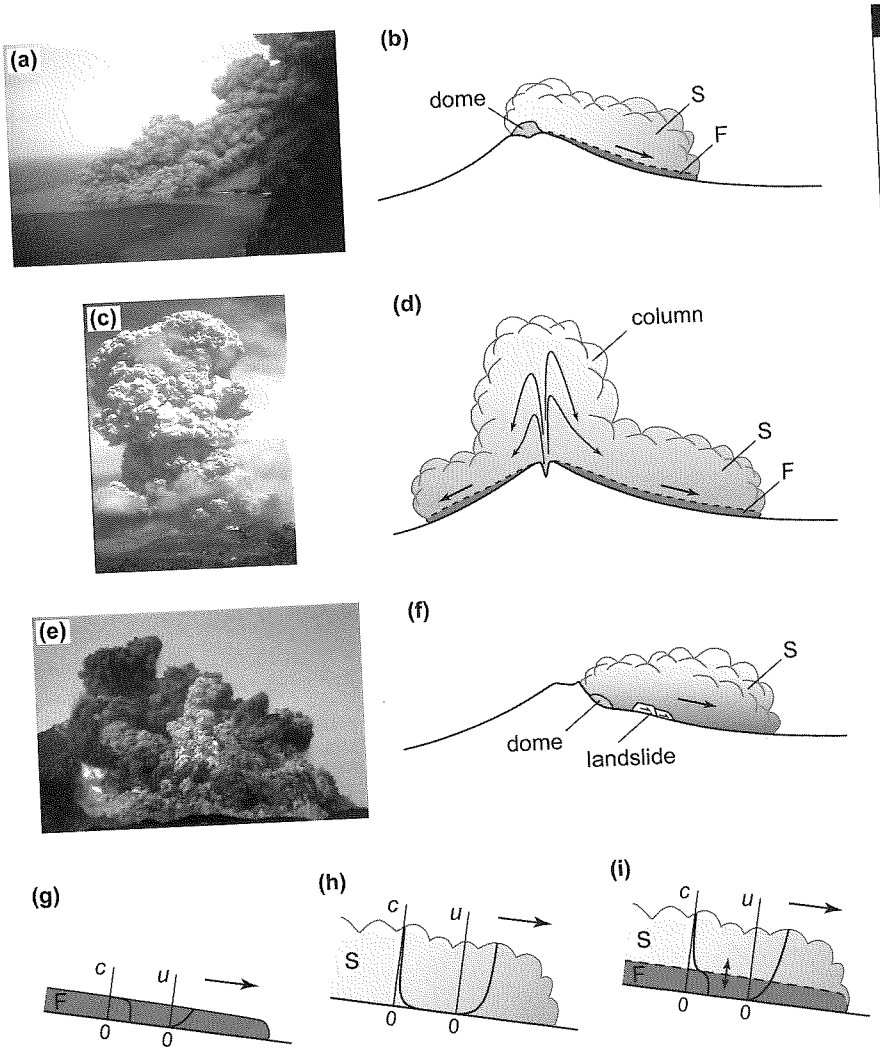

Figure 10.1 Photographs and schematic diagrams of PDCs generated by various mechanisms. The *dilute surge* and *dense flow* portions of the flow are labeled S and F, respectively (not to scale). (a) Lava dome collapse, Montserrat, 1997 (courtesy of R. S. J. Sparks), and (b) schematic diagram of gravitational or explosive lava dome collapse; (c) collapse of a vulcanian eruption column, Montserrat, 1997 (courtesy of A. B. Clarke), and (d) schematic diagram of gravitational collapse of discrete or continuous eruptive column; (e) lateral explosion, Mt. St. Helens, 18 May 1980 (courtesy of U.S.G.S), and (f) schematic diagram of lateral explosion caused by decompression of a cryptodome following landslide. (g–h) Schematic diagrams of the dense (F) and dilute (S) end-members of PDCs, with possible concentration (*c*) and velocity (*u*) profiles, whose curvature can be highly variable. (i) PDC consisting of a basal dense flow and an upper dilute surge; the double arrow and the dashed line indicate, respectively, that the transition between the basal and upper regions can be located at various heights, and be sharp or progressive.

at speeds of up to ~50–200 m s^{-1}, making them much more mobile than dry rock avalanches of equivalent volume. The principal characteristics of PDCs are summarized in Table 10.1.

As direct observations of PDCs are difficult and rare, their properties are inferred mainly from field analyses of their deposits. The characteristics of PDCs are presented in extensive reviews by Cas and Wright (1987), Druitt (1998), Freundt *et al.* (2000), Valentine and Fisher (2000), Branney and Kokelaar (2002), Sulpizio and Dellino (2008), and therefore detailed features will not be given here. PDCs represent a range of gravity-driven flows whose end-members are the *dilute pyroclastic surges* and the *dense pyroclastic flows*. Dilute surges are thought to be turbulent suspensions with solids concentrations of the order of 1 kg m^{-3} that increase downwards through the flow depth, and with mean internal horizontal velocities that increase upwards (Fisher, 1966; Valentine 1987; Dellino *et al.*, 2008). Particle interactions are negligible except at the basal boundary layer where the