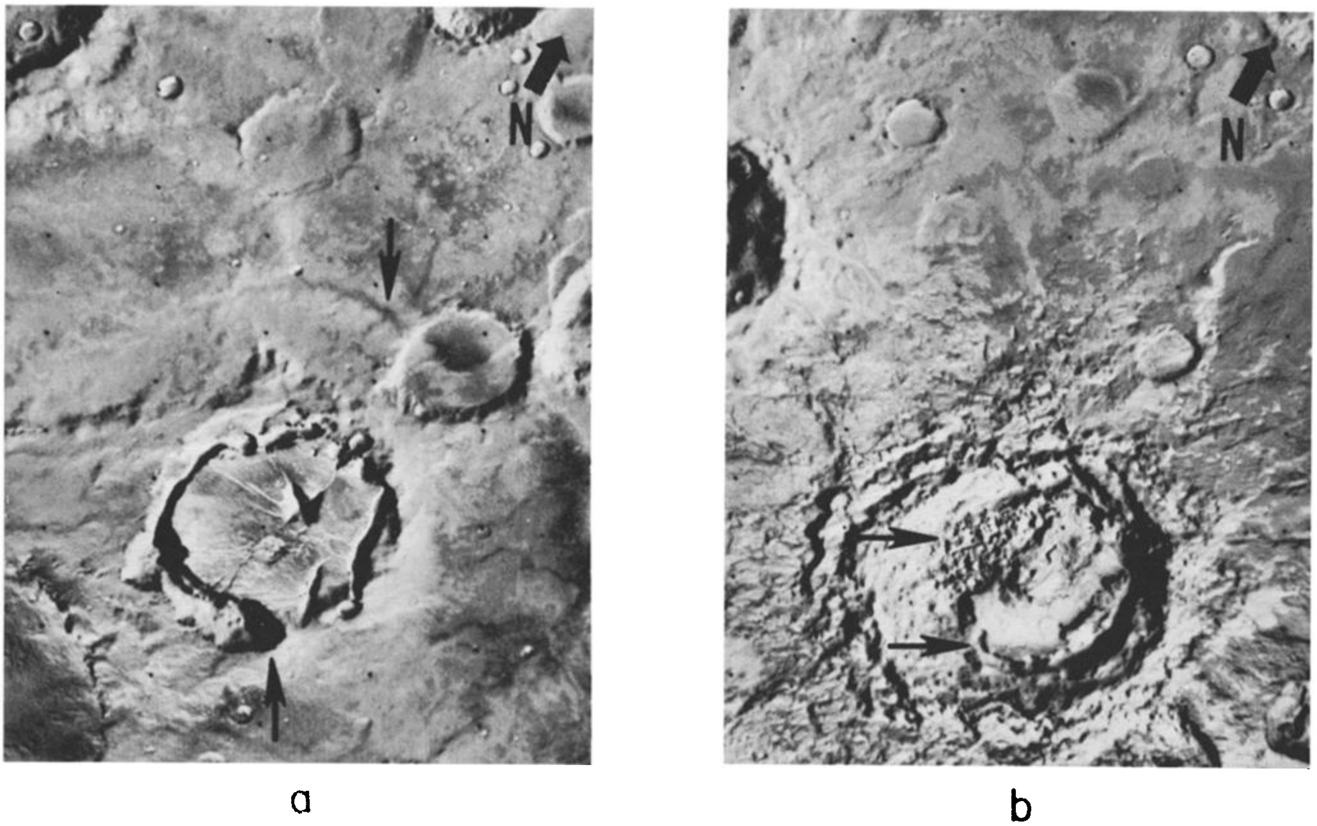
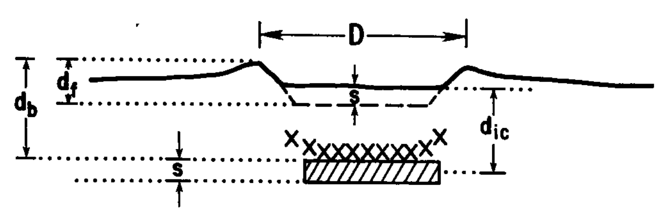


Fig. 8. (*a*) Deep, arcuate depression (lower arrow) engulfing the rim of a partly buried 75-km-diameter crater southeast of the Argyre basin. Undisturbed portions of floor/wall contact indicate that uplift of the crater floor has been minor. A ring of dark deposits partly encircles the region (lower arrow). Viking frame 93A29 centered at 356°W, 47°S. (*b*) Well-preserved impact crater containing a deep, arcuate depression (lower arrow) similar to a nearby crater shown in Figure 8*a*. A portion of the northern floor is broken into chaotic terrain (upper arrow). Viking frame 93A27 centered at 359°W, 49°S.

sufficiently long times. The range in depths for each curve represents different values for the specific heat. Also included are the upper limits of melting for different thermal gradients without an intrusion. As is expected from the defined dependence between crater size and intrusion depth, progressively larger craters result in progressively less melting near the surface when there is no thermal gradient. With a superposed global thermal gradient, the maximum depth of melting asymptotically approaches the depth predicted simply from the thermal gradient alone.

The results shown in Figure 10 suggest that a 1-km-thick intrusion beneath craters smaller than approximately 20 km in diameter may result in melting of water/ice-bearing sediments to near the surface. More likely, crater floor depths for these smaller craters are less than 2.5 km [*Cintala*, 1977], thereby increasing the depth to the center of the intrusion relative to val-



d_f = depth from rim to original crater floor
d_b = depth from rim to base of brecciated zone
d_{ic} = depth from modified floor to center of intrusion
s = thickness of tabular intrusion
D = final crater diameter (after slumping)

Fig. 9. Diagram defining placement of tabular intrusion beneath the brecciated zone (crossed region) of an impact crater. The injection of tabular intrusion is assumed to uplift the crater floor by its thickness *s*.

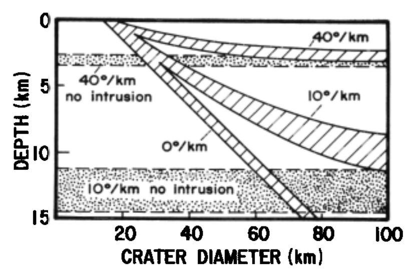


Fig. 10. Comparison of calculated depths below which melting of ice-bearing permafrost can occur as a result of a crater-localized igneous intrusion approximately 1-km thick. Geometry of the intrusive model is shown in Figure 9. Thawing is calculated for conditions without any preexisting thermal gradient and with two superposed gradients (10°/km and 40°/km). Range of adopted volumetric specific heats for country rock (0.52 cal/cm³ °C $\leq \rho c \leq$ 0.83 cal/cm³ °C; includes value for magma, ρc = 0.6 cal/cm³ °C) is indicated by striated regions (intrusion with preexisting gradient) and stippled region (with gradient only).