Figure DR1. Time-lapse animation of overhead views showing the evolution of model 1, lit from the north. Requires QuickTime for playback.

Figure DR2. (a–d) Surface structural evolution of the west end of model 1 during stage 2 of subsidence in which slabs extended on flanks of a drainage trough. (e) Stage 2 of subsidence, featuring radial thrusts in the west drainage trough. Some radial thrusts are annotated; others are marked by shadowed fault scarps. Figure 5 shows the location. Overhead photographs lit from the top. Key structures: 2, hinge graben; 3, axial thrust; 8, inward-tilted slab of unit 1; 9a to 9i, extensional fault scarps in downgoing slab; 10, subsurface reactive diapir; 12, drainage trench; 13, radial thrusts (only some of which are annotated); 21, exposed diapiric wall; 22, exposed diapiric stock; 23, unit 2 exposed in landslide; 25, inward allochthonous flow; 27, linear suture.

Figure DR3. Oblique view to the east end of Hebes Chasma; eye altitude 36 km, 2× vertical exaggeration. Image via Google Earth from NASA/USGS and ESA/DLR/FU Berlin (G. Neukum). Figure 14 shows location.

Figure DR4. Arcuate grabens separate fault benches stepping down the west wall of Hebes Chasma. A septum only 6 km wide at its narrowest point separates Hebes Chasma from Echus Chasma. Vertical CTX image. Figure 14 shows location.

Figure DR5. Comparative hillslope morphology. (a) Shaggy weathering layered Lower Hebes Formation shedding a smooth talus apron down to the left. Vertical HiRISE view of the east flank of Hebes Mensa. Figure 14 shows location. (b–c) Shaggy weathering gypsum and anhydrite with limestone inclusions in Junction Diapir. These Carboniferous evaporites are mechanically weathering in a polar desert in the Sverdrup Basin on Axel Heiberg Island, Nunavut, Arctic Canada. Photographs by Martin Jackson.
Figure DR6. Laser-scan relief map showing vertical view of model 3, where extension spread far beyond the chasma boundaries because the underlying mobile unit 3 was equally widespread. Compare with Figure 6 where the mobile unit 3 was restricted to the chasma.