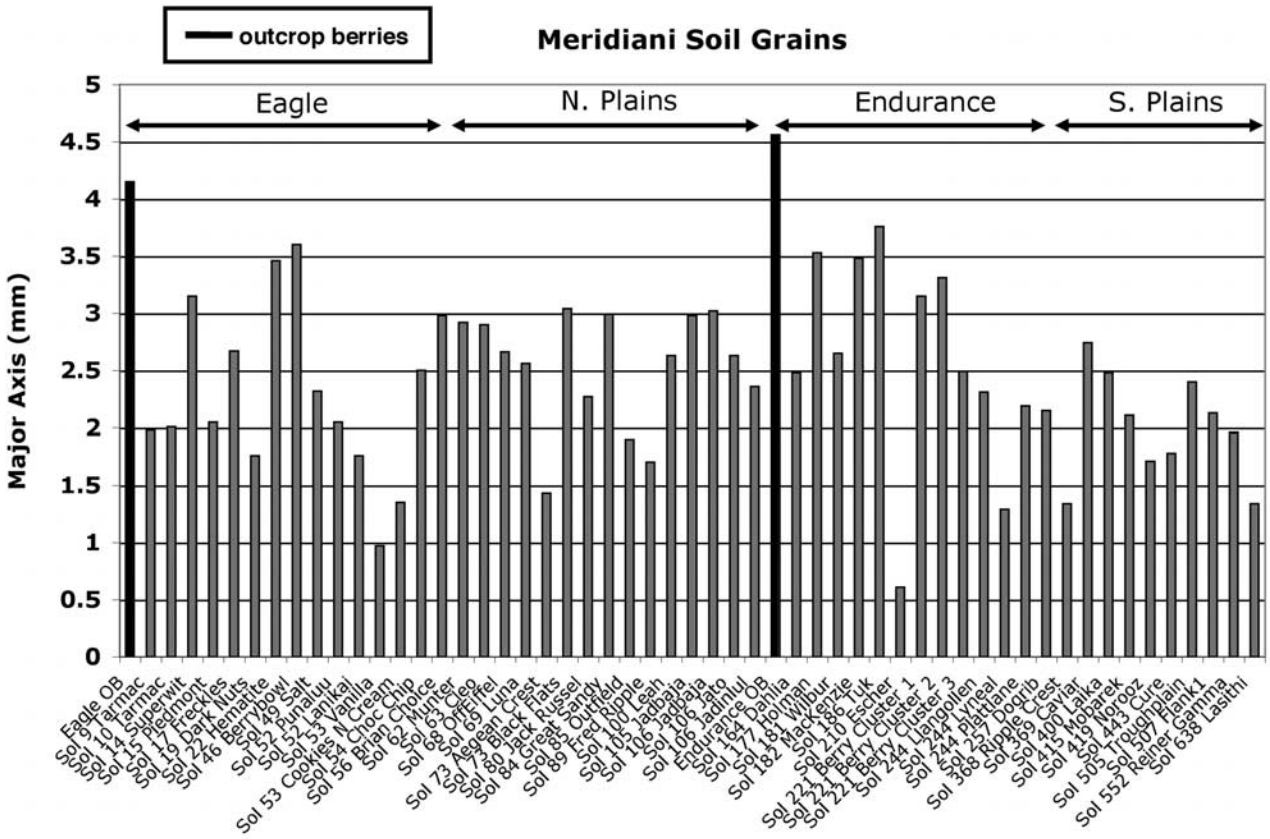

Figure 37. Plot showing average major axis of grains in MI images of various soils at Meridiani Planum. Also shown are average lengths of outcrop spherules (concretions) still embedded within rocks at Eagle (Eagle outcrop berry) and Endurance (Endurance outcrop berry) craters. Grains within Eagle and Endurance have a greater range of sizes compared to the plains. Grains measured on ripple crests tend to be similar in size. Northern interripple plains have slightly larger average grain sizes compared to southerly interripple plains, which is a reflection of the smaller sizes of spherules in the southern soils.

places where the soil has been disturbed by the rover wheels or landing airbags, larger grains are pushed into the finer-grained soil by the full diameter of the grains. This compaction indicates the presence of a large population of smaller grains, as is the case at Gusev Crater [*Arvidson et al.*, 2004]. Figure 32 shows a typical soil that has been compressed by one of the IDD instruments; all four common soil components previously identified in earlier sols [*Yen et al.*, 2005] (i.e., dust, small grains, irregular clasts, and more rounded clasts) can be seen here. Absent from this image are spherules, shown to be rich in hematite [*Klingelhöfer et al.*, 2004; *Morris et al.*, 2006], which are also common to a greater or lesser extent in MI soil targets.

4.3.1. Primary Mission Summary

[82] During the initial 90 sols of the mission, MI observations were dominated by soils within Eagle Crater and a few in the plains between Eagle and Endurance craters. The soils within Eagle Crater varied considerably in their grain sizes and shapes [*Soderblom et al.*, 2004; *Weitz et al.*, 2006]. Grains near the center of the crater were generally smaller than those near the outcrop and one soil at the center of Eagle was composed of dark sand ripples [*Sullivan et al.*, 2005]. Soils closer to the outcrop tended to have larger spherules because wind erosion of the outcrop enabled the more resistant spherules embedded in the outcrop to concentrate in the adjacent soils. Patches of soil composed exclusively of dark sand were observed by the MI between outcrop blocks in Eagle (sol 27 ''Red Sea''), while patches of soil composed of only dust were found just outside the crater rim in the downwind direction (sol 59 ''Dendrites''). The composition of the bright dust (grains not resolved by the MI) has been interpreted to derive from a global unit, rather than local rocks and other loose particles, while the darker grains show a basaltic mineralogy that reflects either similarities in parent rock lithology or another global unit [*Yen et al.*, 2005]. Neither of these components appears to have been derived from local materials, as they are compositionally more similar to other soils across the planet than the local rocks, outcrops and loose particles [*Yen et al.*, 2005]. These authors conclude that fine-grained soil particles are likely the product of eolian transport and redistribution. The pitted, abraded texture of the larger, irregular clasts supports this claim.

4.3.2. First Three Extended Missions

[83] Soils in the plains between Eagle and Endurance craters do not show the same heterogeneities in grain sizes and shapes as those seen within Eagle Crater. Instead, the soils can be divided into ripples and interripples soils.