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Landforms caused by downslope mass wasting on Mercury

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Results from NASA MESSENGER spacecraft have revealed that Mercury's surface is more active than previously thought. New surface features such as faculae and hollows have been described that reveal the influence of volatiles in shaping the hermean landscape. In this study we focus our attention on sloping surfaces and use images to investigate small-scale mass wasting processes. On other bodies, such as Mars and Vesta, downslope mass wasting can be driven by volatiles, hence the objective of this study is to investigate the possible relation between mass wasting and slope-processes on Mercury. We performed a survey of MESSENGER NAC images at better than 100 m/pix between 20°N and 60°N latitudes. These images cover 53% of the surface of Mercury at these latitudes. We did not extend the survey further north to avoid deep shadows, nor further south where images at better than 100 m/pix are rare. Steep slopes are found within impact craters and vents. We systematically catalogued the presence of spur-and-gully morphology and downslope-oriented high albedo streaks. We found both landforms were randomly distributed over the surface, with a few tens of examples of each landform. Spur-and-gully morphology is only clearly visible in images with medium to low incidence angles, and only on steep slopes. Whereas streaks are visible independent of the lighting incidence and can be found on any type of sloping terrain. Spur-and-gully morphology is formed by the natural degradation of bedrock exposures. On the Moon this morphology is rare because of the thick regolith (and only visible in 50 cm/pix images). On Mercury the regolith is thought to be thicker than on the Moon, so the finding of widely distributed spur-and-gully morphology is surprising. The streaks could be related to differential erosion of materials with different albedos. Yet some are found on shallower hillslopes, where factors other than gravity would be required to initiate motion.

