THE MORPHOLOGY AND SURFACE PROCESSES OF COMET 19/P BORRELLY. D. T. Britt, University of Tennessee, Department of Geological Sciences, Knoxville, TN 37996, dbritt@utk.edu

Introduction: The Deep Space One fly-by of the Comet 19P/Borrelly converted the nucleus of Borrelly from an astronomical object, obscured by a coma of gas and dust, to a geological object with striking surface morphology and processes.

Morphological Units: Borrelly is one of the darkest objects ever imaged. The average geometric albedo is 0.022 ± 0.003, but surface reflectance varies by a factor of four between the dark spots with a reflectance as low as 0.007 to the brightest areas with a reflectance of 0.032 [1]. Some of this variation in reflectance may be due to particle size effects. Borrelly's surface can be divided into four morphological units on the basis of texture and albedo. The youngest unit is the *Dark Spots*: These are the darkest areas on the comet with reflectance typically around 0.01 but as dark as 0.007 [1]. This unit is found on the ends of the comet associated with the Mottled Terrain. Morphologically the Dark Spots appear to overlie the Mottled Terrain. These spots may be surface lags with the longest exposure to the space environment. *Mottled Terrain:* Areas rough at pixel resolutions with pits, troughs, aligned hills, and ridges. Textures suggest some degree of desiccation and terrain softening. This unit is generally darker than average, but shows strong albedo variations and it is not strongly associated with the active jet areas on the comet. The morphology and albedo suggest that the Mottled Terrain represents older surface lag deposits that have been subjected to reworking and terrain collapse. These morphologies are probably driven by the slow sublimation of volatiles that are insulated by thick lag deposits. *Mesas:* Areas of bright slopes surrounding darker, flat-appearing tops. These features are primarily in the central portion of the comet and appear, along with the Smooth Terrain, to be associated with the active jets. The tops of the Mesas may be older, darker lag deposits that insulate the lower terrain against outgassing. The Mesa slopes may be some of the more freshly exposed areas that are subject to gas/dust loss. *Smooth Terrain:* The Smooth Terrain shows higher than average albedo, is smoother than average at pixel scale, and is associated with the surface locations of Borrelly's active jets [2]. Reflectances are as high as 0.032, but are typically 0.028 [1]. The surface of the Smooth Terrain shows a fine pattern of albedo variegations. This unit may represent recent deposits of relatively large particle size material associated with the comet's active jets and is part of the active resurfacing processes from dust ejection. The albedo variegations may indicate areas of relatively active or young sublimation features. The size and texture differences between these features and those seen in the Mottled Terrain may reflect differences in the age of the features and/or the thickness of the insulating layer.

Conclusions: The surface of this comet is fundamentally different from the surfaces of asteroidal small bodies. Asteroidal surfaces are dominated by cratering processes and the resultant ballistically-emplaced ejecta. Comets, in stark contrast, are dominated by features directly or indirectly formed by sublimation of their volatiles and ballistic morphologies are absent or rare.

References: [1] Soderblom, L. A. et al. (2002) *Science,* in press. [2] Buratti, B. J. et al. (2001) BAAS 33, 1091.