Thermal Observations and Modeling of NEA Binary Systems

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Over the past several years we have been using near-infrared spectroscopy (0.8-4 μm) of near-Earth asteroids (NEAs) to characterize their composition and thermal properties. The combination of visible and thermal observations of asteroids have long been used to derive diameters, but for small, irregular asteroids, models that assume a spherical shape can result in large uncertainties. In addition, effects of varying thermal inertia, and surface roughness cannot in general be disentangled from effects due to irregular shape. Our thermal targets are imaged using radar, so that the detailed shapes and spin states are known. We apply our shape-based thermal model, SHERMAN, to determine the extent to which the shape affects the thermal emission, through uneven surface temperature distribution, as well as inhomogeneous regolith properties. Although the primaries of NEA binary systems are often close to spheroidal in shape, we find that the thermal emission from these bodies does not always match that of a model sphere when the observations span several different viewing geometries. We will explore the extent to which albedo, thermal inertia and surface roughness affect the observed thermal emission. In particular, we have studied (285263) 1998 QE2 and (175706) 1996 FG3, and will discuss the observations and thermal modeling of these and other NEA binary systems.