CONTROL ID: 2568107

TITLE: Thermal inertia as an indicator of rockiness variegation on near-Earth asteroid surfaces

ABSTRACT BODY:
Abstract (2,250 Maximum Characters): Determining key physical properties of asteroids such as sizes and albedos or reflectance spectra is crucial to understand their origins and the processes that they have undergone during their evolution. In particular, one of the aims of NEOShield-2 project, funded by the European Union’s Horizon 2020 Research and Innovation programme, is to physically characterize small near Earth asteroids (NEA) in an effort to determine effective mitigation strategies in case of impact with our planet [Harris et al. 2013 2013AcAau,90,80H].

We performed thermophysical modelling of NEAs, such as (1685) Toro, and potentially hazardous asteroids (PHAs), such as (33342) 1998 WT24. In addition to size, thermophysical models (TPM) of asteroids can constrain the surface thermal inertia, which is related to the material composition and physical nature, namely its "rockiness" or typical size of the particles on its surface. These have observable effects on the surface temperature distribution as a function of time and thus on the thermal infrared fluxes we observe, to which we can fit our model.

In the case of WT24, its thermal inertia has been previously constrained to be in the range 100-300 SI units [Harris et al. 2007, Icarus 188, 414H]. But this was based on a spherical shape model approximation since no shape model was available by the time. Such a low thermal inertia value seems in disagreement with a relatively high metal content of the enstatite chondrites, the meteorite type to which WT24, classified as an E-type [Lazzarin et al. 2004 A&A 425L, 25L], has been spectrally associated. Using a three-dimensional model and spin vector based on radar observations [Busch et al. 2008 Icarus 197, 375B], our TPM produces a higher best-fitting value of the thermal inertia. We also find the intriguing possibility that the hemisphere of WT24 dominated by concave terrains, possibly be the result of an impact crater, has a higher thermal inertia. This would be similar to the case of our Moon, where young impact craters are rockier than older craters covered by fully developed (i.e., fine-grained) regolith resulting from the erosion of the rocks exposed to the space environment for longer time scales.

CURRENT * CATEGORY: Asteroid Physical Characteristics: Surfaces

CURRENT : None

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