THE NIGHT EMISSION SIMULATED THERMAL MODEL (NESTM) FOR NEAR-EARTH ASTEROIDS. S. D. Wolters[1] and S. F. Green[1], [1]Planetary and Space Sciences Research Institute, The Open University, Walton Hall, Milton Keynes, MK7 6AA, UK, email: s.d.wolters@open.ac.uk

Introduction: Improved statistics of the diameters and albedos of Near-Earth Asteroids (NEAs) are needed for a more accurate derivation of their size distribution, which is crucial for assessment of the impact hazard and for optimising survey strategies. However, the discovery rate of NEAs is vastly outstripping their investigation [1]. As the number of NEAs with known taxonomic type increases, so does the requirement for an increase in measurements of their albedos. If an average albedo is correlated with the taxonomic type it can be used to derive a de-biased size distribution. A study has been done [2] using albedo statistics from NEAs obtained from [3].

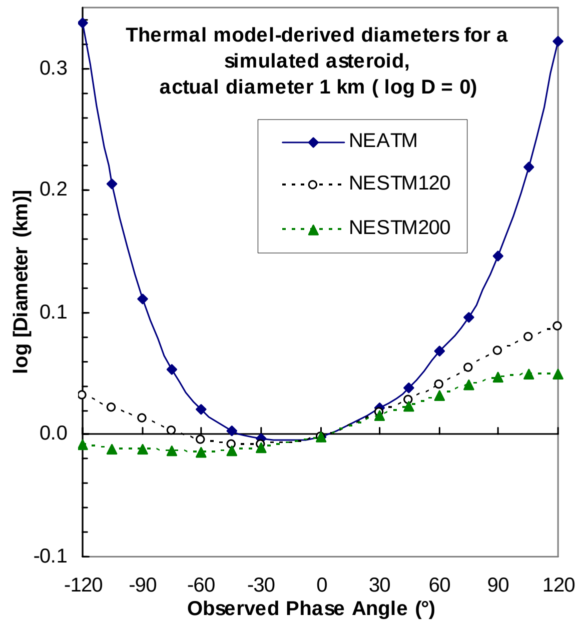
Limitations of current models: In a minority of cases, the asteroid's spin axis and shape are known, in which case complex thermophysical models can be used to derive the size and albedo of an asteroid., e.g. [4], [5]. However, in most cases we do not have this information, in which case more simple thermal models are required.

The Near-Earth Asteroid Thermal Model (NEATM) [6] has proven to be a reliable model for radiometric diameter determination. However, NEATM assumes zero thermal emission on the night side of an asteroid, affecting the best-fit beaming parameter η, overestimating the effective diameter D_{eff} and underestimating the albedo p_v at large phase angles (see Figure).

New Model: The Night Emission Simulated Thermal Model (NESTM) models the night side temperature (T_{night}) as an iso-latitudinal fraction (f) of the maximum day side temperature (T_{max} calculated for NEATM with $\eta = 1$):

$$T_{night} = fT_{\max} \cos^{1/4} \phi$$

where ϕ is the latitude. A range of f is found for different thermal parameters, which depend on the surface thermal inertia (Γ).



NESTM is tested on thermal IR fluxes generated from simulated asteroid surfaces with different Γ. NEATM and NESTM diameters are compared with radar diameters, and it has been found that NESTM may reduce a systematic bias in overestimating diameters. From these tests, it is suggested that a version of the NESTM which assumes $\Gamma = 120$ J m^{-2} s$^{-1/2}$ K^{-1} is adopted as a default model when the solar phase angle is greater than 45°.

References: [1] Cellino, A., Zappalà, V. and Tedesco, E. F. (2002) *Meteoritics & Planet. Sci, 37*, 1965-1974. [2] Stuart, J. S. and Binzel, R. P. (2004) *Icarus, 170*, 295-311. [3] Delbó, M., Harris, A. W., Binzel, R. P., Pravec, P. and Davies, J. K. (2003) *Icarus, 166,* 116-130. [4] Harris, A. W., Mueller, M., Delbò, M. and Bus, S. J. (2005) *Icarus, 179,* 95-108. [5] Müller, T. G., Sekiguchi, T., Kaasalainen, M., Abe, M. and Hasegawa, S. (2005) *Astron. Astrophys., 443,* 347-355. [6] Harris A. W. (1998) *Icarus, 131,* 291-301.