

## The Night Emission Simulated Thermal Model for Near-Earth Asteroids

Stephen D. Wolters and Simon F. Green, Planetary and Space Sciences Research Institute, The Open University, Walton Hall, Milton Keynes, MK7 6AA, UK, email: s.d.wolters@open.ac.uk

The Near-Earth Asteroid Thermal Model (NEATM, Harris, 1998) 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  $\eta$ , overestimating the effective diameter  $D_{eff}$  and underestimating the albedo  $p_v$  at large phase angles. The Night Emission Simulated Thermal Model (NESTM) is introduced. 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  $\phi$  is the latitude. A range of  $f$  is found for different thermal parameters, which depend on the surface thermal inertia ( $\Gamma$ ). NESTM is tested on thermal IR fluxes generated from simulated asteroid surfaces with different  $\Gamma$ .

NEATM and NESTM diameters are compared with radar diameters. For NEATM, we discuss the possibility that diameters obtained using default  $\eta$  may be systematically underestimating the diameter while diameters obtained by best-fitting  $\eta$  may be overestimating the diameter. It is 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  $\Gamma = 200 \text{ J m}^{-2} \text{ s}^{-1/2} \text{ K}^{-1}$  is adopted as a default model when the solar phase angle is greater than  $45^\circ$ .