EPSC Abstracts
Vol. 13, EPSC-DPS2019-1014-1, 2019
EPSC-DPS Joint Meeting 2019

EPSC
EPSC-DPS Joint Meeting 2019
15–20 September 2019 | Geneva, Switzerland

Infrared Radiometric Diameter Determination

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Abstract

Objects seen only at high phase angles present a challenge for all radiometric diameter determination methods. In [5] a thermophysical model [TPM] was used to simulate WISE or Spitzer observations, and the NEATM [1] was found to be a good approximation for phase angles less than 65 degrees with diameter errors less than 15%. A TPM was also used by [3] to simulate observations and diameters were calculated using both the NEATM and the FRM [2]. This paper found that at phase angles greater than 65 degrees the FRM gave better diameters even though the NEATM was always a better fit to the data with its one extra parameter, the beaming parameter η. But both studies used unrealistic distributions of the dimensionless thermal inertia parameter[3] $\Theta = \Gamma\sqrt{\Omega}/[F_\odot/T_{SS}]$, where $\Gamma = \sqrt{\kappa\rho C}$, $\Omega = 2\pi/P$ is the rotation rate, $F_\odot$ is the absorbed solar flux, and T_{SS} is the sub-solar temperature with no thermal inertia. This study uses a diameter dependent realistic Θ distribution computed from the small sample of measured thermal inertias Γ and the large sample of measured periods to compute the bias and scatter of diameter determinations for objects seen once at various phase angles, using a thermophysical model to simulate NEOCam observations.

Acknowledgements

This work has been supported by NASA under the NEOWISE project and the NEOCam project.

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