The Thermal Inertia of (16) Psyche Revisited

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M-type asteroid (16) Psyche has been selected by NASA as the target of a mission to be launched in 2023 (Elkins-Tanton & Bell 20172017EPSC...11..384E). It is hypothesized to represent the core of a differentiated planetesimal, which is supported by its large bulk and regolith densities (the latter inferred from radar; Shepard et al. 2010Icar..208..221S). On the other hand, its reflectance and emissivity spectra reveal absorption features associated with silicates, including a 3-micron band related to hydroxylated silicates.

Recently, thermo-physical modelling of mid-infrared spectra by Landsman et al. (2018Icar..304...58L) using the radarderived shape of Shepard et al. (2017Icar..281..388S) suggests that (16) Psyche's surface thermal inertia is low (5-25 SI units for emissivity 0.9), in contrast with an earlier estimate of about 125 SI units by Matter et al. (2013Icar..226..419M) based on interferometric data and a convex shape model. Matter et al. interpreted their result as evidence of a high metal content, but the incompatible results of Landsman et al. challenged this interpretation.

We will present our own additional thermo-physical analysis featuring IRAS and AKARI data (50 fluxes in total) and the new shape model by Viikinkoski et al. (2018A&A...619L...3V) based on ESO VLT/SPHERE/ZIMPOL high angular resolution observations of (16) Psyche.

Our preliminary results suggest that the thermal inertia is not smaller than 35 SI units at the 3-sigma level, which is incompatible with Landsman et al.'s result, whereas our best-fitting thermal inertia is compatible with Matter et al.'s previous higher estimate. While the association of a high thermal inertia with a high iron content might be contestable, it is still important to understand these discrepant results for accurately interpretating observations of Psyche and other targets with potentially similar surfaces.