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Characterising near-Earth asteroids using multi-wavelength observations

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Tracking and characterisation of near-Earth objects (NEOs) are crucial aspects of planetary science by helping us to understand the formation and evolution of Solar System, and planetary defence by providing information required for impact risk mitigation strategies. As more NEOs get discovered, also the opportunities to characterise them better increase, including using the Nordic Optical Telescope for that purpose. In fact, telescopes in the size scale of NOT could be key contributors in NEO tracking and characterisation, if utilised effectively. In this presentation, I discuss characterisation of the physical properties of NEOs using optical and radar observations. I used radar disk-function analysis, i.e., modelled the observed radar reflectivity as a function of the incidence angle, which can be used to derive the effective permittivity of the surface and the decimetre-scale surface roughness. The permittivity was then used for estimating the effective regolith bulk density up to the depth of about one metre. Radar delay-Doppler observations enable imaging resolution as fine as 7.5 m. Only NEOs greater than 100 m were included in this study. The radar observations can inform better of metallicity that can be challenging to distinguish using only optical observations, whereas optical observations are better at distinguishing between S- and C-complex asteroids. The goal is to investigate the trends in composition, density, and surface-roughness for different types of NEOs, and to understand how these characteristics can be investigated most effectively at different wavelengths.

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