Bulletin of the AAS • Vol. 52, Issue 6 (DPS52 Abstracts)

Heterogeneous surface of 1998 OR2

M. Devogèle[1], A. Virkki[1], S. E. Marshall[1], F. Venditti[1], D. Hickson[1], Z. Luisa[1], A. McGilvray[1], E. Jehin[2], M. Ferrais[3], Z. Benkhaldoun[4], J. Masiero[5], N. Moskovitz[6], B. Skiff[6], P. Taylor[7], A. Cellino[8], J. Rivet[9], P. Bendjoya[9], G. Borisov[10], D. Vernet[9], J. Chatelain[11], T. Lister[11]

[1]Arecibo Observatory/University of Central Florida, Arecibo, PR, [2]Liege University, Liege, Belgium, [3]Observatoire de Marseille, Marseille, France, [4]Oukaimeden Observatory, Oukaimeden, Morocco, [5]Jet Propulsion Laboratory, Pasadena, CA, [6]Lowell Observatory, Flagstaff, AZ, [7]Lunar and Planetary Institute, Houston, TX, [8]INAF Torino, Torino, Italy, [9]Observatoire Côte d'Azur, Nice, France, [10]Armagh Observatory/Institute of Astronomy and National Astronomical Observatory, Bulgarian Academy of Sciences, Armagh, United Kingdom, [11]Las Cumbres Observatory, Goleta, CA

Published on: Oct 26, 2020

We report observations of the H=15.8 mag potentially hazardous asteroid 52768 (1998 OR2) obtained during its 2020 apparition. On April 29th 2020, OR2 experienced its closest approach to Earth (16.4 Lunar distance) until 2079. Observations were obtained in polarimetry with the Torino Polarimeter at the Calern observatory (France; MPC 010) in February and April 2020, in radar with the Arecibo Radio telescope (Puerto Rico; MPC 251) Planetary Radar system from April 13th to 23rd 2020, and in photometry with the TRAPPIST-North and the Las Cumbres observatory (LCOGT) network of telescopes. One epoch was obtained by the NEOWISE mission.

Using the polarimetric albedo-polarization relation [1] we derived a visual albedo p_V = 0.16 ± 0.02 corresponding to an equivalent diameter of D=2.3 km based on its measured H=15.8 absolute magnitude. The NEOWISE observation provides other determinations of D=2.5 ± 0.5 km and p_V = 0.13 ± 0.04 consistent with the polarimetric data. Radar delay-Doppler images, with a resolution of 7.5 m per pixel in delay and 0.037 Hz in frequency, provide another independent size measurement and display a maximum extent of 2.16 km ± 0.05 km. Both radar and optical lightcurve observations confirm the rotation period of p=4.112 h [2], with a low amplitude lightcurve varying from single to double peaked, based on the phase angle and aspect angle variation throughout the apparition.

The polarimetric observations were conducted over more than one rotation period during each night and we observe a consistent phase-locked variation of the polarization. Asteroid polarization is independent of shape and is at first order dependent on the surface albedo. The observed variation of the polarization thus suggests that the surface of OR2 is heterogeneous. Such variation has only previously been observed for 4 Vesta [3], 1943 Anteros [4], and 3200 Phaethon [5,6].

The radar images of OR2 suggest the presence of a large concavity or crater near the radar sub-latitude (closest point of the object to the observer). Phasing the radar and polarimetric observations, we find that the maximum of polarization occurs when the radar concavity is directly facing the observer. Such correlation suggests that the polarimetric variations could be related to the presence of the concavity and that it possesses lower albedo or different scattering properties than the rest of the surface.

1. Cellino et al., 2015 MNRAS, 451, 3473
2. Skiff et al, 2019, MPB, 46
3. Cellino et al., 2016, MNRAS, 456, 248
4. Masiero et al., 2010, Icarus, 207, 795
5. Devogèle et al., 2018 MNRAS, 465, 4335
6. Borisov et al., 2018 MNRAS, 480, L131