

(52768) 1998 OR2, an analog to (16) Psyche in the near-Earth space?

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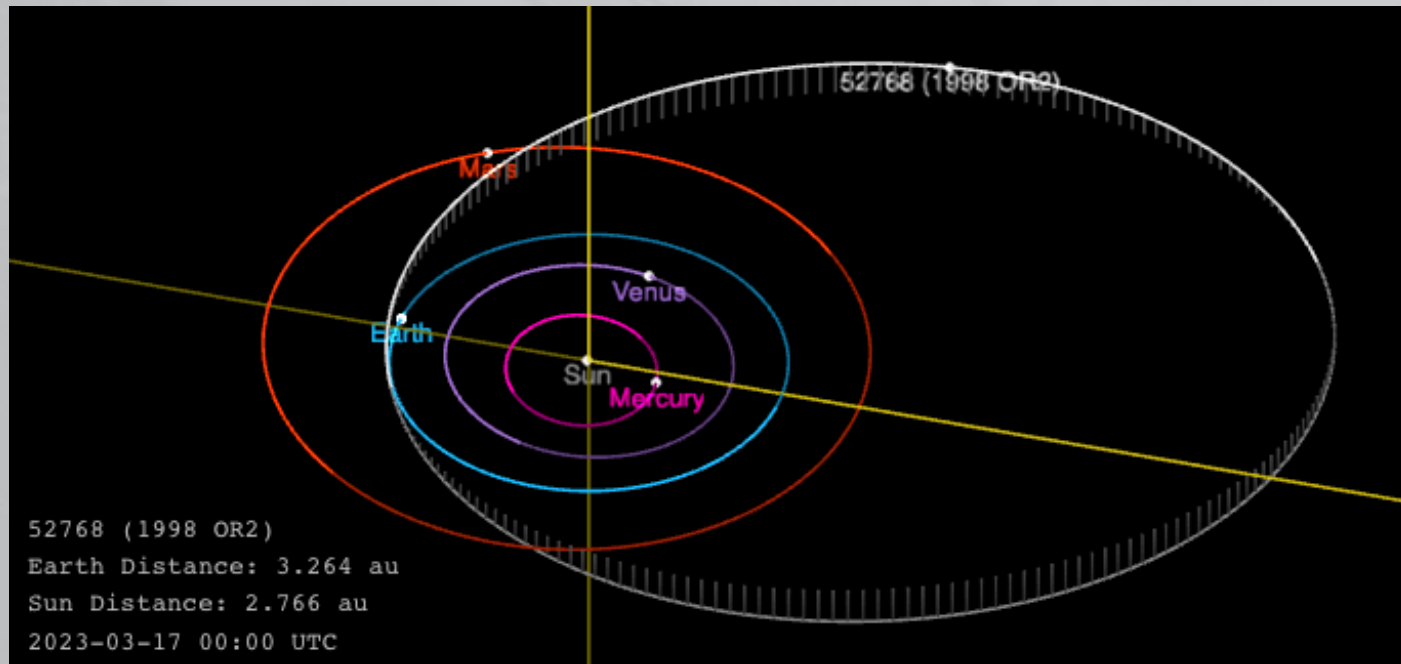
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(52768) 1998 OR2



H = 16.04 magnitude object

Size ~ 2 km



MOID = 0.0087 au

Performed a close fly-by to Earth on April 29th 2020 at a distance of 16.4 LD.

Future closest approach will be 4.6 LD on April 16th 2079

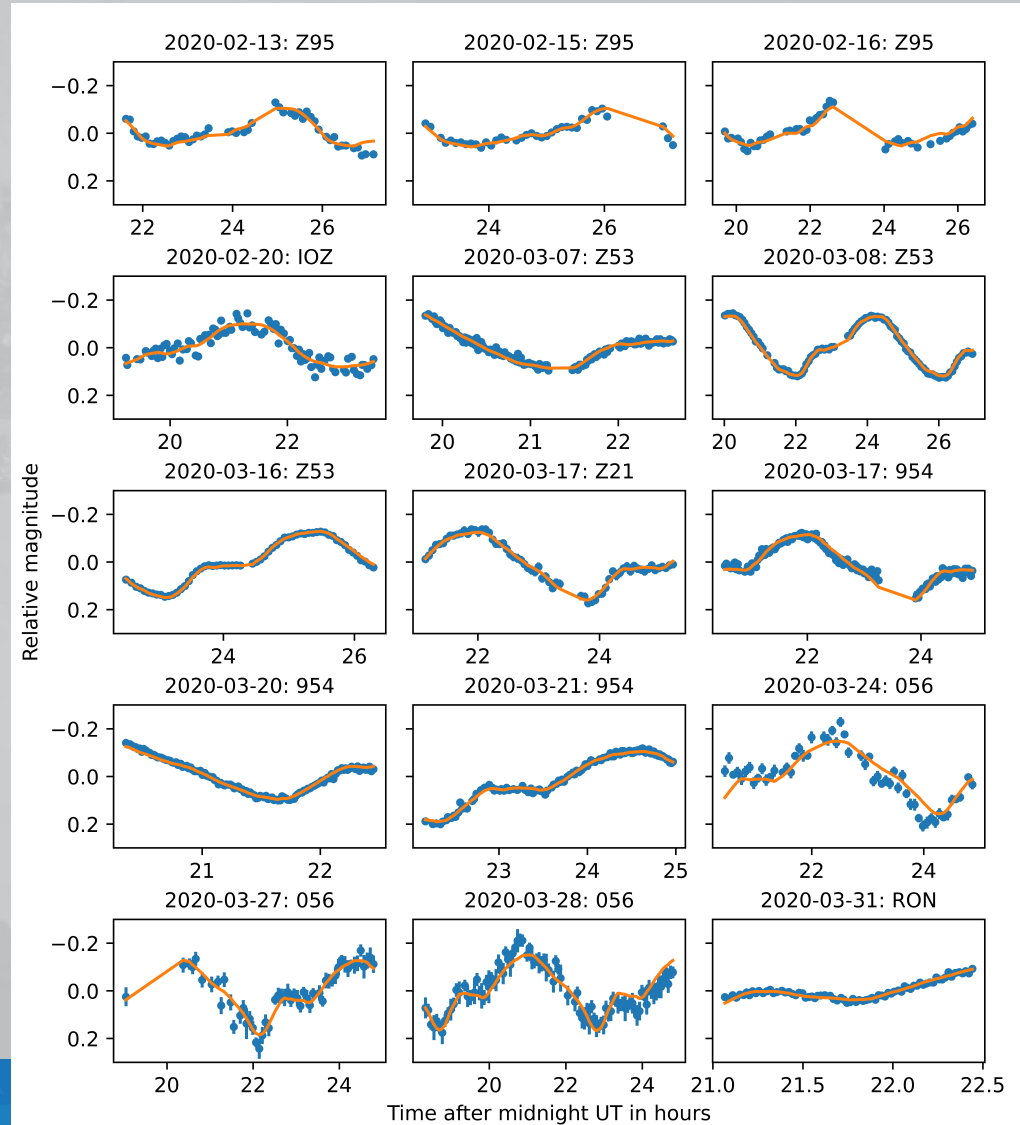
Observations



Radar at Arecibo



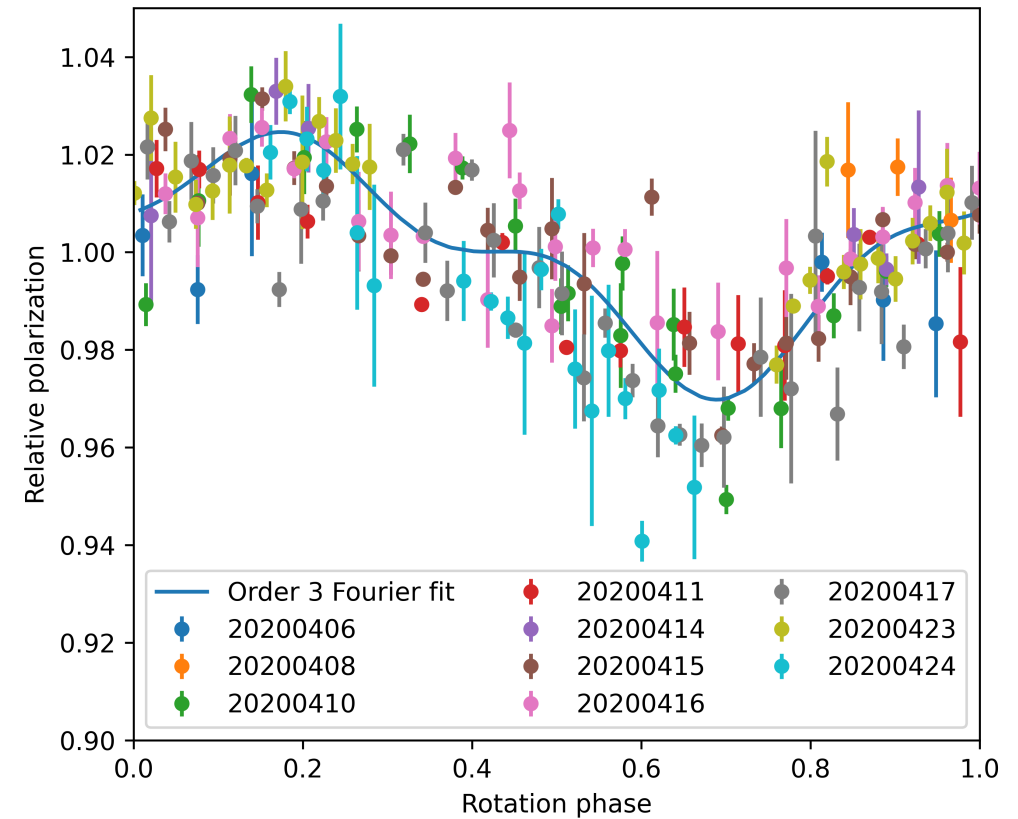
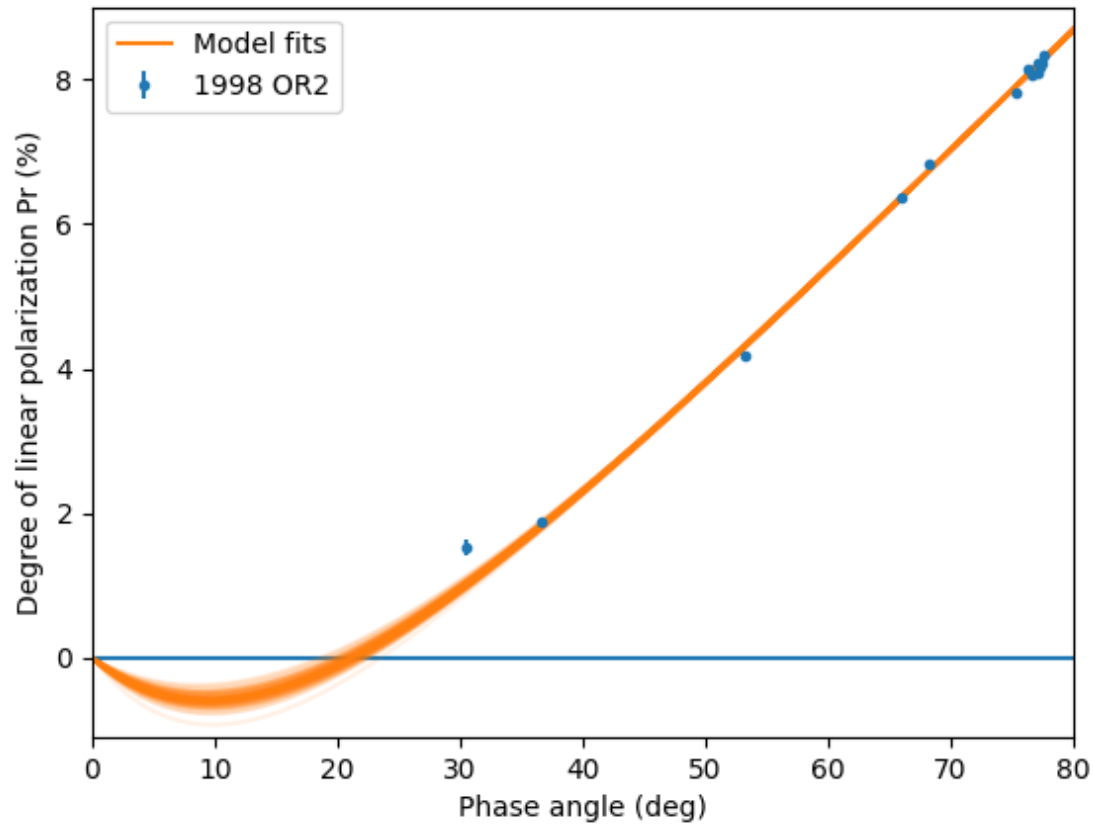
Lightcurves at 22 different observatories



Observations



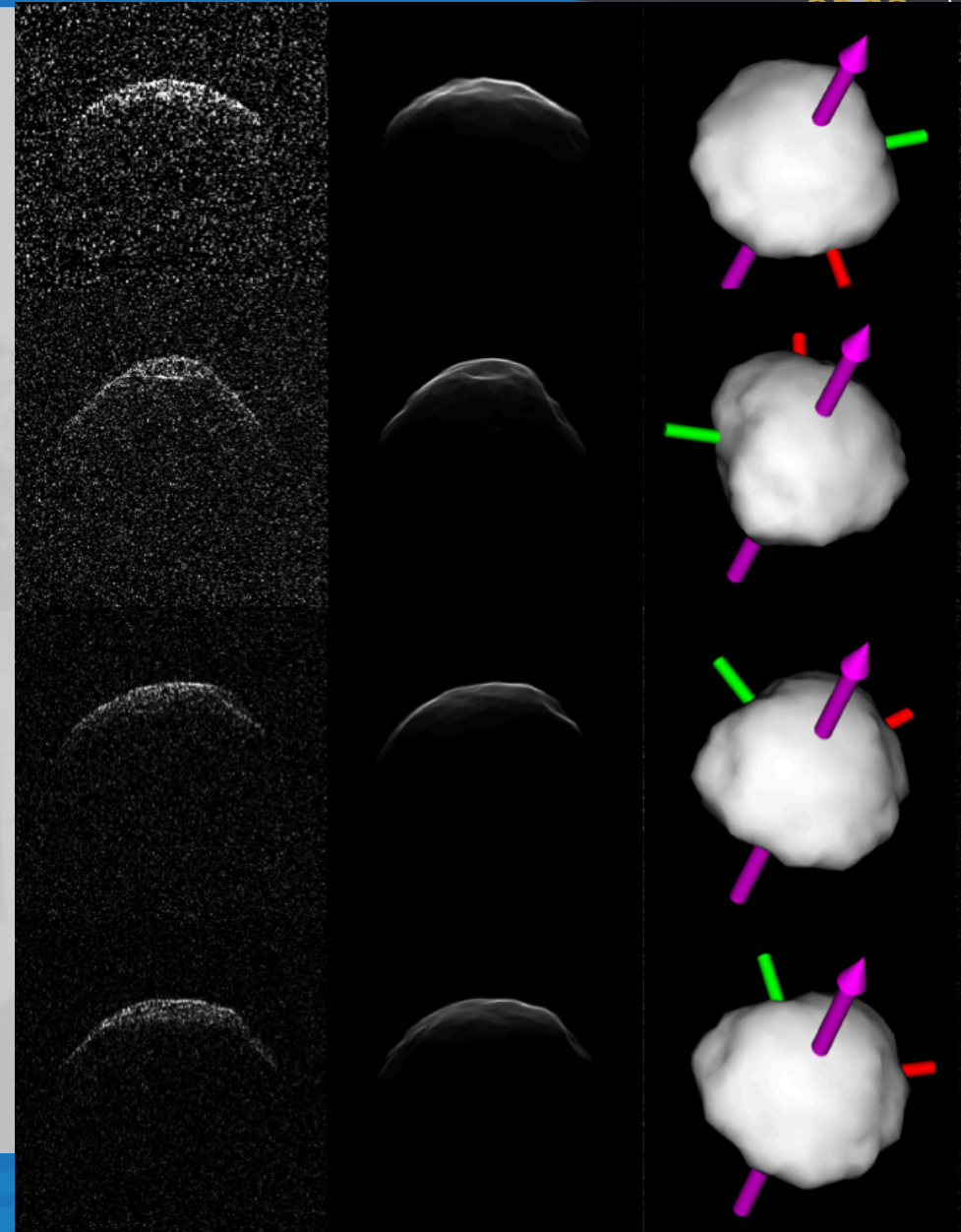
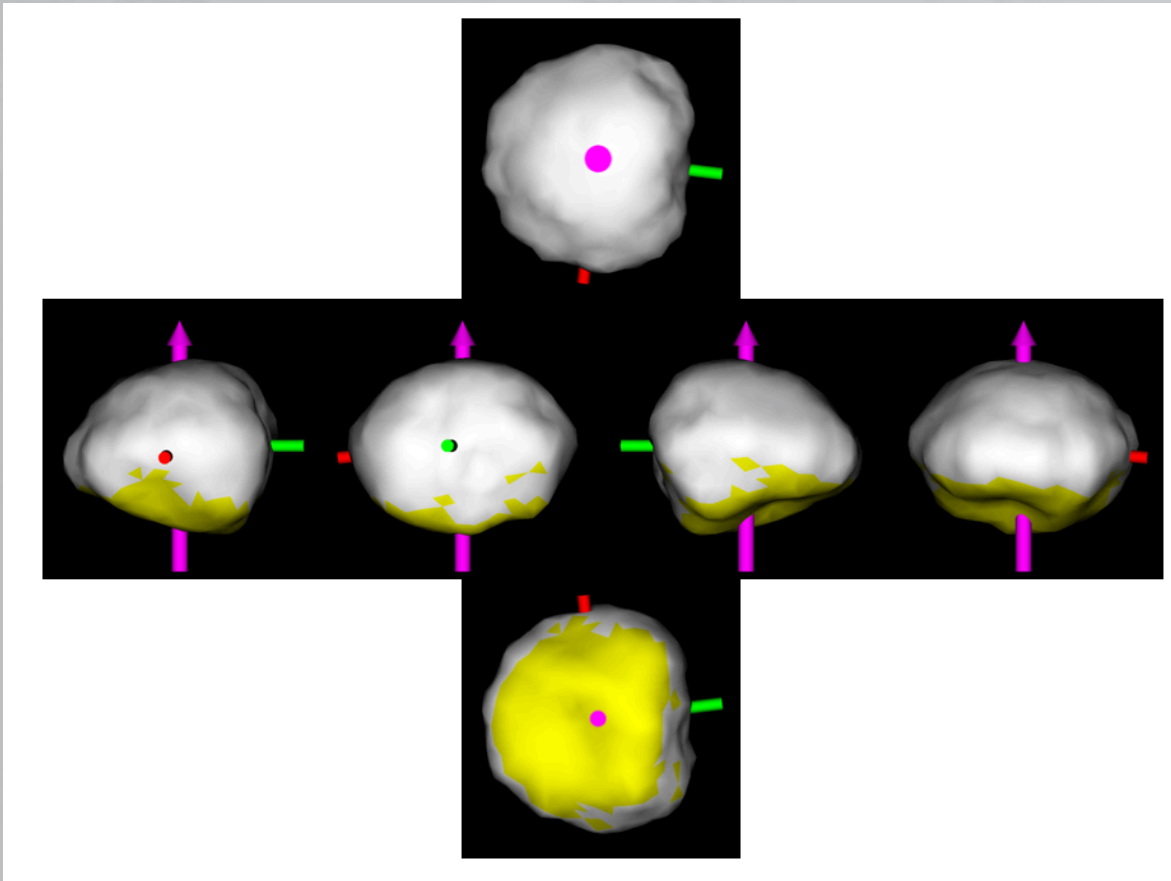
Polarimetry at the Calern Observatory



Results



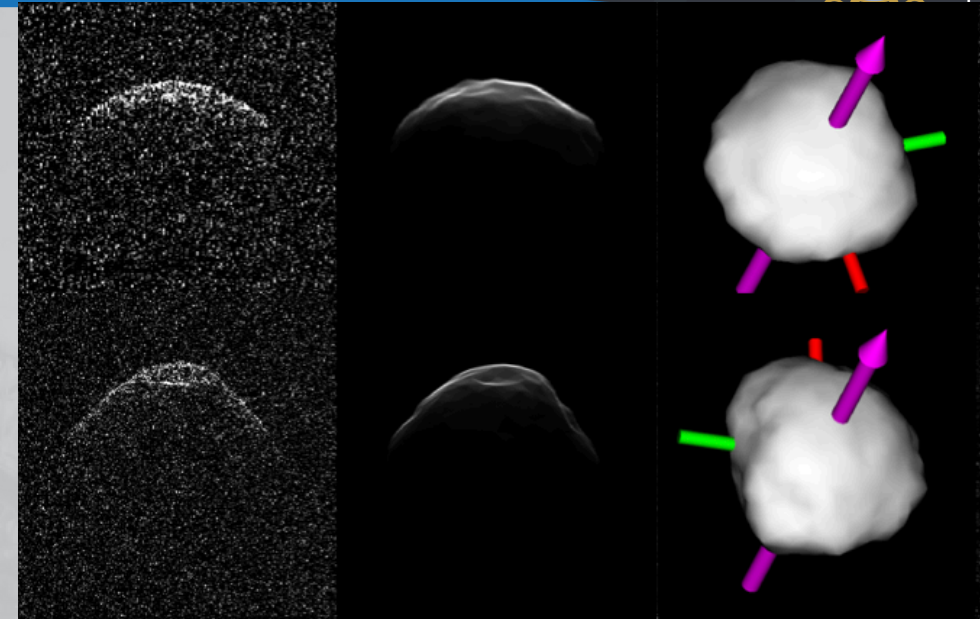
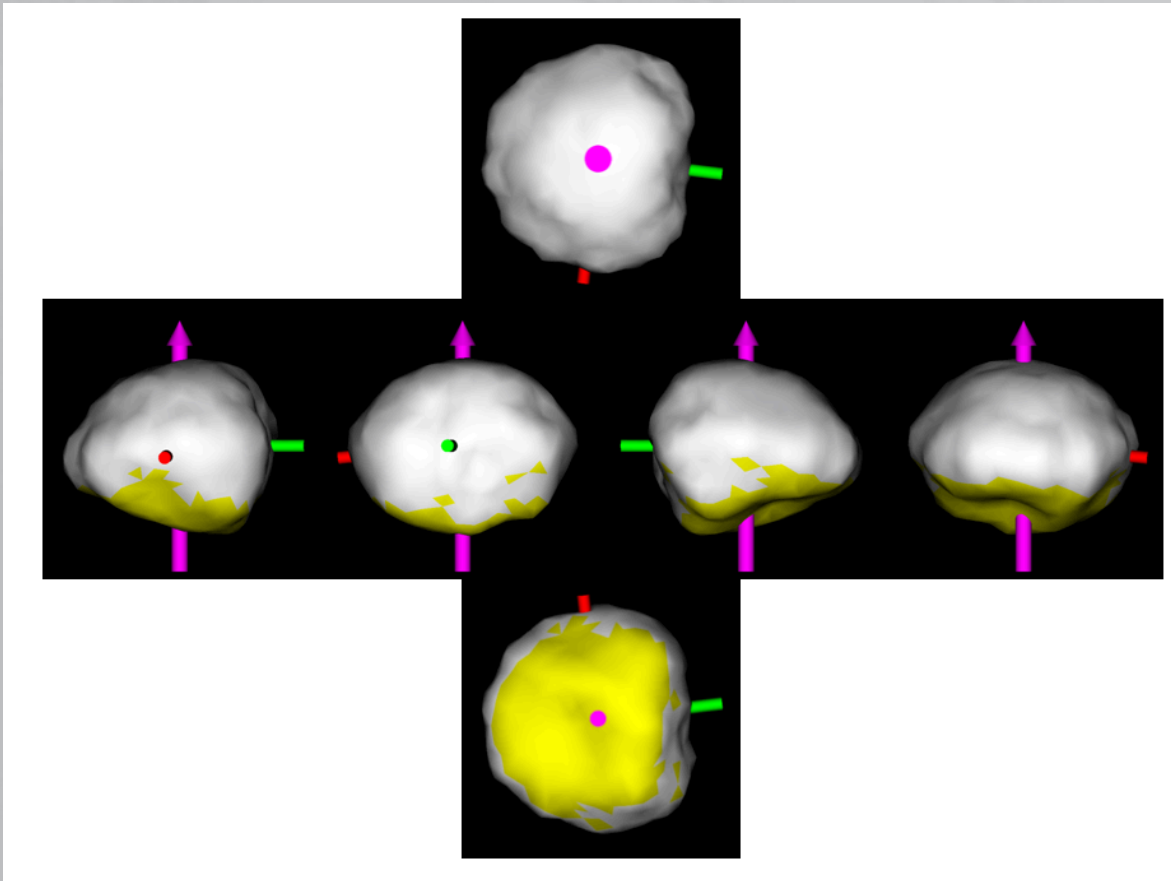
Convex shape modeling using radar and lightcurve observations



Results



Convex shape modeling using radar and lightcurve observations

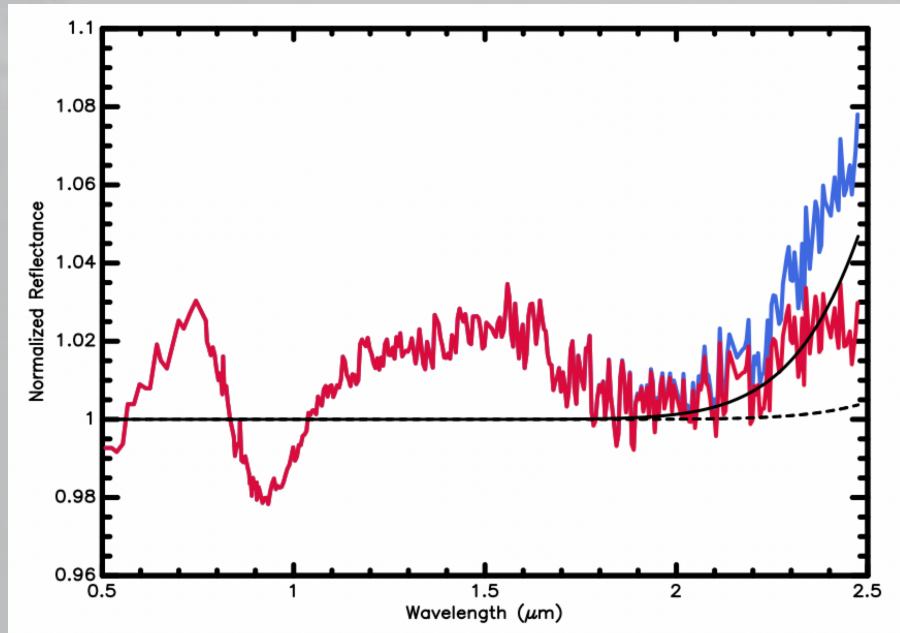


Parameter	Value
Maximum dimensions (km)	$2.08 \times 1.93 \times 1.60$
Uncertainties (km)	$\pm 0.10, \pm 0.10, \pm 0.03$
D_{eff} (km)	1.78 ± 0.10
DEEVE (km)	$2.00 \times 1.87 \times 1.51$
Surface area (km ²)	10.67
Volume (km ³)	3.0 ± 0.5
Sidereal rotation period (hr)	4.10872 ± 0.00001
Ecliptic pole (λ, β)	$(332.3^\circ \pm 5^\circ, 20.7^\circ \pm 5^\circ)$

Discussions



1998 OR2 has a flat slope, but displays absorption bands characteristic of S-type asteroids



Battle et al. 2022 interpreted the bands as OR2 being an S-type with shock darkened surface or with the presence of melts.

Using the shape model and radar observations, we derived a radar albedo of 0.29 ± 0.08 .

Such high radar albedo corresponds to a near-surface bulk density of $3.2 \pm 0.2 \text{ g cm}^{-3}$

Discussions



(52768) 1998 OR2 similar to (16)~Psyche?

Radar albedo:	0.29 ± 0.08	0.34 ± 0.08
Density:	$3.2 \pm 0.2 \text{ g cm}^{-3}$	$4.2 \pm 0.6 \text{ g cm}^{-3} / 3.88 \pm 0.25 \text{ g cm}^{-3}$
Circular polarization ratio:	0.291 ± 0.012	0.1 ± 0.1

There are evidences of the presence of siliceous regolith on Psyche (Landsman et al. 2018, Hardersen et al. 2011, Sanchez et al. 2017, Takir et al. 2017)

OR2 possesses similarities with Psyche although is not identical. Our hypothesis is that OR2 is similar to Psyche but with higher concentration of silicates.



Conclusions



- We observed 1998 OR2 during its 2020 fly-by and 2021 and 2022 oppositions
- Polarimetric observations suggest OR2 has an heterogeneous surface
- Radar and spectroscopic observations suggest OR2 is an X-type from the M-type sub-class
- We suggest that OR2 is similar to the asteroid (16) Psyche, but with a higher concentration of silicates on its surface
- OR2 would be a perfect target for a space mission as Psyche will also be visited soon