

Transitional near-Earth Objects: asteroids or comets?

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Audizioni grant INAF 2022 - RSN3

Status of the TRANSNEO project

The main goal of the project was to obtain photometry, spectroscopy and polarimetry the TRANSNEOs population, a new class of small bodies showing both asteroid and cometary characteristics. **The team** was led by S. Ieva (INAF-OAR, photometry and spectroscopy) & M. Ishiguro (Univ. Korea, polarimetry), establishing **a new collaboration**.

We started asking for new observational data on a competitive base since mid-2022. We already obtained time at several telescopes. Data reduction and analysis is currently in progress (see table below). We foresee to continue to ask for telescope time during the second year of the project.

Telescope	Comments
NOT	Photometry and spectra for TRANSNEOs. Observed during 5 nights from January to May 2023. One night avoided due to bad weather. Data reduction completed. Analysis is currently in progress, a publication is foreseen.
IRTF	Proposal submitted to characterize spectra of 3200 Phaethon, target of DESTINY+. Not accepted.
ESO-VLT	Proposal submitted in P112 to characterize several TRANSNEOs. Not accepted. Proposal modified and resubmitted in P113.
TNG	Proposal approved to characterize TRANSNEOs in AOT48. Observations were scheduled for Oct 14 2023, Dec 13 2023 and March 9 2024. Data from the first run is currently under reduction. Proposal will be submitted in AOT49 to study different targets (deadline Nov. 27)
3x Japan Obs.	Polarimetric observations of 3200 Phaethon and 4015 Wilson-Harrington from several locations in Japan (Higashi-Hiroshima, Nayoro & Nishi-Harima). Data under analysis and soon to be published.



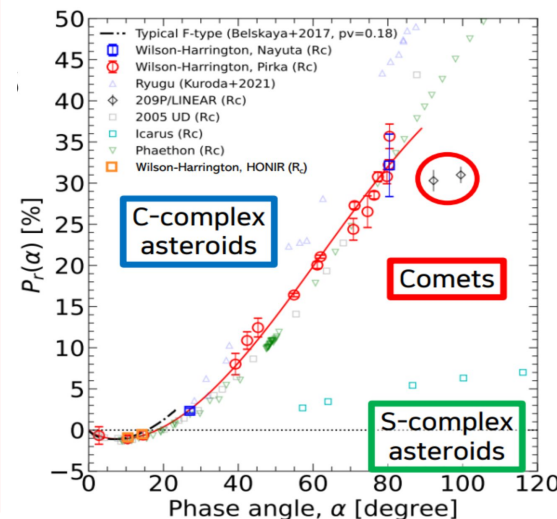
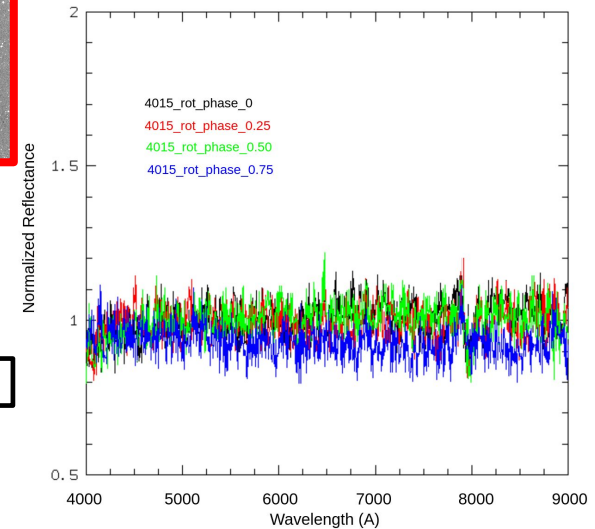
TRANSNEO project: goals reached

We characterized several TRANSNEOs using different techniques, as state in the request. We obtained from TNG several spectra of (4015) Wilson-Harrington at different rotational phases. Simultaneously, we also took photometric data in V- and R-bands. We confirm its similarity with C-complex asteroids, suggesting a primitive composition and a more asteroidal than cometary nature. Spectra taken at different rotational phases suggest that W-H is mostly homogeneous, with some subtle spectral variability.

Polarimetry for 4015, obtained from several observatories in Japan from our Korean collaborators indicate a polarization curve similar to C-complex asteroids, and different from comet 209P, confirming once again the asteroidal nature.



Ieva et al. in prep



Jin et al. in prep.

Dissemination of results & Legacy of the project

The project was financed at the begin of 2023. Nonetheless, we already presented this work at several conferences and schools connected to the project goals. Several first-author publications are also expected.

No potential critical issues has been identified at the moment. Data are being currently reduced and analyzed; a new collaboration with the Korean group has been put in place thanks solely to **this minigrant**, which ultimately **has been fundamental**.

Dissemination of results	Place	Date
PERC Int'l Symposium on Dust & Parent Bodies 2023 (IDP2023)	Tokyo, Japan	February 27th - March 1st 2023
Active small bodies in the Solar System	Stara Lesna, Slovakia	September 5th - 8th 2023
<i>JWST data reduction masterclass</i>	<i>ESAC, Spain</i>	<i>December 11st-14th 2023</i>
<i>XIX Italian Conference of Planetology</i>	<i>Bormio, Italy</i>	<i>February 5th-9th 2024</i>

Publications

Geem, J., Ishiguro M. et al. (3200) *Phaethon* polarimetry in the negative branch: new evidence for the anhydrous nature of the DESTINY+ target asteroid, MNRAS 516, L53, (2022).

Ieva, S. et al. *The TRANSNEOs: the missing link in the asteroid-comet continuum*, in prep.

Jin, S. et al. *Polarimetry and dust ejection modeling of 107P/(4015) Wilson-Harrington*, in prep.