Multicolor Photometry of the Neptune Irregular Satellite Neso

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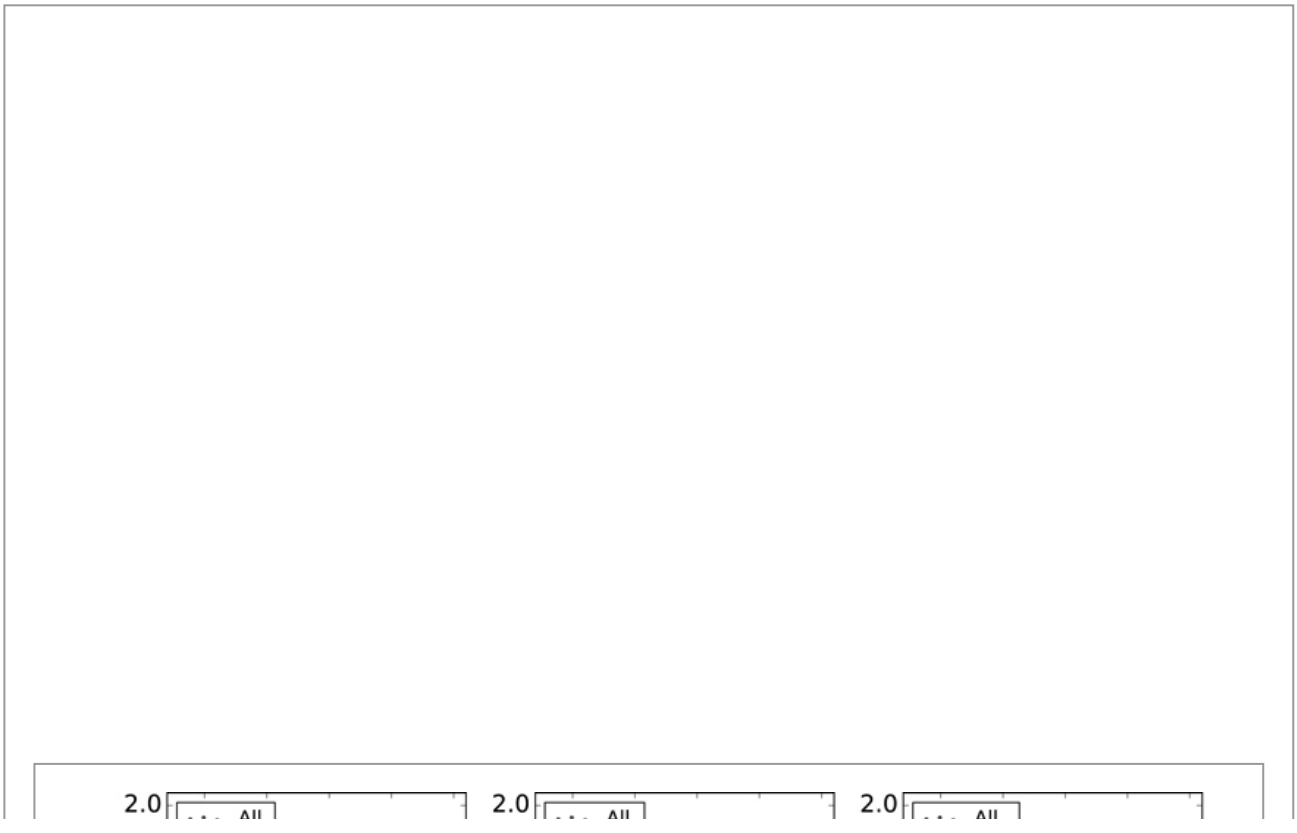
Planets and satellites: fundamental parameters ; Planets and satellites: individual Neso

We report on time series photometry of the faint Neptune irregular satellite Neso. Observations in the *V*, *R*, and *I* pass-bands were performed in photometric conditions at the Cerro Paranal observatory using the instrument FORS2. Photometric calibration was secured using observatory standards. Magnitudes were extracted using the IRAF task *qphot*, and corrected for aperture using bright stars in the field. Photometric errors have been derived extracting photometry of stars with magnitudes comparable to Neso, and were found to be around 0.3−0.4 mag. Astrometry is derived using up to 5 stars in the satellite vicinity basing on the astrometric catalog USNO-B1. We expect these data will be useful to better constrain the poorly known Neso orbit (Brozovic & Jacobson 2017). The time coverage is not sufficient to construct a light curve and derive a meaningful rotational period. However, we could derive new estimates of apparent magnitudes, in particular in *V* and *I* passbands, and for the first time we could calculate Neso colors. Arithmetic averages yields $V = 25.6 \pm 0.3$ from 12 exposures, $R = 25.2 \pm 0.2$ from 13 exposures, and $I = 24.5 \pm 0.3$ from from 25 exposures. The *R* averaged magnitude is in agreement with Brozović et al. (2011) who quote $R = 25.2$, the only available measure to date. From these measures of the averaged magnitudes, we derive averaged colors. We obtain $V - I = 1.0 \pm 0.4$, $R - I = 0.7 \pm 0.4$, and $V - R = 0.3 \pm 0.4$, respectively. The color $R - I$ appear to be slightly redder than the typical values for Centaurs and KBOs as reported in Peixinho et al. (2015), while the color $V - I$ is in nice agreement with both populations (see Figure 1). Given the large error-bars in the averaged colors, it is a difficult task to assign Neso to any of the Peixinho et al. (2015) classes, although the data seem to suggest that we can rule out its membership in classes of resonant objects or Plutinos.



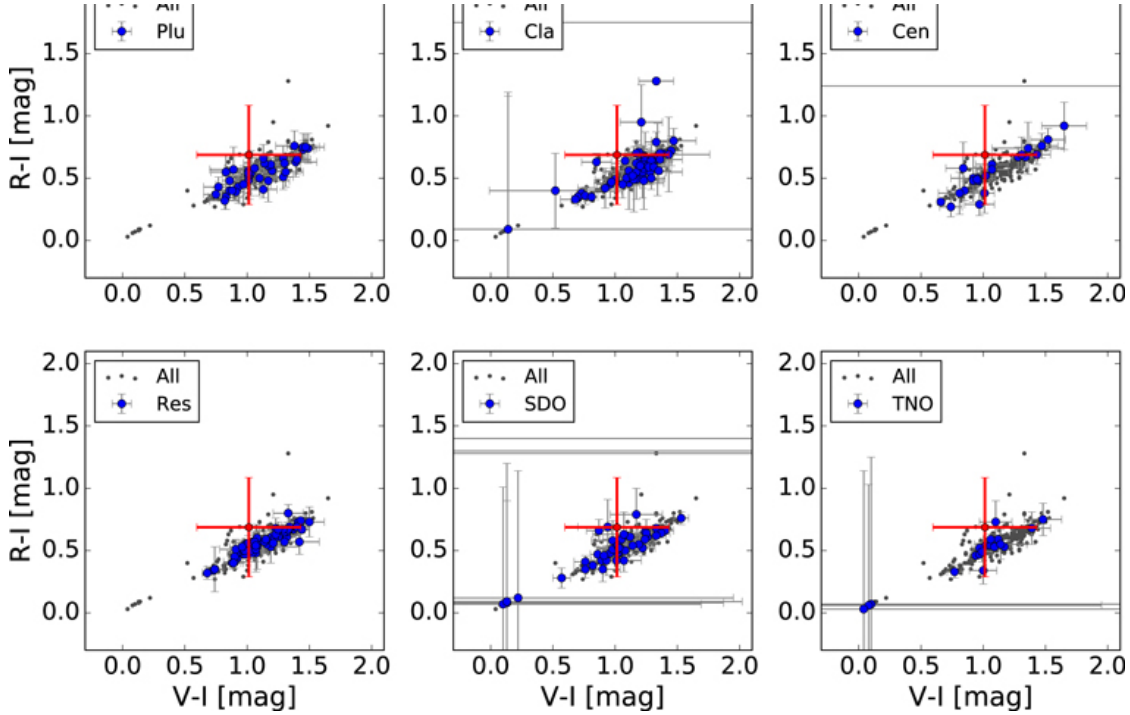


Figure 1. A comparison of the Neso colors from this work with solar system minor body classes from Peixinho et al. (2015). In each frame Neso colors are marked in red and are compared with the colors of a single class from Peixinho et al. (2015) represented by blue points, the gray points represents the other classes and are left as a reference. From left to right and from top to bottom: Plutinos (Plu), Classical KBOs (Cla), Centaurs (Cen), Resonant (Res), Scattered Disk Objects (SDO), Trans Neptuninan Objects (TNO). All the VRI photometry used to derived the average colors of Neso shown in red are available as the Data behind the figure. The data used to create this figure are available.

Based on observations carried out at ESO Paranal under program 085.C-0187(C).

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