Are the radar scattering properties of near-Earth asteroids correlated with size, shape, or spin?

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An ongoing effort to characterize the size, surface, and spin data of over 300 near-Earth asteroids taken by the Arecibo Observatory planetary radar system since 1998.

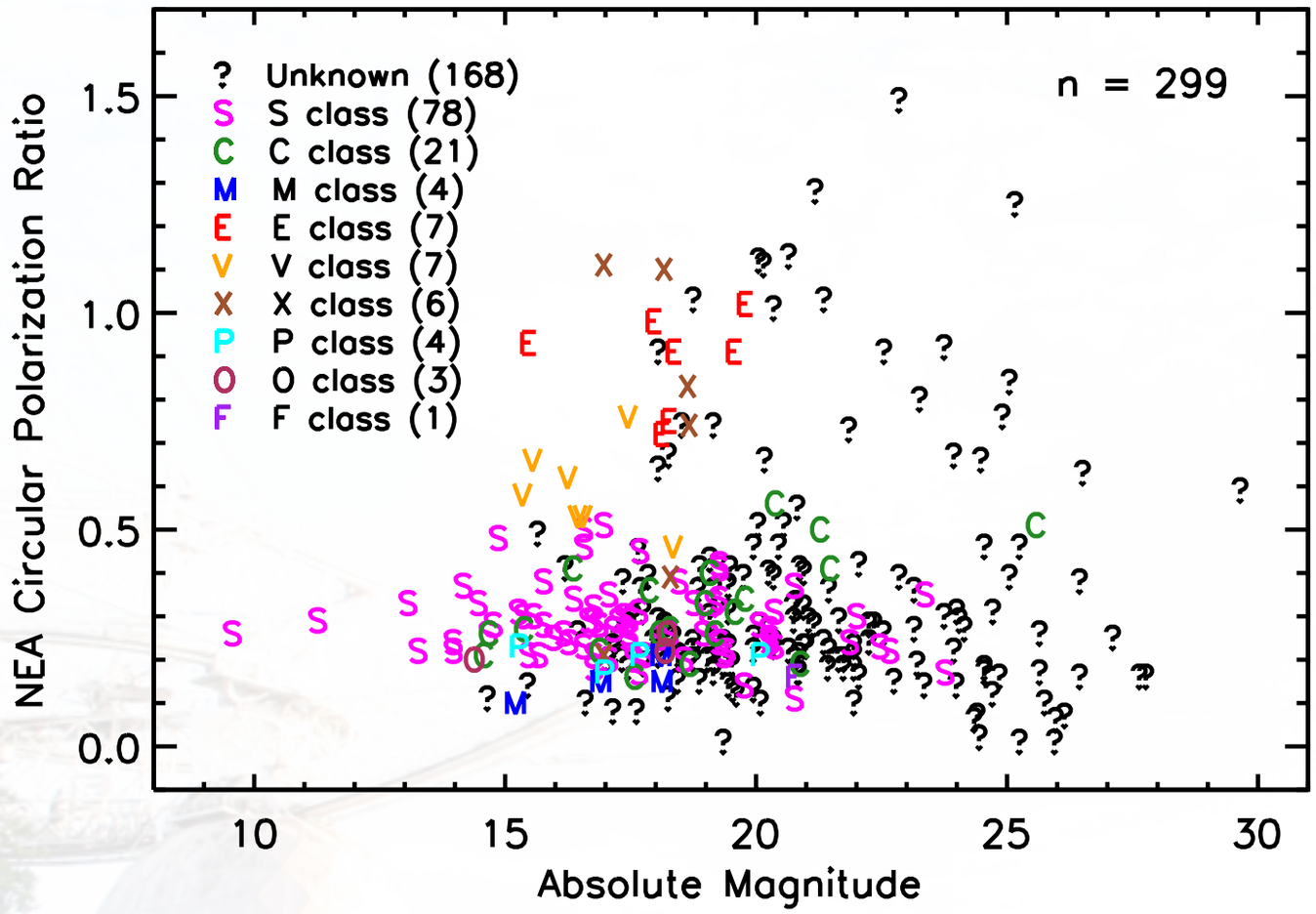

Fig. 1: Polarization Ratio versus Absolute Magnitude with Spectral Type
Asteroids with E-, V-, and X-class spectra have higher polarization ratios than other spectral classes, implying that there is a compositional dependence in addition to a surface roughness dependence for the polarization ratio and spectral class. This analysis expands Benner et al. (2008) by 40%. We see a similar distribution of spectral classes and sizes in the new sample as Benner et al. saw in the original 214 observed asteroids.

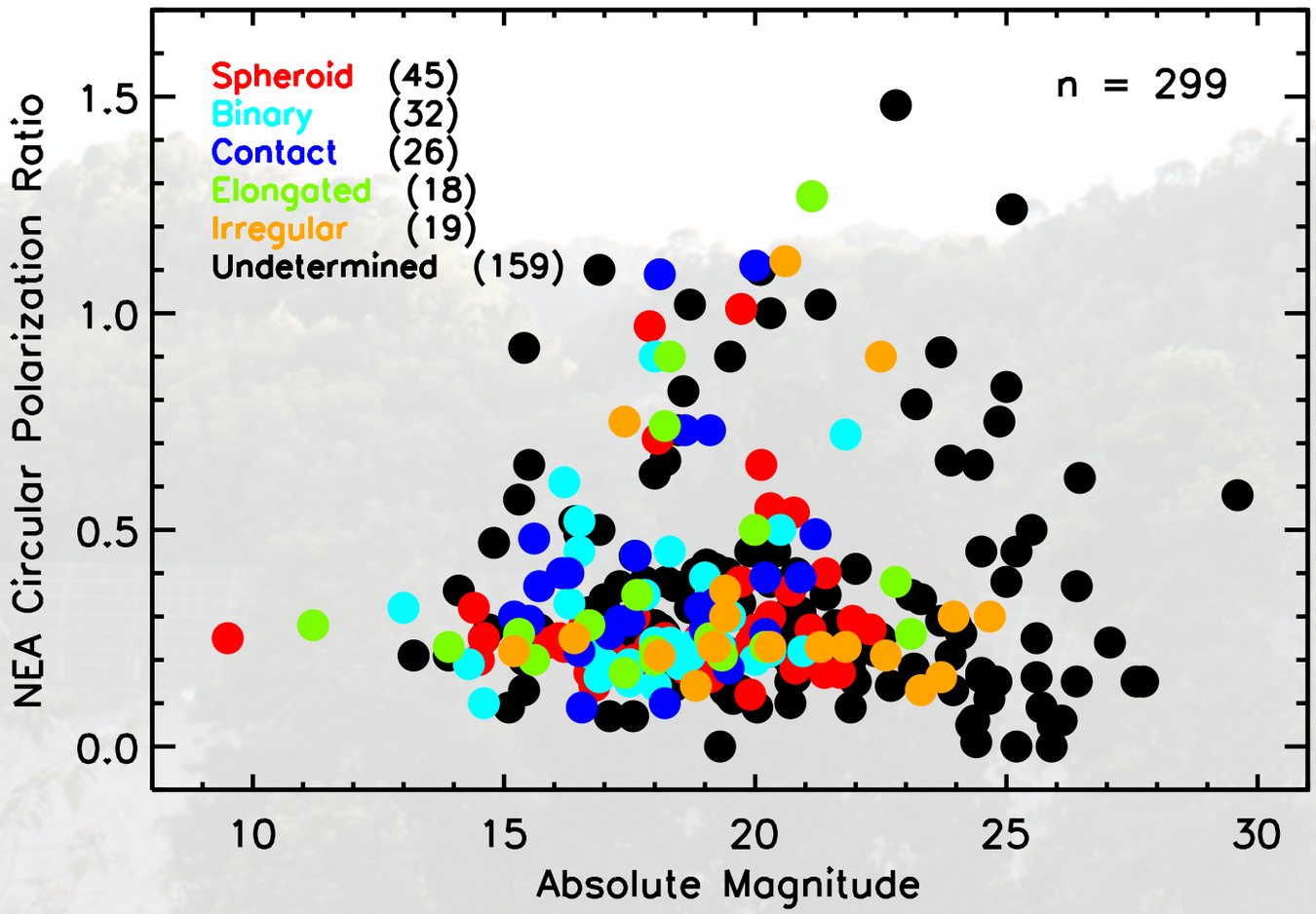

Fig. 2: Polarization Ratio versus Absolute Magnitude with Morphology
Polarization ratio does not appear correlated with shape: all shape classes observed exhibit a range of polarization ratios.

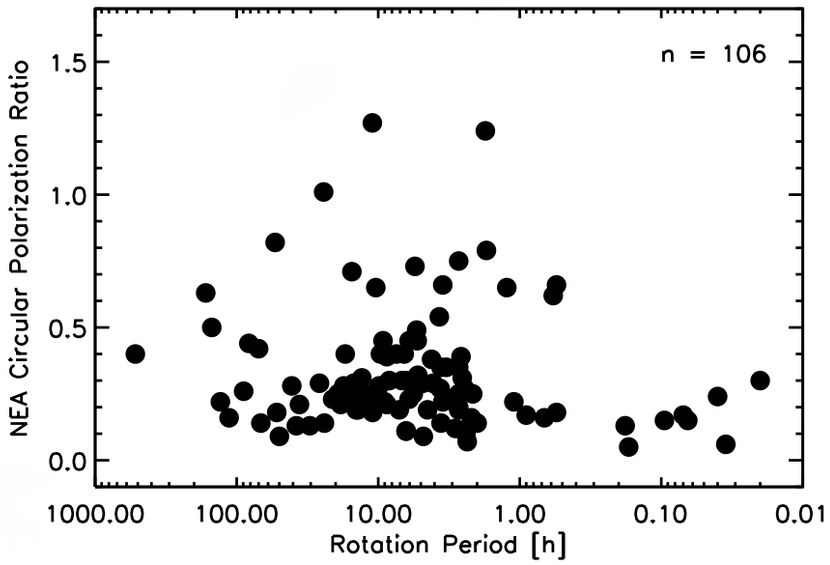

Fig. 3: Polarization Ratio versus Rotation Period
There is no obvious trend connecting rotation period and polarization ratio. Further, we do not see a higher than average (0.33 ± 0.23) polarization ratio for rapid rotators with periods on the scale of minutes.

Future work will include expanding the analysis presented here to the full sample (n > 300) of NEAs observed by the Arecibo planetary radar as well as exploring the relationship between spin rate and object diameter.

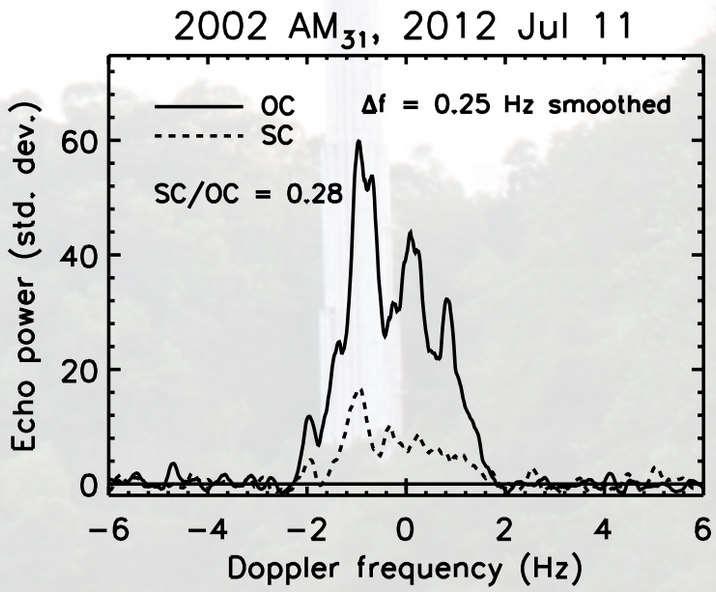

Fig. 4: Example spectrum of 2002 AM_{31}, showing a bandwidth of approximately 4 Hz and a signal peak at -1 Hz indicating a binary system.

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