Characterization of NEAs in the frame of NHATS program using the 10.4m Gran Telescopio Canarias

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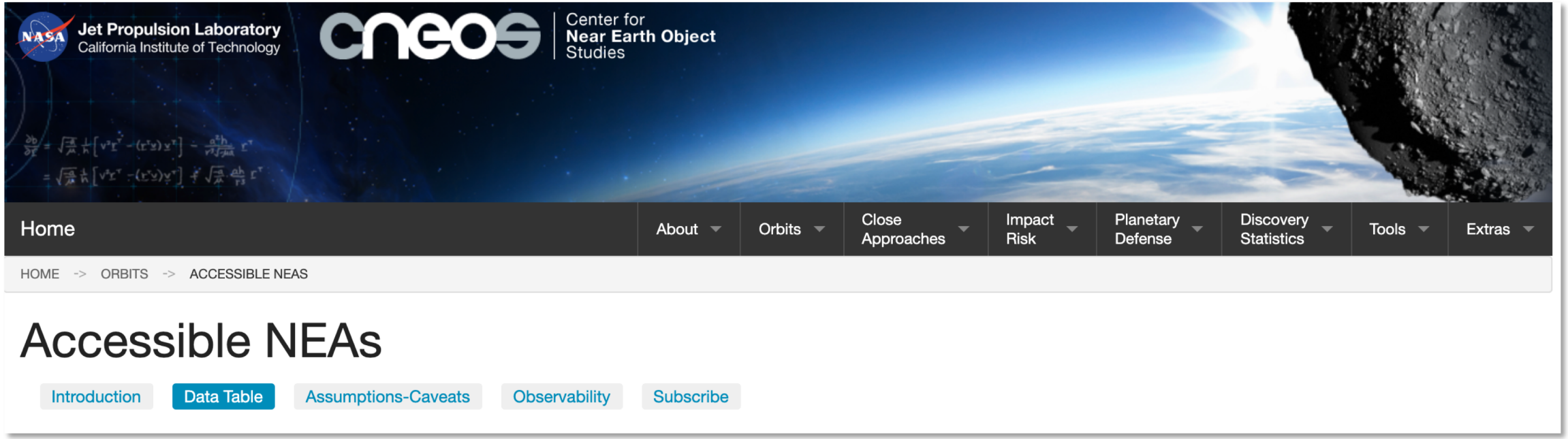
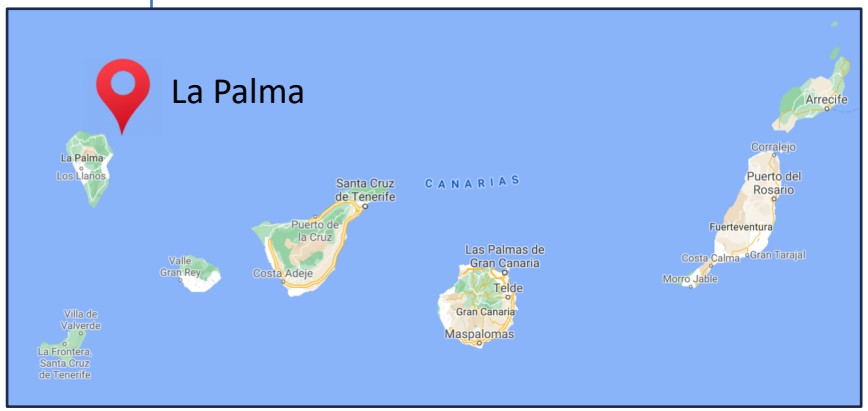
NASA Near-Earth Object Human Space Flight Accessible Targets Study: NHATS



- NHATS began in September 2010 **to identify any known NEOs that might be accessible by future human space flight missions**.
- High-priority targets are identified and alerts are sent out to the observing community requesting observations.
- Best observed during discovery apparition --> need from fast response (in particular for small NEAs)
- Large aperture telescopes are best suited

Observing with the 10.4m Gran Telescopio Canarias (GTC)

Canary Islands (Spain)

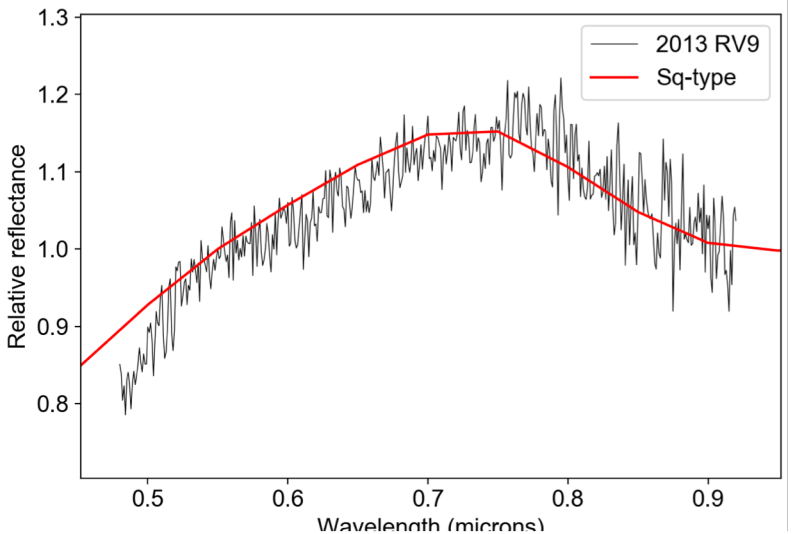


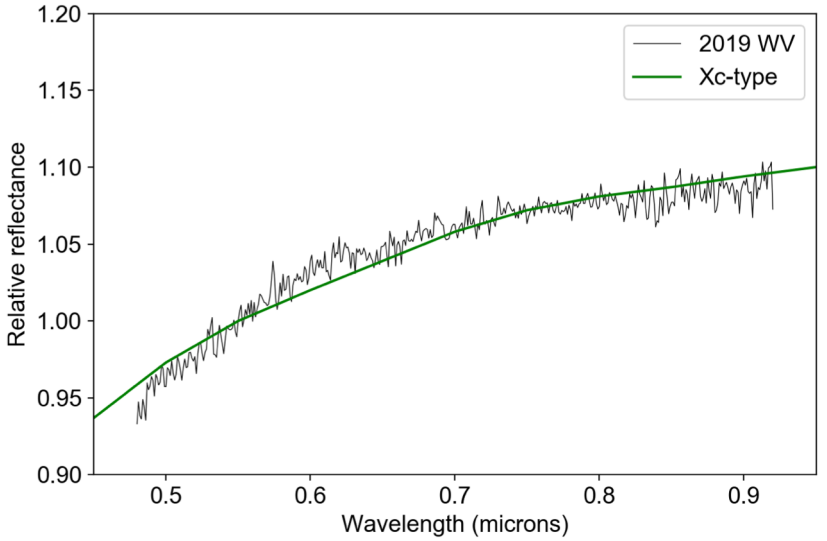
The 10.4m Gran Telescopio Canarias (GTC) is located at the El Roque de Los Muchachos Observatory (La Palma), managed by the Instituto de Astrofísica de Canarias (IAC).

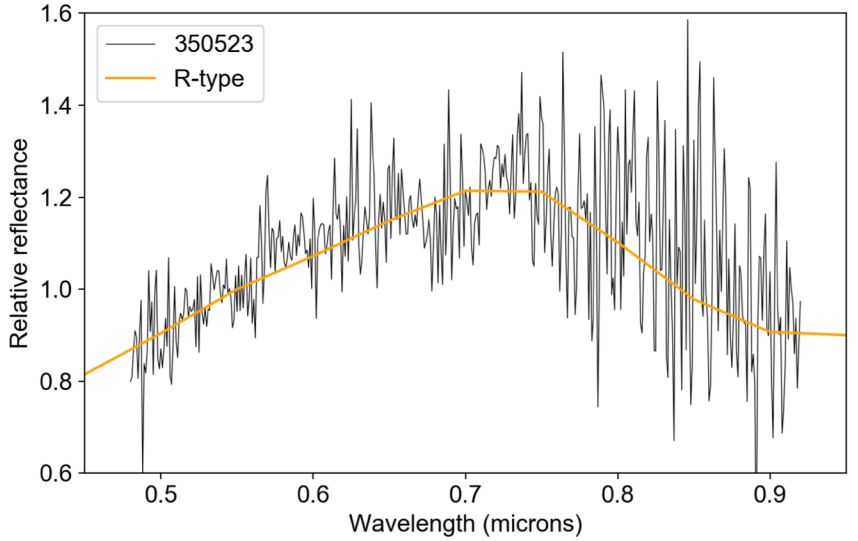
We started this observational program in 2014 for 3 semesters. It was resumed in 2019 and is currently on-going.

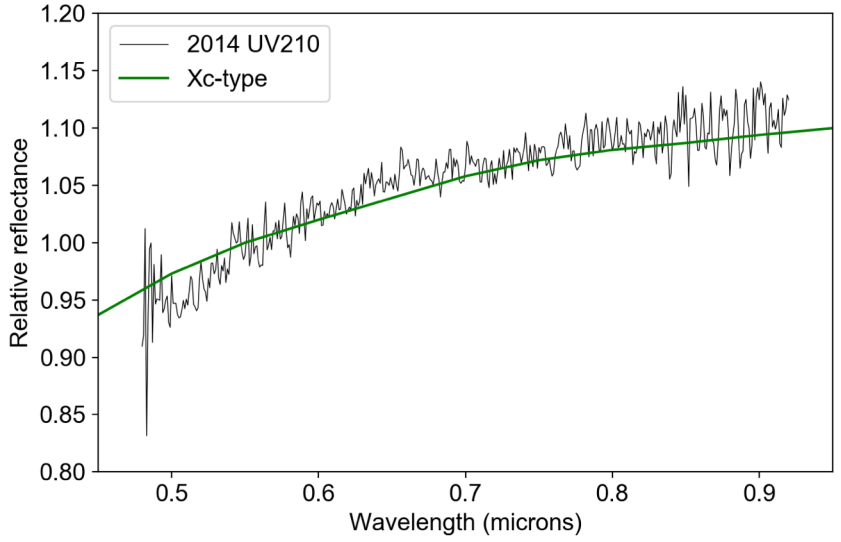
OSIRIS camera-spectrograph | 2 CCD detectors 2K x 4K | FOV 7.4’ x 7.4’ | Long-slit | R300 grism | $\delta\lambda$ ~ 0.001 µm | 0.48 – 0.92 µm

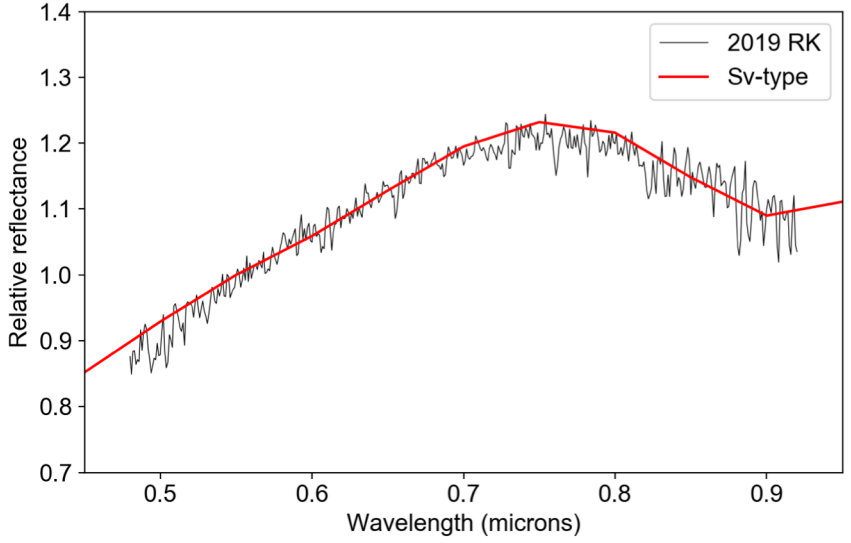
Observing with the 10.4m Gran Telescopio Canarias (GTC)

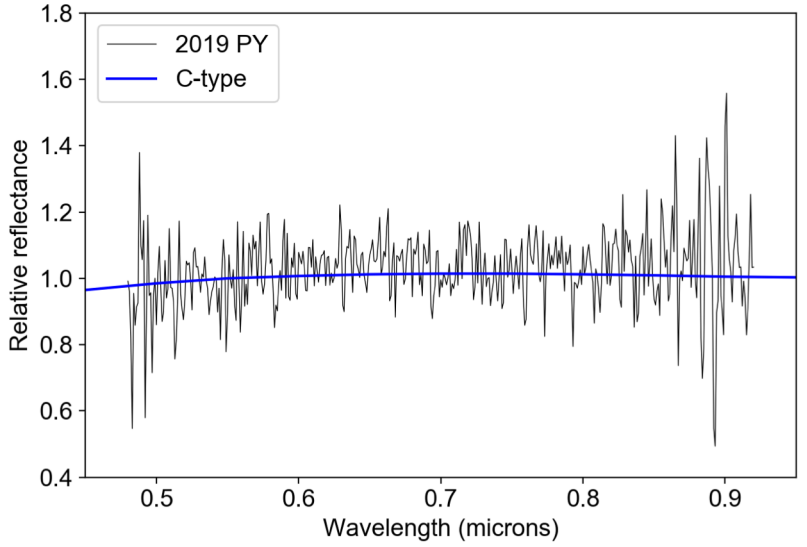












Observing with the 10.4m Gran Telescopio Canarias (GTC)

Asteroid	Discovery date[1]	Observation date	m_V	α (°)	H[1]	p_V[2]	Tax[3]	*D* (km)	Notes
350523	Mar 3, 2000	Jun 1, 2019	20.5	23.1	21.0	0.148	R	0.218	
2013 RV9	Sep 3, 2013	Mar 9, 2019	20.7	33.6	23.6	0.211	S	0.055	
2014 UV210	Oct 25, 2014	Dec 16, 2014	18.7	5.8	26.9	0.047	X	0.025	Fast rotator (< 1 h)
2015 BG92	Jan 19, 2015	Jan 26, 2015	18.6	25.6	25.1	0.048	D	0.058	Fast rotaror (< 0.2 h)
2015 DU	Feb 17, 2015	Feb 28, 2015	19.1	19.5	26.6	0.211	S	0.014	Fast rotator (< 0.1 h)
2017 PV25	Jul 24, 2017	Mar 10, 2019	20.7	18.0	24.7	0.129	Xc	0.042	
2019 JU5	May 4, 2019	Jun 2, 2019	20.7	31.5	24.0	0.211	S	0.045	
2019 UO1	Oct 19, 2019	Oct 28, 2019	21.0	15.5	25.0	0.050	C	0.059	
2019 WV	Nov 21, 2019	Nov 25, 2019	19.2	27.8	24.9	0.129	Xc	0.038	P_{rot} = 1.25 h
2019 YV	Dec 19, 2019	Dec 27, 2019	18.9	39.7	23.6	0.042	T	0.123	
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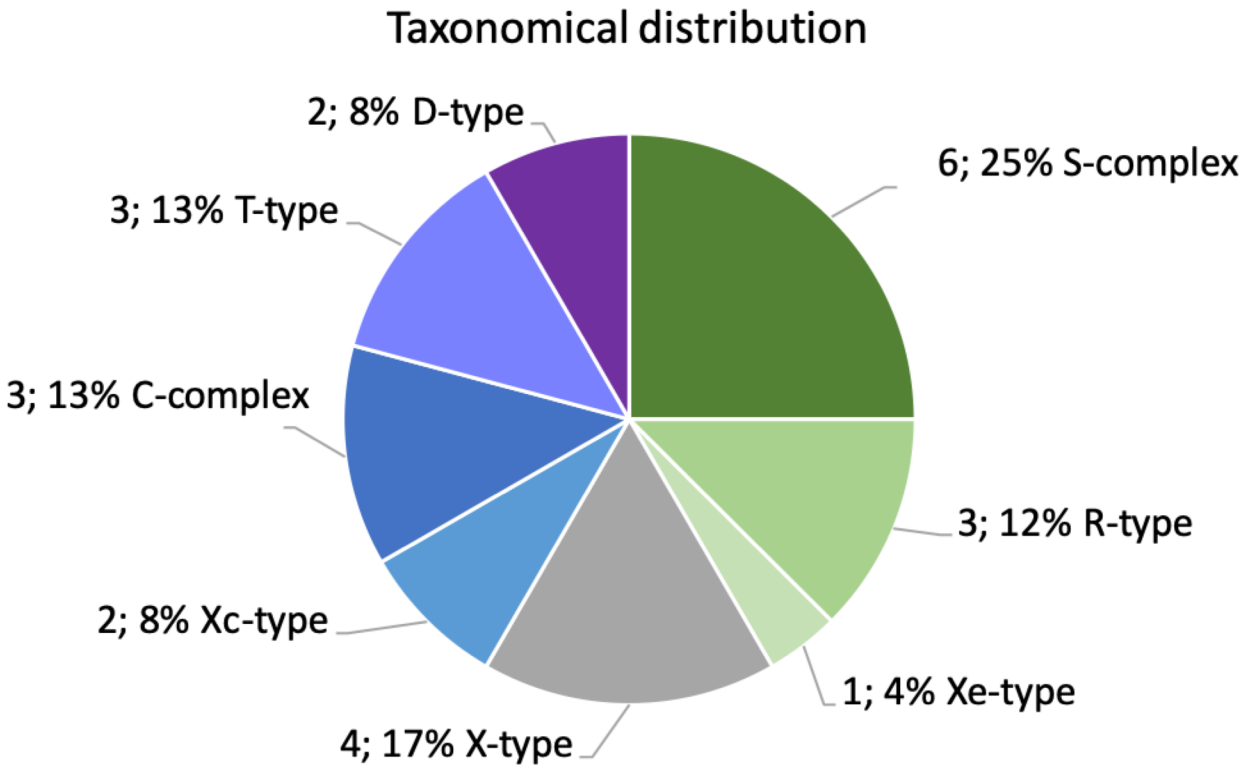
[1] JPL Small-Body Database Browser (https://ssd.jpl.nasa.gov/sbdb.cgi#top) and IAU Minor Planet Center

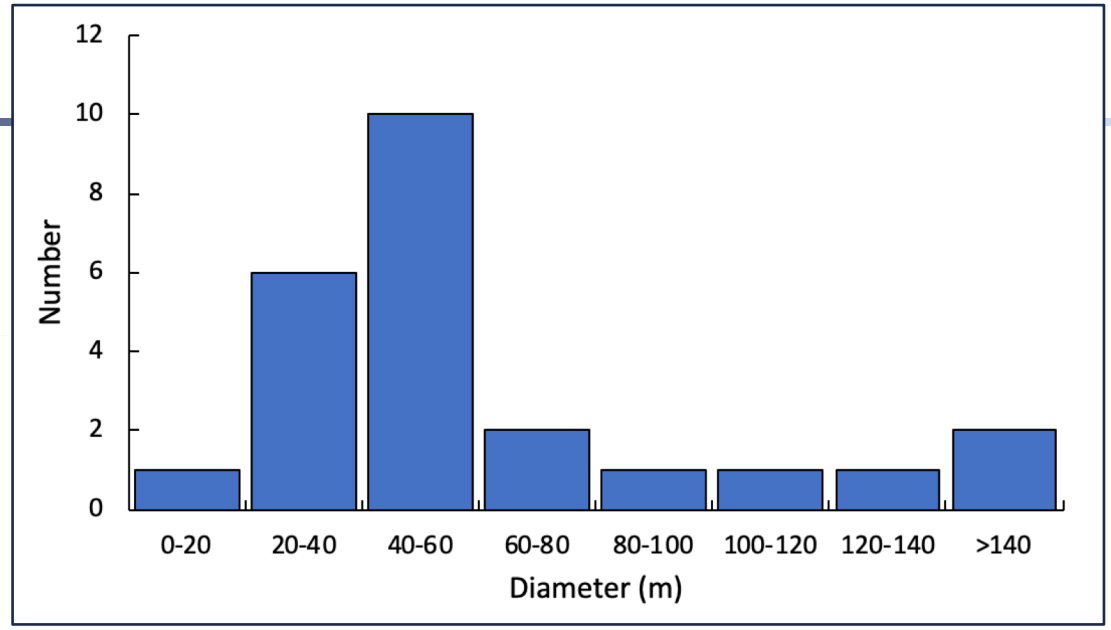
[2] When no albedo information is available, we use the average albedo for the taxonomical class from Mainzer et al. (2011)

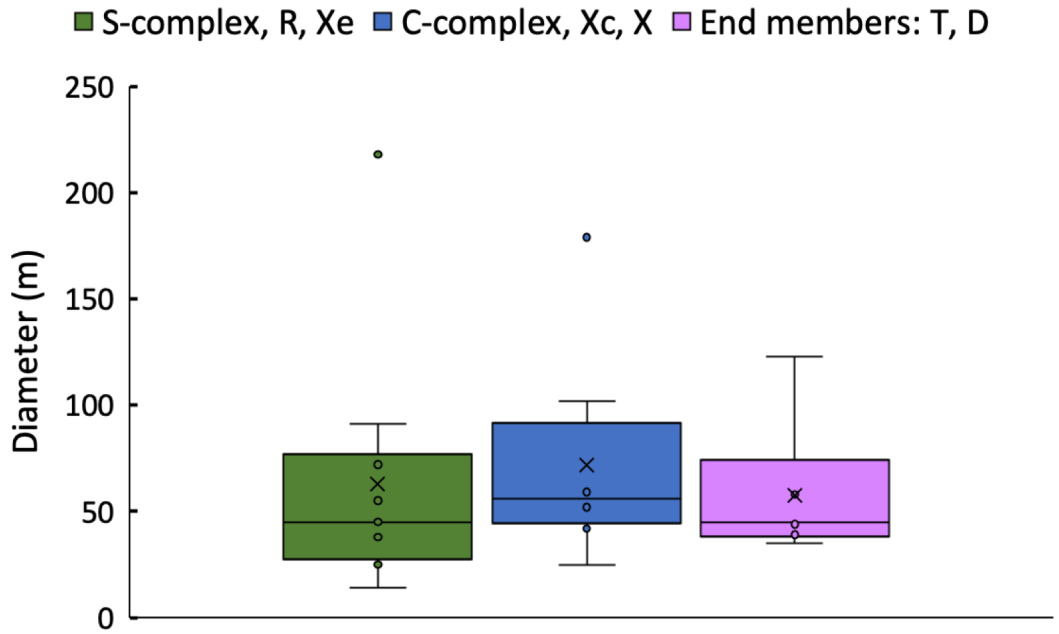
[3] Taxonomical classification is done using the M4AST on-line tool (http://spectre.imcce.fr/m4ast/index.php/index/home, Popescu et al. 2012)

Some preliminary results

A total of 24 NEAs have been observed so far







Conclusions

- We have an on-going observational program to obtain visible spectra of NEAs using the 10.4m Gran Telescopio Canarias (GTC), in the frame of the NHATS program.

- So far, we have observed 24 NEAs.

- We find a bit more primitive (59%) than rocky (41%) NEAs, and a total of 2 D-types and 3 T-types.

- The majority of the targets (83%) have diameters < 100m. Some of them are fast rotators (P_{rot} < 1h). We do not see any tendency between taxonomical classes and diameters.