NIR SPECTRAL OBSERVATIONS OF CANDIDATE V-TYPE ASTEROIDS. M.C. De Sanctis[1], A. Migliorini[1], E. Ammannito[2], M.T. Capria[1], G. Filacchione[1], D. Lazzaro[3], F.Luzia[3], S. Marchi[4].
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Introduction: Vesta composition suggests that it has undergone extensive differentiation and resurfacing. It is the only large basaltic asteroid known at present and it could be the smallest differentiated body of the Solar System. The NASA mission DAWN, launched on September 2007, is intended to investigate the mineralogical properties of Vesta, in order to shed light on this puzzle [1]. Although Vesta is the only large object in the Solar System which shows an almost intact basaltic crust, an increasing number of small asteroids with similar surface composition of Vesta were discovered thanks to ground-based observations, posing the fundamental problem of the presence and distribution of basaltic material in the solar system.

At present, hundreds of asteroids are classiffied as potentially V-type bodies, thanks to new photometric investigations. Some of these objects possibly belong to the Vesta-family, according to dynamical considerations, while other asteroids seem to be not clearly related to Vesta. Ground-based observations allow to investigate the spectral properties and hence the mineralogical composition of such asteroids.

Observations: The asteroids we have observed were selected from different dataset of possible V-type asteroids. Spectral data are needed to confirm if these objects are V-type asteroids and hence to better understand their relationship with Vesta. The proper orbital parameters, taken from astdys website (http://hamilton.dm.unipi.it/astdys/) and the absolute magnitude of the observed objects are listed in Table 1. We have acquired near infrared spectra of these asteroids by using the Telescopio Nazionale Galileo (TNG), a 3.6 m class telescope in La Palma, during a DDT (Discretional Director Time) on December 2009, and an AOT program, on March 2010.

We used the Near-Infrared Camera Spectrometer (NICS) equipped with the Amici prism, which yields a complete 0.8–2.5 μm spectrum in one single acquisition. The low resolution together with the high efficiency of the Amici allowed us to obtain spectra of faint objects like small V-type asteroids with the advantage of having the whole near infrared range measured simultaneously. Three well-known solar analogue stars (Land 115-27, Land 102-10, Hyades) were also observed during the same nights and used to remove telluric contribution and calibrate the signals.

Table1: orbital parameters and absolute magnitudes of the observed asteroids.

Asteroid	**a (AU)**	**e**	**i (°)**	**H (mag)**
4383 Suruga	2.42	0.063	7.15	12.8
5498 Gustafsson	2.24	0.146	2.1	13.9
5560 Amytis	2.28	0.107	5.61	13.5
6563 Steinheim	2.29	0.068	5.89	14.0
6976 Kanatsu	2.33	0.168	8.245	12.9
8761 Crane	2.24	0.091	3.162	13.6
9147 Kourakuen	2.19	0.105	5.81	13.4
9531 Jean Luc	2.23	0.186	5.81	13.7
10614 1997UH1	2.35	0.084	7.42	13.6
17064 1999GX16	2.34	0.072	6.98	13.7
11764 Benbaillaud	2.19	0.06	4.75	14.4
28517 2000DD7	2.29	0.043	8.5	13.2
28160 1998VC11	2.19	0.107	4.62	14.9
31692 1999JQ31	2.42	0.036	6.65	13.8
31953 2000GZ125	2.26	0.06	4.67	15.0
32940 1995UW4	2.18	0.13	8.11	14.5
47961 2000RR69	2.42	0.082	7.2	15.1
61235 2000OT15	2.4	0.137	7.557	14.4
64276 2001TW218	2.3	0.128	7.1	15.4
94686 2001XO25	2.48	0.125	7.7	14.7

Results: All the observed asteroids are characterized by the typical absorption bands, near 1 and 2 μm, indicative of the presence of pyroxene. The depth and width of their pyroxene bands are those typical of V type asteroids: therefore these objects are compatible with the V-class. For some of them, the 2 band is less constrained with respect to the 1 μm band due to the lower S/N in that range.

The spectra show that the asteroids selected as possibly V-type based only on the visible colors can be confirmed as V-type asteroids when we consider the full spectral range up to 2.5 μm. These new data will greatly enlarge the current database of near infrared spectra of V-type asteroids. Moreover, most of the observed asteroids are not member of the Vesta classical family, thus increasing the number of confirmed basaltic asteroids not clearly related to Vesta.

The near-infrared spectra of the objects listed in Table 1 shall be analyzed in order to have an insight on the mineralogical properties of the selected set of asteroids. We intend to use the same approach discussed in [3] to infer their mineralogical composition based primarly on the 1 and 2 μm bands characteristics (band center, depth, asymmetry, fwhm). The spectral analisys is still in progress.

Conclusions: We have observed 20 V-type candidate asteroids measuring their reflectance spectra from 0.7 up to 2.5 μm. These spectra has been obtained with same telescopic set-up of other 25 V-type asteroids previously observed [3], making possible a direct comparison of the two datasets.

The mineralogical analisys is still underway and the future comparison of V-type band parameters to those of HED meteorites from the RELAB database will improve our understanding of the correlation between the two samples. The new results will possibly confirm and improve the finding of [3]: in that analysis, some of the observed asteroids have spectral characteristics similar to diogenites.

It must be recalled that the observed asteroids have been suggest to be V-Type asteroids based only on their VIS colors: the methods based on photometric surverys to infer the basaltic asteroids distribution seem to be very robust.

This mineralogical analysis of asteroids related to Vesta is done in support of NASA's Dawn mission, which will enter into orbit around Vesta in the summer of 2011. This work extends the scientific context of the mission to include processes contributing to the nature of smaller V-type asteroids that may be related to Vesta.

References: [1] Russell, C. T. et al. (2007), Earth, Moon, and Planets, 101, Issue 1-2, pp. 65-91. [2] M. C. De Sanctis (2010), SSR, 10/2010, doi: 10.1007/s11214-010-9668-5. [3] M. C. De Sanctis (2011), MNRAS, in press.