TNO ESO-VLT LARGE PROGRAM (2006-2008) : RESULTS AND IMPLICATIONS. M. A. Barucci[1] and ESO Large Program team, [1]Observatoire de Paris, LESIA, (92195 Meudon Principal Cedex, F antonella.barucci@obspm.fr).

Introduction: In October 2006 we started a two year large program at the Very Large Telescope at European Southern Observatory (VLT-ESO, Cerro Paranal, Chile) to study the surface properties of selected icy bodies in orbit beyond Neptune (TNOs) by carrying out simultaneous visible and near-infrared spectroscopic observations and relative photometry at the highest possible S/N. Our target sample includes about 40 objects with various dynamical properties. For a few of them, complementary observations in polarimetry were also carried out to better investigate the surface characteristics.

The aim of this program is to investigate the physical properties and unambiguously detect and quantify the main icy compounds present on the surface of the selected TNOs and constrain their composition with a high accuracy. An overview of the obtained results during the first year of observations will be presented.

Visible and Near-Infrared spectroscopy: Simultaneous visible and near-infrared spectroscopy have been carried out on 21 objects using FORS1 (V), ISAAC (J) and SINFONI (H+K bands) mounted respectively at UT2, UT1 and UT4 VLT-ESO telescopes. For spectroscopy we computed the spectral slope for each object and searched for possible rotational inhomogeneities. A few objects show features in their visible spectra as Eris, whose spectral bands are displaced with respect to pure methane-ice. We confirm the presence of a feature at 0.65 µm on 2003 AZ_{84} maybe due to aqueous alteration as already detected by Fornasier et al. [1], and we identify new faint absorption features on 10199 Chariklo and 42355 Typhon, possibly due to the presence of aqueous altered materials, which remain to be confirmed [2]. The H+K band spectroscopy was performed with the new instrument SINFONI which is a 3D intengral field spectrometer. The depth of the 2 µm water ice absorption band, when meaningful, has been calculated relative to the continuum reflectance [3].

Modelling: The spectroscopic regions V, J , H and K have been connected together with simultaneous V, J, H and K photometry for all observed objects. To investigate the surface properties of these bodies, a radiative transfer model has been applied. The first results will be presented and in particular, detailed models will be discussed for Eris [4], Quaoar and Orcus. Crystalline water ice, and possible ammonia ice have been detected on the surface of Orcus [5]. The existence of such ices may indicate a renewal mechanism on the surface and geological activities.

Taxonomy: The photometric data V, R, I, J, H and K and in some case B colors, taken almost simultaneously, allowed us [6] to verify and, for the objects observed for the first time, to determine their taxonomic class following Barucci et al. system [7].

Polarimetry and phase function: Polarimetric observations associated with the brightness phase function have been obtained for 7 objects. The obtained data have been modeled in terms of the coherent backscattering mechanism to constrain the surface properties of the objects. The first results in the case of Eris [8] revealed that the small negative degree of polarization without a surge in the phase angle range of 0.15°-0.5° is similar to that of Pluto. The observational data with theoretical modeling suggest that the surface of Eris and that of Pluto are covered by rather large inhomogeneous particles.

Rotational properties - lightcurves and density: For a few objects, we also carried out photometric observations (R filter) to determine rotational periods. The synodic period of three new objects has been computed (65489 Ceto with P=4.43±0.03 hrs, 90568 2004 GV_9 with P=5.86±0.03 hrs and 95626 2002 GZ_{32} with P= 5.80 ±0.03 hrs). We confirmed the rotational period previously published for two of them (12929 1999 TZ_1 and 47932 2000 GN_{171}) and we give a first estimation for 42355 Typhon and 120132 2003 FY_{128} [8]. From the obtained synodic periods and the amplitude of the lightcurves we estimated the lower limit for the density and the semi-axis ratio a/b and we investigated the density distribution as a function of the absolute magnitude.

References:. [1] Fornasier et al. 2004, *A&A*, 421, 353-363. [2] Alvarez et al. 2008, *A&A*, submitted.[3] Guilbert et al. 2008, *Icarus*, submitted. [4] Merlin et al. 2008 *AJ*, submitted. [5] Barucci et al. 2008, *A&A*, 479, L13-L16. [6] De Meo F. et al. 2008, *A&A*, submitted. [7] Barucci et al. 2005, *AJ*, 130, 1291-1298. [8] Belskaya et al. 2008. *A&A* 479, 265-269. [9] Dotto E. et al. 2008, *A&A*, submitted.

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