A CANADA-FRANCE-HAWAII TELESCOPE SURVEY FOR VISIBLE & NEAR-INFRARED COLORS OF KUIPER BELT OBJECTS AND CENTAURS. A. Delsanti[1], A. Doressoundiram[1] and N. Peixinho[2,3,4],[1]Observatoire de Paris - Meudon, LESIA, 5 Place Jules Janssen, F-92195 Meudon Cedex, France, Audrey.Delsanti@obspm.fr, Alain.Doressoundiram@obspm.fr, [2] Institute for Astronomy, University of Hawaii, USA, [3]Center for Computational Physics, University of Coimbra, Portugal, [4]Astronomical Observatory of the University of Coimbra, Portugal.

Introduction: Broadband photometry of minor bodies of the outer Solar System provides us an insight on their surface properties. From the colors derived, we can assess the general reflectance properties of the surfaces from the different dynamical subgroups (namely Centaurs, classical, resonant, scattered, extended Kuiper Belt objets or KBOs). The trends that can be identified through various statistical tools might point to different evolution processes and/or initial conditions of the formation of these planetesimals, that are the most primitive remnants from the accretion disk of our planetary system.

Optical BVRI colors have been measured for almost 200 objects showing a wide variety of reflectance properties from spectrally neutral (solar colors) to very red (the reddest surfaces in the Solar System) [1]. Near-infrared colors are more difficult to obtain as the objects are faint and the data is dominated by the sky background. A more limited amount of colors are therefore available ([2], [3], [4] and references therein) and these studies show that JHK properties show no statistically significant trends so far while a single coloring agent might affect the surface from the visible to the near-IR domain.

This projects aims at complementing and increasing the scientific output of the Meudon Multicolor Survey (2MS) [2], in particular to better assess near-IR general surface properties and confirm or not the marginal trends detected in previous studies on a larger sample.

Observations: We used the Canada France Hawaii Telescope (CFHT) located on top of Mauna Kea, Hawaii, with the CFHT-IR camera to perform IJHK broadband photometry of 20 KBOs and Centaurs from November 9 to 12, 2005. CFHT-IR is a 1K x 1K Rockwell detector with a 3.6' x 3.6' field of view and a 0.211"/pixel scale. Filters used were mould I, infrared J, H and K' centered respectively at 0.834, 1.245, 1.654 and 2.120 μm, and with a bandwidth of resp. 0.194, 0.163, 0.296, and 0.340 μm. For each object we observed a IJHK'I sequence following a dithered pattern for each exposure to ensure a good estimation of the sky background. For 7 of the objects, this sequence was repeated on a consecutive night.

Data reduction and photometry: We performed dark, flat-field and bad pixel correction using the ECLIPSE software as described in [2]. Cubes of data were sky-corrected and recombined into a final image with the IRAF/XDIMSUM package dedicated to high-background near-infrared imaging. We measured the science objects flux using an aperture correction method as described in [4]. Photometric calibration was done using faint standards stars [5],[6].

Statistical analysis : we present the resulting IJHK colors for the 20 objects observed. For objects with two photometric sequences available over two nights, we flag magnitude and/or colors variations when detected. We merge this data set with BVRI data previously obtained within the 2MS survey at CFHT, [2] and references therein. For both our BVRIJHK sample and the larger sample compiled from published photometry we look for :

- the color-color correlations
- the color-physical parameters (such as orbital parameters and absolute magnitude, as a metric for the size of the object) trends
- the structure of the near-IR Centaurs colors distributions (bimodal or continuous) with dip test and Kolmogorov-Smirnoff test, for comparison with [3]
- test for the marginal trends detected in [3]

For all these tests we will present the statistical tools used, the results and discuss the statistically significant trends. When possible, we will propose physical implications on the evolution of the objects surface and/or initial conditions from the identified colors-color and color-physical parameters trends.

References: [1] Doressoundiram et al. (2008), in "The Solar System beyond Neptune", Univ. of Arizona Press, Tucson, p91; [2] Doressoundiram et al. (2007), AJ 134, 2186–2199; [3] Delsanti et al. (2006), AJ 131, 1851–1863; [4] Delsanti et al. (2004), A&A 417, 1145–1158; [5] Hunt et al, (1998), AJ 115, 2594–2603; [6] Persson et al (1998), AJ 116, 2475–2488.

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