THE NEAR-EARTH ENCOUNTER OF 2005 YU55: TIME-RESOLVED VISIBLE AND NEAR-INFRARED SPECTROSCOPY. N. A. Moskovitz[1], B. Yang[2], L. F. Lim[3], M. Willman[2], A. S. Rivkin[4], J. P. Emery[5], M. Granvik[6], S. S. Sheppard[1]. [1]Carnegie Institution of Washington, Dept. Terrestrial Magnetism, 5241 Broad Branch Rd., Washington DC 20015, nmoskovitz@dtm.ciw.edu. [2]Institute for Astronomy, Univ. Hawaii. [3]NASA/Goddard Space Flight Center, Astrochemistry Laboratory. [4]JHU/APL. [5]Univ. Tennessee Knoxville, Dept. Earth and Planetary Sciences. [6]Univ. Helsinki (Finland), Department of Physics.

Approximately once every decade a large near-Earth object passes inside of the Moon's orbit. On November 8, 2011 at 23:28 UT the 300 to 400m C-type asteroid 2005 YU55 passed inside of the Earth-Moon distance (=0.0025 AU) and reached a brightness of V~11. This enabled a host of novel investigations on an object ordinarily too faint for extensive multi-wavelength observations. We employed a suite of visible through mid-infrared (0.4 - 22 μm) instruments as part of a multi-observatory campaign to understand the physical and chemical properties of 2005 YU55. These data complement other studies of 2005 YU55, including radar observations and a light curve campaign that measured a rotation period between 16 and 20 hours [1].

The goals of our spectroscopic campaign are to (i) determine 2005 YU55's composition, (ii) constrain the effects of phase angle (i.e. the Sun-asteroid-Earth angle) on its reflectance properties, (iii) constrain the thermo-physical properties of its surface, and (iv) determine whether it displays any physical or chemical heterogeneity across its surface. Our mid-infrared (7-22 μm) observations and thermo-physical modeling are presented in complementary abstracts [2,3]. Here we focus on our visible (VIS, 0.5-1.0 μm) and near-infrared (NIR, 0.8-3.5 μm) data.

VIS spectra were acquired using GCAM at the Kitt Peak 2.1m telescope. NIR spectra were acquired using SpeX at IRTF [4] and TripleSpec at the Palomar 200". A composite VIS-NIR spectrum will be presented to provide insight on the taxonomy and compositon of 2005 YU55. NIR taxonomic classification shows that 2005 YU55 is a member of the C- or X-complex (Fig. 1).

We will also present modeling of the thermal emission at NIR wavelengths (Fig. 1). These models are based on an IDL implementation (by E. Volquardsen) of the Near-Earth Asteroid Thermal Model [5] and reveal a clear correlation between thermal beaming paramter (η) and phase angle (α, Fig. 2). The fit to these data is given by:

$\eta = (0.83 \pm 0.03) + \alpha\ (0.0088 \pm 0.0007)$,

which is in good agreement with other generalized η-α relationships (e.g. [7,8]).

References: [1] Warner B. et al. (2012) *MPB*, submitted. [2] Lim L. F. et al. (2012) *ACM 2012,* this volume. [3] Emery J. P. et al. (2012) *ACM 2012,* this volume. [4] Rayner J. T. et al. (2003) *PASP*, 115, 362-382. [5] Harris A. W. (1998) *Icarus*, 131, 291-301. [6] DeMeo F. E. et al. (2009) *Icarus*, 202, 160-180. [7] Delbo M. et al. (2003) *Icarus*, 166, 116-130. [8] Masiero J. R. et al. (2011) *AJ*, 741, 68.

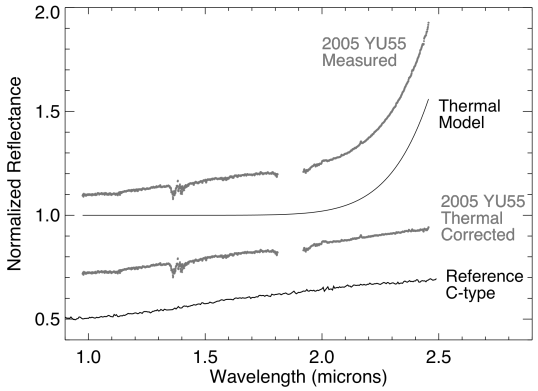

Figure 1: From top to bottom: TripleSpec spectrum of 2005 YU55 from ~4:00UT Nov. 9, thermal emission model, thermally corrected reflectance spectrum, and reference spectrum of C-type asteroid 175 Andromache from [6]. The spectra have been normalized and offset for clarity. The gap around 1.85 μm is due to non-overlapping spectral orders.

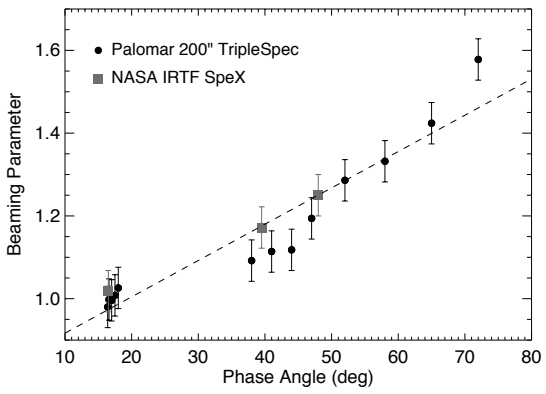

Figure 2: Thermal beaming parameter versus phase angle from our NIR spectroscopic observations on UT Nov. 9 (phases > 30°) and Nov. 10 (phases < 20°). The dashed line represents a linear fit to our data.