The population of Sedna-like objects. Y.-T. Chen[1], J. J. Kavelaars[2] , S. Gwyn[2], A. Parker[3], V. Suc[4], A. Jordan[4] and W.-H. Ip[1]. [1]Institute of Astronomy, National Central University, No. 300, Jhongda Rd, Jhongli City, Taoyuan County 32001, Taiwan (charles@astro.ncu.edu.tw), [2]Herzberg Institute of Astrophysics, National Research Council of Canada, Victoria, BC V9E 2E7, Canada, [3]Harvard-Smithsonian Center for Astrophysics, Cambridge, MA, USA, [4]Pontificia Universidad Católica de Chile.

Introduction: In few years ago, the discovery of inner Oort cloud objects give a light for answering process of evolution of Solar system. Because their high perihelion orbit could not be scattered into highly eccentric orbit from interactions with planets alone, orbit and dynamic investigation are required for explanation of solar system evolution.

Up to now, only 3 objects have semi-major axis > 200 AU and q > plutino orbit (~39.4 AU), e.g. Sedna, 2004 VN112 and 2000 CR105. This kind of objects, we call Sedna-like objects, don't have close encounter with known planets and be vary stable in extremely long numerical simulations[1]. It means that Sedna-like object is beyond the perturbations from known solar system, and may be not originate from other mechanisms. Unfortunately, there is no additional Sedna-like objects were discovered within +- 30 of ecliptic plane to R 21.3[2]. More new or faint Sedna-like objects found would help with verifying scenarios which propose to explain its origin. Here we report new discovery and result of NGVS survey.

Observation: The Next Generation Virgo Cluster Survey (NGVS) of Canada French Hawaii Telescope (CFHT) Large Program will spend > 700 hours of telescope time to image the 100 deg^2 Virgo Cluster using five filters u, g, r, i, z. We have used template-based image subtraction to achieve a depth of g'=25.1 for moving sources in each of a series of 3x634s g' or 3x441s i' exposures.

Data Reduction: We developed the pipeline for processing all data sets from CFHT. The pipeline includes PYTHON, SExtractor, SWarp, DEngine (developed by Alex Parker), IRAF, and CFHT Elixir pipeline for NGVS and CFEPS. After "purification" of object catalogues (to remove background stars, cosmic rays, residual of image subtraction), the detections are linking for detection of possible moving objects. Then the linkings will be checked through the BK orbit fitting program[3] for identifying Trans-Neptunian objects (TNOs) candidates.

Results: We searched ~ 100 deg^2 down to a mean limiting magnitude of 25.1 in g'. A total number of 91 NEW TNOs and Centaurs have been discovered, one of which was identified as Sedna-like objects in this survey. The new TNOs shown in Fig. 1 describe distribution of barycentric distance v.s. inclination. From Fig. 2, it is obvious to distinguish that our Sedna-like object is below empirically bound ($q = 30 + 0.085(a - 30)$)[4]. Above this line, most of the orbits exhibit strong short time-scale chaos. We also compute a population estimate for Sedna-like objects .

References:

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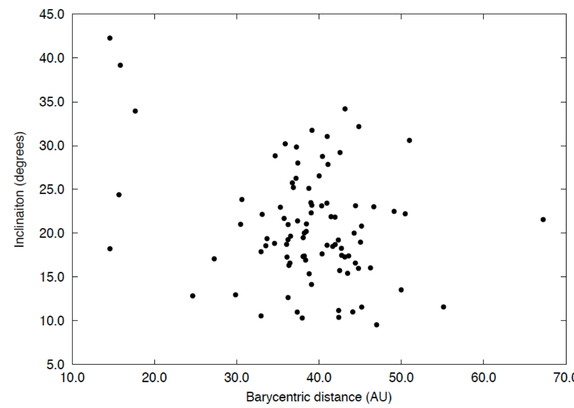

Fig. 1. The distribution of inclination v.s. barycentric distance. The farthest object is our Sedna-like object.

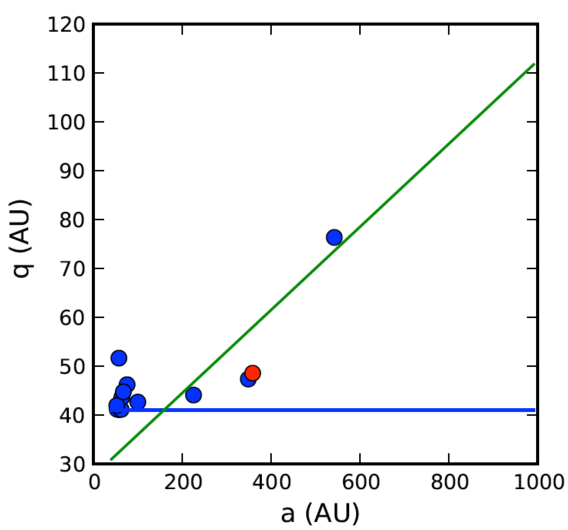

Fig. 2. The segment of a v.s q plot from MPC database (blue circle) and our Sedna-like object (red circle). Blue line indicate q =41, the green line denotes the empirically relation.