PHOTOMETRIC OBSERVATION OF YOUNG ASTEROID FAMILIES IN 2006-2010 AT MAIDANAK OBSERVATORY, UZBEKISTAN. F. Yoshida[1], Y. Nozawa[2], T. Ito[1], S. Takahashi[1], K. Okita[1], M. Ibrahimov[3], S. Ehgamberdiev[3], A. Marshalkina[3], R. Karimov[3], O. Burhonov[3], Y. Tillayev[3], B. Hafizov[3], T. Yanagisawa[4], H. Kurosaki[4], M. Yoshikawa[4], S. Urakawa[5], H. Ohtani[6], [1]National Astronomical Observatory of Japan, fumi.yoshida@nao.ac.jp, [2]Japan Women's University, [3]Ulugh Beg Astronomical Institute, [4]Japan aerospace Exploration Agency, [5]Bisei Space guard Center, [6]Kyoto University.

Introduction: Asteroid families have been believed that they were born 10^8-10^9 years ago. However, four very young asteroid families were discovered in 2002 by Nesvorny et al.. Their formation ages are only several Myrs ago. There are at least two important science aspects on young family asteroids: (1) Young family asteroids likely preserve some information of the asteroid collisional events. Because they have less experience on collisional/orbital evolutions after disruption event. Fresh information of the disruption events is essential for investigating the physical process of the collitional impact. (2) They likely have less weathered surface. Knowing correlation between space weathering degree and formation age, we can get a time scale of space weathering. The time scale of space weathering allows us to estimate the surface age of non-family asteroids by using space weathering degree obtained from their spectra. Under these motivations, we performed multi color photometry of young family asteroids at Maidanak observatory, Uzbekistan.

Observations: Maidanak observatory is located at the west edge of Pamir Mountains. It has an average seeing size of 0.7 arcsec and more than 200 clear nights per year. Since this site has very good conditions for astronomical observation, we signed a research collaboration agreement between NAOJ and UBAI so that we can occupy 50% observing time of the 60 cm telescope from 2006. We use 1kx1k CCD camera (FLI IMG1001E, FOV 10.7' x 10.7', Pixel scale 0.67") and B, V, R, I-filters. Since this telescope is very old type, it can not track asteroid. Therefore the exposure time is limited up to 3 min. With current condition, we can observe asteroids brighter than 17 mag. We determined rotation period, lightcurve amplitude, B-V, V-R, V-I colors of young family asteroids. We also observed old family asteroids for comparisons.

In total, we observed 43 young asteroids and 7 old asteroids.

Results: At first, we investigated correlation between rotation rate, peak to peak variation, diameter in the Karin family asteroids. Then we found a tendency that slow rotators have elongated shape, fast rotators have spherical shape. In other young family, Iannini and Veritas, we also recognized the same tendency as the Karin family. Meanwhile, we didn't see the trend in the old asteroid families. Therefore, the tendency may reflect a rotation status of re-accumulated asteroids just after the disruption event which formed the asteroid family.

Speculation on internal structure of asteroids: We assumed a simple model of the rubble pile asteroid and then calculated the the upper limit of spin rate of rubble pile asteroids with a function of peak to peak variation. Although it depends on the density of the particle composing the rubble pile and on the filling rate, most of the Karin and the Iannini family members that we observed lay down under the upper limit of the rubble pile structure (Fig.1).

Colors: We also investigated asteroid's color, and compared the color of the young and the old family asteroids. Then we found that the Koronis family (old S-type) shows slightly redder colors than the Kain and Iannini families (young S) have. The Themis family (old C) shows slightly bluer colors than the Veritas family (young C) has. On the graphs of average relative reflectance of each family (see Fig.2), we can see that, in the S-type asteroids, their spectra get redder with their age; on the other hand, C-type's spectra get bluer with their age.

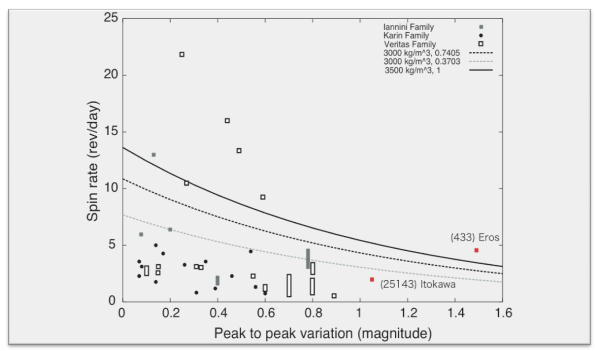

Fig.1 Peak to peak variation vs. Spin rate. Lines show the upper limit of rubble pile structure. Three cases were shown: β (filling factor):1, ρ (particle's density):3500 kg/m^3, β:0.7405, ρ:3000, β:0.3703, ρ:3000.

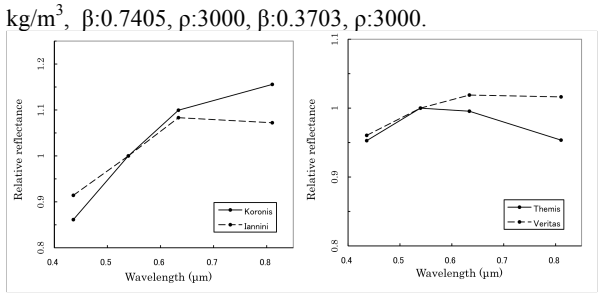

Fig.2 Relative reflectance of the young and old families. The reflectance was averaged out in each family.