CONFIRMATIONS OF (704) INTERAMNIA'S SUBLIMATION ACTIVITY NEAR PERIHELION. V. V. Busarev[1], M. P. Scherbina[1], G. I. Kokhirova[2], U. Kh. Khamroev[2], A. Sh. Mullo-Abdolov[2], T. R. Irsmambetova[1] and N. N. Pavlyuk[1], [1]Lomonosov Moscow State University, Sternberg Astronomical Institute (SAI MSU), 13 University Av., Moscow, 119992, Russian Federation, e-mail: busarev@sai.msu.ru; [2]Institute of Astrophysics of the Academy of Sciences (IAAS), 22 Bukhoro str., 734042 Dushanbe, Republic of Tajikistan.

Introduction: As it seems, condensation and accumulation of volatile compounds (H_2O, CO_2, CO, etc.) in the internal Solar System beyond the "snow-line" (actually, in its more wide vicinity) was one of the key processes that influenced the formation of not only proto-Jupiter and other giant planets, but also a swarm of smaller planetary bodies herein, including asteroids. If such a scenario thought to be natural for primitive-type bodies filling the periphery of the main asteroid belt and father, it raises questions in the case of unusual combination of low and high temperature compounds on some other asteroids (e. g., [1-3]). Somehow or other, this issue is one of the fundamental for our solar system.

It is important to note that ellipticity of asteroid's orbit (at its different insolation) creates a natural way to test asteroid stuff on the presence of volatile compounds. We have obtained new spectroscopic (June 2017) and UBVRI-photometric (September-November 2017) data confirming sublimation activity of (704) Interamnia, F(or B)-type main-belt asteroid, near its perihelion distance. The phenomenon on Interamnia and three other primitive main-belt asteroids near perihelion was first discovered by us in September 2012 (Busarev et al., 2015, 2016).

Observational Data: The spectrophotometric observations of (704) Interamnia in June 2017 were performed at Terskol Observatory (Mt. Terskol, 3150 m above sea level, Russia) with 2-m telescope and a low resolution CCD-spectrograph of (R≈100) in the range of 0.38-0.85 μm. A conventional method of asteroid spectral observations (along with solar analog standard stars) and a standard processing procedures (flat-field correction, bias and dark subtraction, etc.).

Fig. 1.

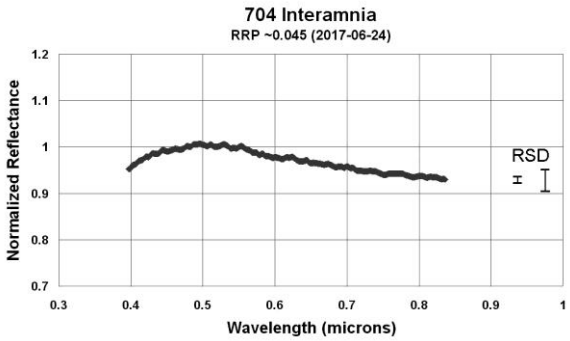


Fig. 2.

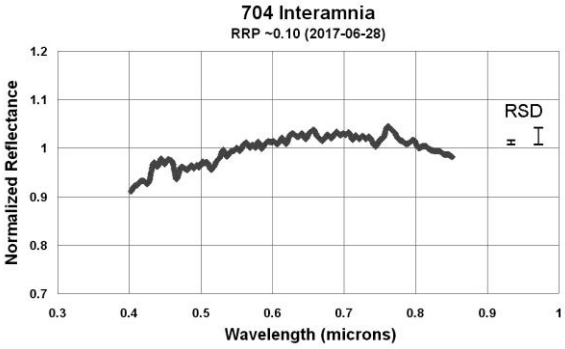


Fig. 3.

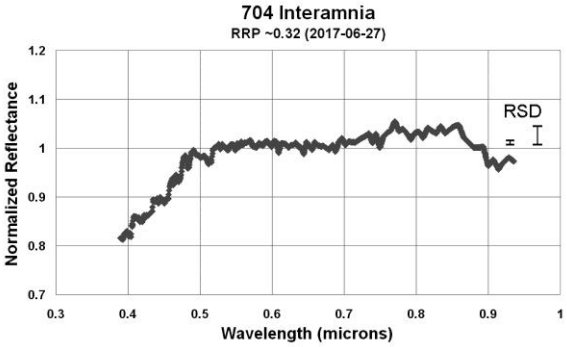
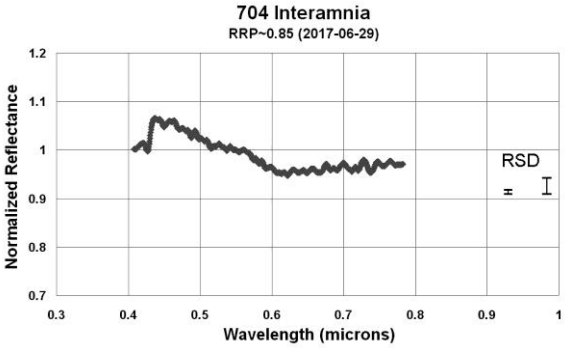


Fig. 4.



DECH software spectral package [4] was also used to reduce the data and calculate corresponding reflectance spectra. The normalized reflectance spectra, the relative standard deviations in the ranges 0.40-0.65 μm and 0.66-0.85 μm (RSD), and consecutive of relative rotational phase values (RRPs) of the asteroid are given in figs. 1-4. To calculate the RRPs, we used Interamnia's rotational period of 8.727 h [5].

UBVRI or BVRI photometric observations of Interamnia in September – November 2017 were performed to estimate changing shape of reflectance spectrum of the asteroid. The data were obtained at SAI MSU Crimea Observatory (Crimea-Nauchnij) with 60-cm telescope and a CCD-camera and at IAAS Sanglok Observatory (Mt. Sanglok, 2300 m above sea level, Tajikistan) with 1-m telescope and a CCD-camera. Calculated normalized (at effective wavelength of V-band, λ = 0.5448 μm) approximations of the reflectance spectra are shown in chronological order in figs 5-9.

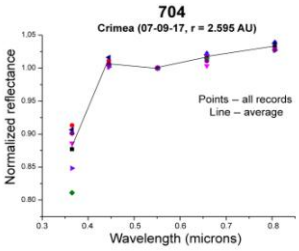


Fig. 5.

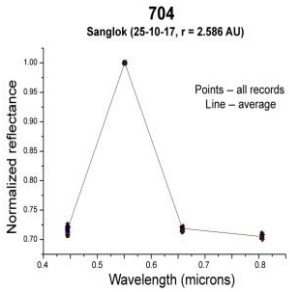


Fig. 6.

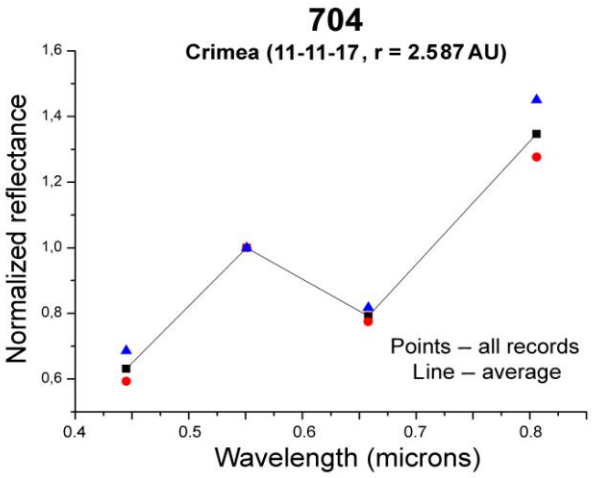


Fig. 7.

Fig. 8.

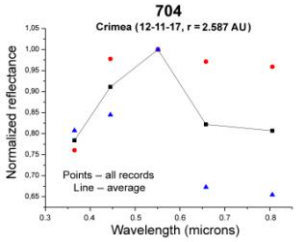
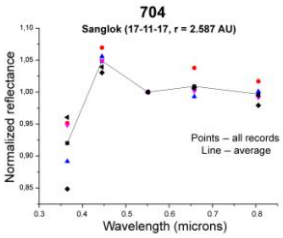


Fig. 9.



Brief Discussion: Sublimation activity of Interamnia begins very ahead of perihelion passage. Whereas this time the event took place on 29 October 2017, we registered quick and considerable changes (up to 10-15%) in reflectance spectra of the asteroid at close RRPs even in June 2017 (figs 1-4). UBVRI monitoring spectral variations of Interamnia in September – November 2017 (figs 5-9) demonstrated a strong short-wavelehgth reflectivity rise (up to 30-40%) of the asteroid at the passage of perihelion. It could be connected with formation of haze or an irregular coma near asteroid surface due to sublimation of mainly H_2O ice from the surface matter. The process should involve ejection of tiny sub-micron dust, especially at the highest surface temperatures near perihelion. We estimated that subsolar temperature on Interamnia at perihelion could be ~240 K [6, 7] which is about a hundred degrees above the sublimation threshold for water ice (~145 K) (e. g., [8]).

Conclusions: Thus our confirmations of Interamnia's sublimation activity in 2017 at its passage of perihelion along with discovering similar phenomena on three other main-belt primitive asteroids [6] led us to conclusion about sizeable ice content of H_2O ice on the asteroids. Moreover, a synchronism in sublimation activity on several main-belt asteroids with low-temperarture mineralogy at perihelion points, first, to a likely mass character of the process and, second, to close conditions of origin and evolution of the bodies.

References: [1] Rivkin A. S. et al. (1995) *Icarus 117*, 90-100. [2] Busarev (2002) *Solar Sys. Res., 36*, 39-47. [3] McCord T. B. et al. (2012) *Nature, 491*, 83-86. [4] Galazutdinov G. A. (1992) *Preprint of Special Astrophys. Observ., 92*, 27-52 [in Russian]. [5] Warner B. D. et al. (2009) *Icarus, 202*, 134-14. [6] Busarev V.V. et al. (2015) *Icarus*, 262, p. 44-57. [7] Busarev V.V. et al. (2016) *Solar Sys. Res., 50*, 281–293. [8] Schorghofer N. (2016) *Icarus, 276*, 88-95.