Title : will be set by the publisher
Editors : will be set by the publisher
EAS Publications Series, Vol. ?, 2013
e-mail: apozanen@iki.rssi.ru

GAMMA-RAY BURST OBSERVATIONS WITH ISON NETWORK

A. Pozanenko[1], L. Elenin[2], E. Litvinenko[3], A. Volnova[1,4], A. Erofeeva[5], A. Matkin[5], A. Ivanov[6], V. Ivanov[6], D. Varda[7], E. Sinyakov[7], V. Nevski[8], Yu. Krugly[9], A. Erofeev[5], N. Tungalag[10], R. Inasaridze [11], O. Kvaratskhelia[11], V. Kouprianov[3] and I. Molotov[2]

Abstract. We present details of the ISON network for GRB follow-up and complete list of observations in 2010–2012.

1 The network description and results

The International Scientific Optical Network (ISON) comprises several worldwide (Fig.1) small aperture automated telescopes (Table 1). The ISON project is originally devoted to space debris observations (Molotov *et al.* 2008). Since 2010 ISON started observations of GRB. The shortest time delay after GRB trigger (130 s) was achieved in robotic mode of ISON-NM. After two years of GRB follow-up (Table 2) one can conclude that the network of small aperture telescopes is an efficient tool for GRB detection and photometry. Totally we observed 33 GRBs, detected 15 optical transients, and in several cases we succeed to build a dense light curve of early optical afterglow (Fig.2). Future development of GRB follow up within

[1] Space Research Institute of the Russian Academy of Sciences, Moscow, Russia
[2] Institute for Applied Mathematics of the Russian Academy of Sciences, Moscow, Russia
[3] Central Astronomical Observatory of the Russian Academy of Sciences, Pulkovo, Russia
[4] Sternberg Astronomical Institute of Lomonosov Moscow State University, Moscow, Russia
[5] Ussuriysk Astrophysical Observatory of the Russian Academy of Sciences, Far East Branch, Gornotayojnoye, Russia
[6] Kuban State University, Krasnodar, Russia
[7] Blagoveschensk Educational State University, Blagoveschensk, Russia
[8] Astronomical Science Center "Proekt-Tekhnika", Moscow, Russia
[9] Institute of Astronomy of Kharkiv National University, Kharkiv, Ukraine
[10] Research Center of Astronomy & Geophysics of the Mongolian Academy of Sciences, Ulaanbaatar, Mongolia
[11] Kharadze Abastumani Astrophysical Observatory of Ilia State University, Georgia

DOI: (will be inserted later)

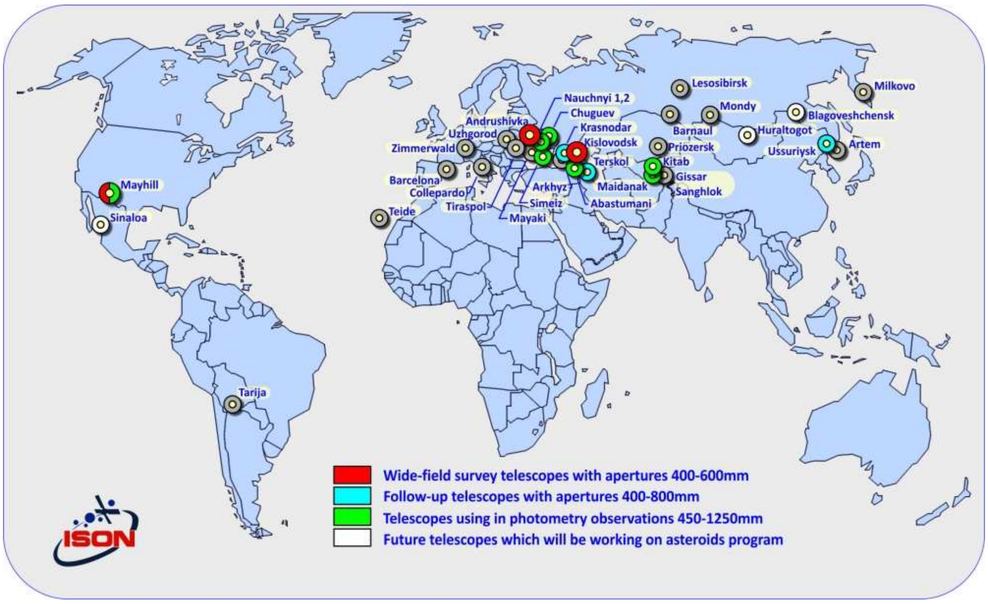

Fig. 1. Map of ISON observatories.

Site	Telescope	Aperture, m	Num. of clear night hours/year
(M)ilkovo	ORI-22	0.22(f/2.45)	n/a
(U)ssuriysk	VT-50	0.5(f/2.3)	900
(B)lagoveshchensk	ORI-22	0.22(f/2.45)	1600
(H)ureltogot	ORI-40	0.4(f/2.3)	1400
(K)itab	ORI-40	0.4(f/2.3)	1650
(S)anglokh	VT-78a	0.19(f/1.54)	n/a
(A)bastumani	AS-32	0.7(f/3)	1200
K(I)slovodsk	SANTEL-400A	0.4(f/3)	1343*
K(R)asnodar	Astrosib RC-508	0.51(f/6.3)	1200
(N)ew Mexico	Centurion-18	0.45(f/2.8)	1800

Table 1. ISON and cooperative telescopes used for GRB observations. * – taken from Kornilov *et al.* (2010), other data obtained from own monitoring.

ISON includes robotization of the telescopes, elaboration of new wide-field telescopes for fast and deep follow up GBM/Fermi and synchronous observations of FOV of space borne observatories (e.g. Pozanenko *et al.* 2003), development of automatic pipelines for astrometry and photometry, and installation the telescopes in new observatories (Fig.1).

Acknowledgment. The work was partially supported by RFBR grants 12-02-01336-a, 11-01-92202_Mong-a.

GRB	Delay	R_{mag}(obs.)	GCN num.	GRB	Delay	R_{mag}(obs.)	GCN num.
100728B	16.4^m	18.36(N)	11012,11045	120402A	20.9^m	> 19.8(K)	13200
101804A	3.27^d	19.79(N)	11129,11133	120404A	22.0^m	17.35(B)	13235
100901A	8^m	17.82(N)	11184,11234	120802A	12.5^m	> 17.5(N)	13556,13609,13712
100906A	13.5^m	15.89(U)	11395	120803A	3.7^m	> 17.3(N)	13617
110719A	1.05^h	19.70(N)	12177	120811C	20.0^m	17.90(K)	13693,13679
110820A	15.4^m	> 19.2(K)	12321	120816A	15^m	> 18.5(R)	n/a
111016A	3.82^h	> 19.2(K)	12486	120907A	12.9^m	18.55(I)	13761
111029A	3.61^m	> 18.3(N)	12500	120911A	2.45^m	> 18.4(N)	13759
111205A	2.90^d	> 19.8(N)	12736	120923A	6.43^m	> 19.7(N)	13820
111228A	0.84^d	19.27(N)	12832	121001A	7.1^m	19.0(R)	n/a
120106A	4.81^h	> 18.5(K)	12830	121011A	6.2^m	16.46(U)	13884
120116A	21.3^m	> 19.4(K)	12899	121108A	9.0^m	n/a(S)	n/a
120118B	45.0^m	> 19.5(K)	12900	121117A	1.75^h	> 18.9(B)	13978
120119A	1.26^h	18.97(N)	12871,12881	121123A	5.2^h	19.01(A)	13988,14200
120121A	2.78^h	> 19.7(N)	12887	121128A	0.43^d	20.24(A)	14201
120308A	3.3^m	17.30(N)	13019	121212A	2.3^m	20.7(S)	14071
120320A	12.6^m	> 16.7(B)	13198				

Table 2. GRBs observed with ISON and cooperative observatories. In the column (2) the time delay between GRB trigger and start of observation is presented. In the (3) we provide brightness of the OT at the first detection (or 3σ UL). Most of observations are unfiltered. Brightness is estimated against USNO-B1.0 reference stars, R mag.

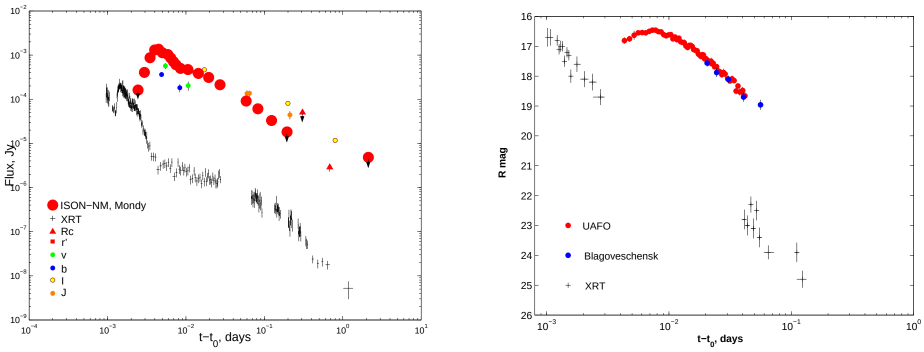

Fig. 2. *Left*: GRB 120308A: the ISON-MN began the observations of the optical transient 3.3 minutes after GRB trigger and continued it 5 hours. *Right*: GRB 121011A: the optical transient was recorded 6.2 minutes after the GRB trigger by Ussuriysk observatory.

References

Molotov, I., Agapov, V., Titenko, V. *et al.* 2008, AdSpR, 41, 1022.
Kornilov, V., Shatsky, N., Voziakova, O. *et al.* 2010, MNRAS, 408, 1233.
Pozanenko, A., Chernenko, A., Beskin, G. *et al.* 2003, ASPC, 295, 457.