

## INTERNATIONAL SCIENTIFIC OPTICAL NETWORK (ISON) IN LATIN AMERICA

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### RESUMEN

La Red Internacional Científica Óptica (ISON) representa una gran red internacional especializada en la observación de objetos espaciales. Sus objetivos principales son la investigación de la basura espacial, estudiar asteroides cercanos a la Tierra y la observación de explosiones de rayos gama. El proyecto ISON está continuamente ampliándose, actualmente cuenta con 35 observatorios en 15 países con 80 telescopios de diferentes aperturas (de 12,5 cm a 2,6 m)(ver Fig. 1). 8.4 millones de mediciones en 1.26 millón de trazos para aproximadamente 4000 objetos de basura espacial fueron obtenidos por ISON en 2014 y utilizados para su análisis. Actualmente 3 observatorios colaboran con ISON en el hemisferio occidental: Tarija en Bolivia, Cosala en México y Mayhill en USA.

### ABSTRACT

International Scientific Optical Network (ISON) is one of largest observing networks specializing in space objects. The main goals of ISON are the investigation of space debris, studying near Earth asteroids (NEA) and observing gamma-ray-bursts (GRB) afterglows. ISON is continuously growing and currently has 35 observation facilities in 15 countries, with 80 telescopes of different apertures (from 12.5 cm to 2.6 m)(see Fig. 1). 8.4 millions of measurements in 1.26 millions of tracks for about 4000 space debris objects were collected by ISON in 2014 and used for analysis. Currently 3 observatories collaborate with ISON in the Western Hemisphere: Tarija in Bolivia, Cosala in Mexico and Mayhill in USA.

*Key Words:* space debris

### 1. INTRODUCTION

The observation and investigation of artificial objects in orbits near our planet started from the moment the first artificial satellite Sputnik 1 by the former USSR, was launched on October 4, 1957. These observations were made in order to determine model parameters of movement, dynamic studies of these devices and the improvement of astrometric and photometric methods. But then there were no systematic research on the problem of filling an orbit around the Earth with space debris. Considering the increasing problem of space debris, the Russian Academy of Sciences in February 2001 commissioned the Research Institute of Applied Mathematics Keldysh of Moscow to plan and create a center for collection, conservation, calculation and analysis of information on space debris. For this purpose ISON

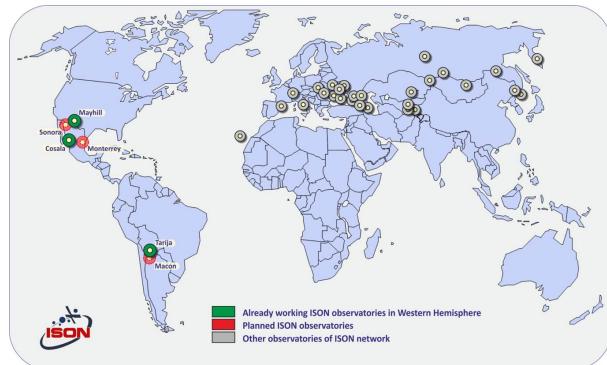


Fig. 1. ISON observatories in Western hemisphere.

was organized.

### 2. TARIJA - BOLIVIA

Tarija Observatory provides since 2009 survey observations of geostationary orbit objects (GEO) with a 25-cm telescope ORI-25, with a FOV of 3.3 degree. The modernization of the 60-cm Zeiss-600 telescope is almost finished, the mount is automated, its FOV has been enlarged using a lens corrector and the dome is assembled. It is planned for observations of faint space debris objects, asteroids and GRB. In

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TABLE 1  
RESULTS OF TARIJA & COSALA OBSERVATORIES

Telescope	Ori 25 (Cosala, Mexico)			Sigma Ori 25 (Tarija, Bolivia)		
	Observed nights	Number of images	Discovered cosmic objects	Observed nights	Number of images	Discovered cosmic objects
2013	101	200460	90360, 90415	181	340556	90357, 90360, 90380
2014	77	128441	-	125	218709	90453
Total	178	148501	2	306	559265	4

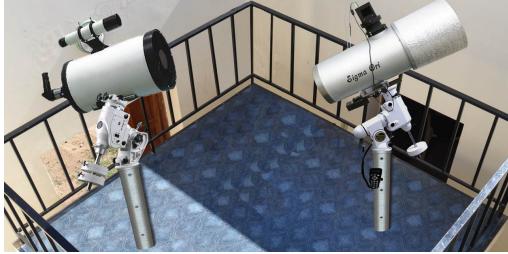


Fig. 2. Telescopes TAL-250K & ORI-25.



Fig. 3. Telescopes CHV-400.

addition, a 25-cm telescope TAL-250K (see Fig. 2) will be installed for ephemeris observations of bright space objects and GRB.

### 3. COSALA, SINALOA - MEXICO

Cosala Observatory provides since 2012 survey observations of GEO objects with a 25-cm telescope ORI-25, with a FOV of 3.3 degree. In 2013, a 40-cm telescope CHV-400 (see Fig. 3) with a FOV of 1 degree for observations of faint space debris objects, asteroids and GRB was installed. In addition, a 25-cm telescope TAL-250K will be installed for ephemeris observations of bright space objects and GRB.

### 4. MAYHILL, NEW MEXICO - USA

New Mexico Observatory started observations of asteroids and GRB in 2010. A new 40-cm telescope SANTEL-400A (see Fig. 4) with a FOV 1.76 degree was installed in 2013. Two comets and four NEAs has been already discovered (see Tables 1, 2, 3 & 4).



Fig. 4. Telescopes SANTEL-400A.

Also many photometry curves for NEAs have been measured.

TABLE 2

### DISCOVERED NEAS

Object	<i>a</i>	<i>e</i>	<i>i</i>	<i>q</i>	<i>MOID</i>	<i>H</i>
2010 RN80	2.2511	0.5394	8.7314	1.0368	0.0904	20.2
2011 QY37	2.4904	0.5112	7.5634	1.2173	0.2699	18.5
2013 TB80	2.8196	0.5454	12.7225	1.2816	0.302	17.6
2014 KH2	2.2505	0.5361	3.3403	1.0441	0.0522	18.9

TABLE 3

### DISCOVERED COMETS

Object	<i>a</i>	<i>e</i>	<i>i</i>	<i>q</i>	<i>M1</i>
C/2010 X1 (Elenin)	-	0.999989	1.8391	0.4825	10.4
P/2011 NO1 (Elenin)	5.5648	0.7767	15.2810	1.2428	13.3

TABLE 4

### DISCOVERED UNUSUAL OBJECTS

Object	<i>a</i>	<i>e</i>	<i>i</i>	<i>q</i>	<i>H</i>
(365756) 2010 WZ71	5.7124	0.5251	20.0034	2.7131	14.2
2011 RC17	6.3104	0.5375	11.3157	2.9186	15.7
2013 UL10	9.9911	0.3795	19.1446	6.1995	12.8