ISWI, Quito, Ecuador
Oct. 8 – 12 of 2012

International Collaboration of the CHAIN Project in Peru and Summary of Events Observed with the Flare Monitoring Telescope (FMT) in Peru

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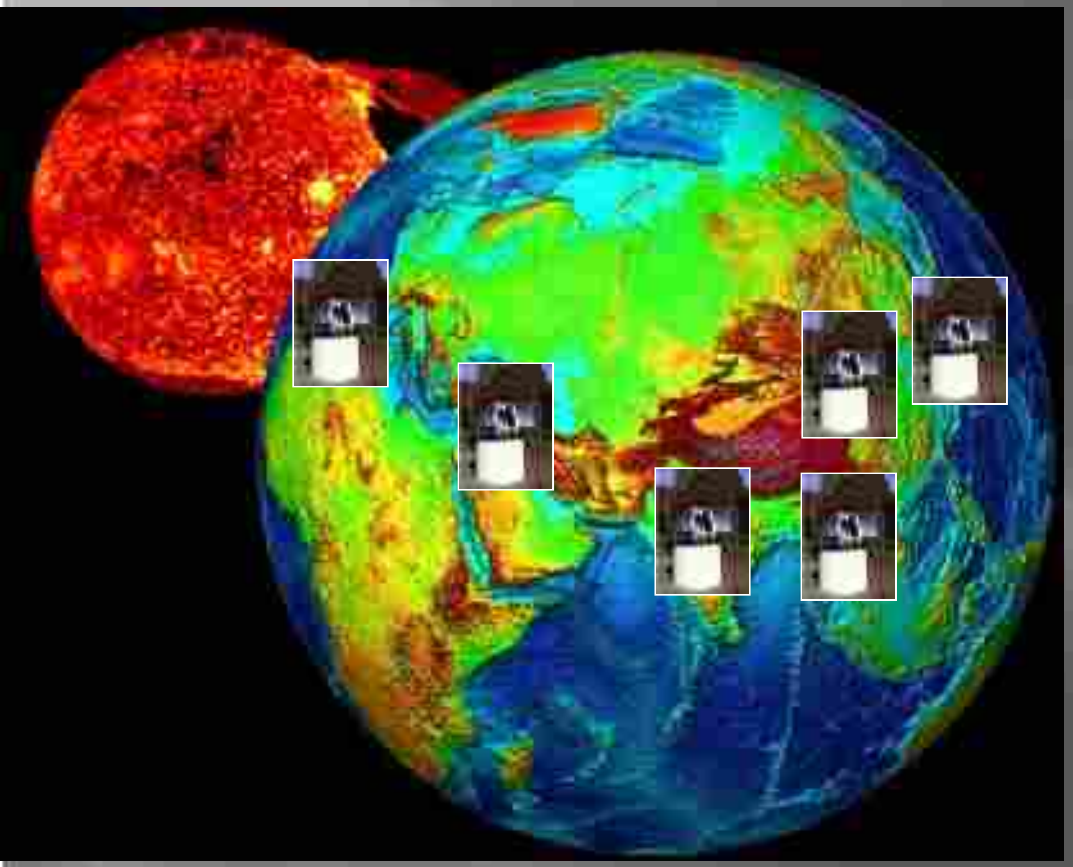
1: IGP, 2: Kyoto Univ., 3: UNICA-Peru, 4: NAOJ, 5: JAXA

CHAIN Project (Continuous H-alpha Imaging Network Project)



Reinforcement of observations of the solar activity for understanding and predicting space-weather events.

Formation of an inter-national network of ground-based observations for filament eruptions and shock waves with solar flares on the full-disk Sun for the purpose of knowing physical parameters of all solar active phenomena.

International spread, academic exchange and promotion of the space-weather research including developing countries.

Under the CHAIN project, we installed FMT at Ica Univ. in Peru in March 2010 with cooperation of IGP.

LIMA

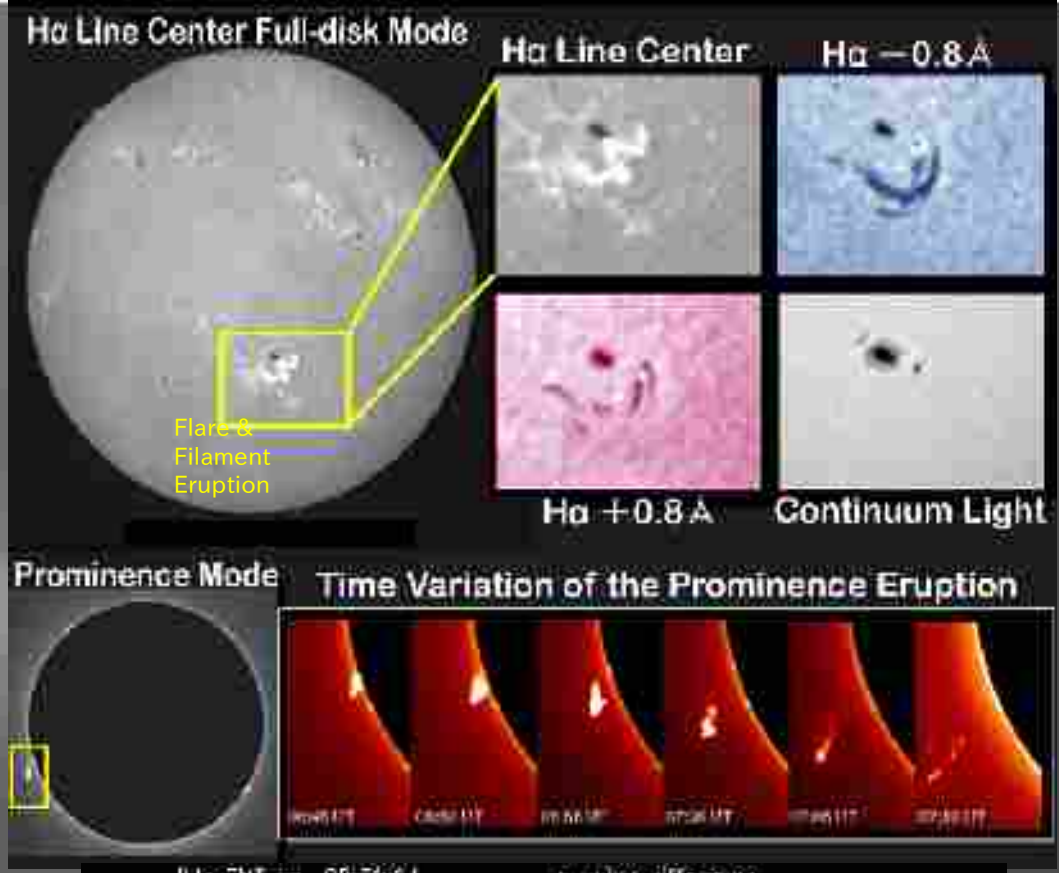
ICA

National Ica University, Peru

Latitude : - 14° 11’
Altitude : ~ 80 m
Rain : 0 mm/year
Temperature : 10 - 27 ℃
Avrg. Humidity : 20 %

FMT

(Flare Monitoring Telescope)



Full-disk, multi-wavelength, chromospheric (Hα) observations

- Observations of filament/prominence eruptions, Moreton waves (shock waves)
- 3D velocity field

Personnel Training and Academic Exchange

***<u>Scientific training of Peruvian students and young researchers in Peru</u>**

Dr. Morita (an assistant teaching staff) of Hida Observatory trained Peruvian students and young researchers at Ica University in Peru, in June and October – November in 2010.

The subjects are

* Acquisition method of calibration data and calibration method
* Calculation of physical parameters from multi-wavelength solar images and scientific analysis
* Lectures of solar physics and space weather.



At Ica University in Peru, June 2010

International Cooperative Researches

The 2nd Japan & Peru Data Analysis Workshop

20 – 31 Jul. 2011

8 days : at Hida Obs.

4 days : at NAOJ, Mitaka

[Objective]

- Report of progress of data-analysis during this one year
- Lectures of solar physics and solar active phenomena in more detail.
- Introduction of recent studies by using the data obtained with CHAIN-network, by Japanese researchers
- How to analyze solar observational data taken with FMT and space mission such as Hinode
- How to write scientific paper on solar physics research
- Basics of solar observations on ground

[Scientific Results]

- Group1: 2011-Feb-16 M1.6 Flare
- Group2: 2011-Mar-08 M4.4 Flare

3rd FMT Work Shop in Japan

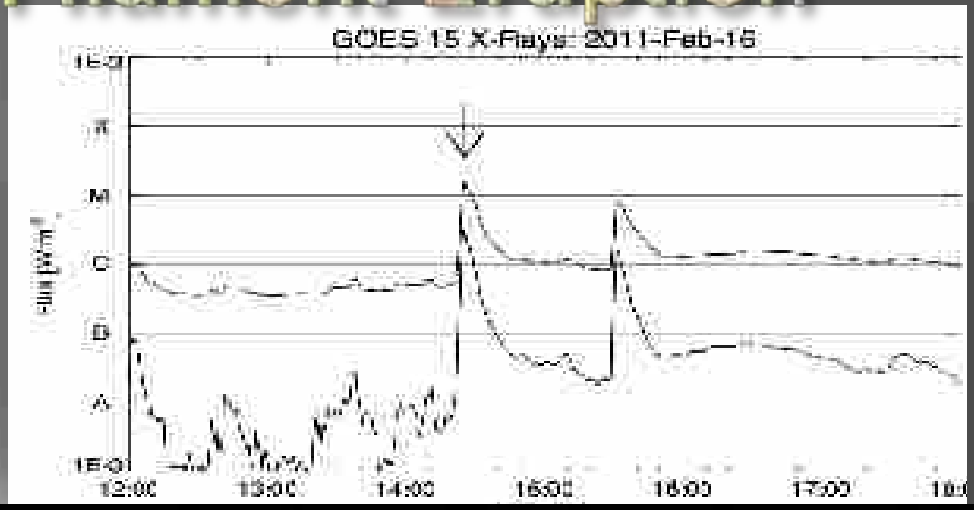
March 11th 15th of 2013

In Hida Observatory

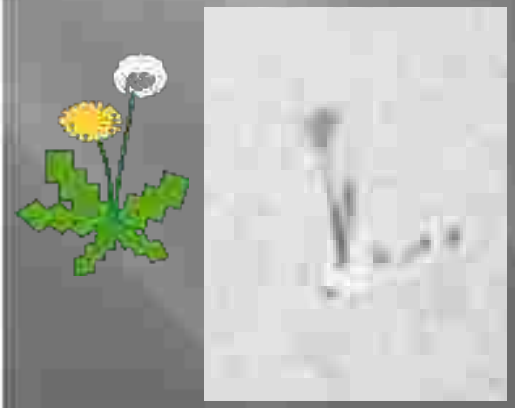
(1) "Dandelion" Filament Eruption

- 2011-Feb-16 14:19UT~
- GOES M1.6
- NOAA 11158

GOES X-ray light curve →



Dandelion

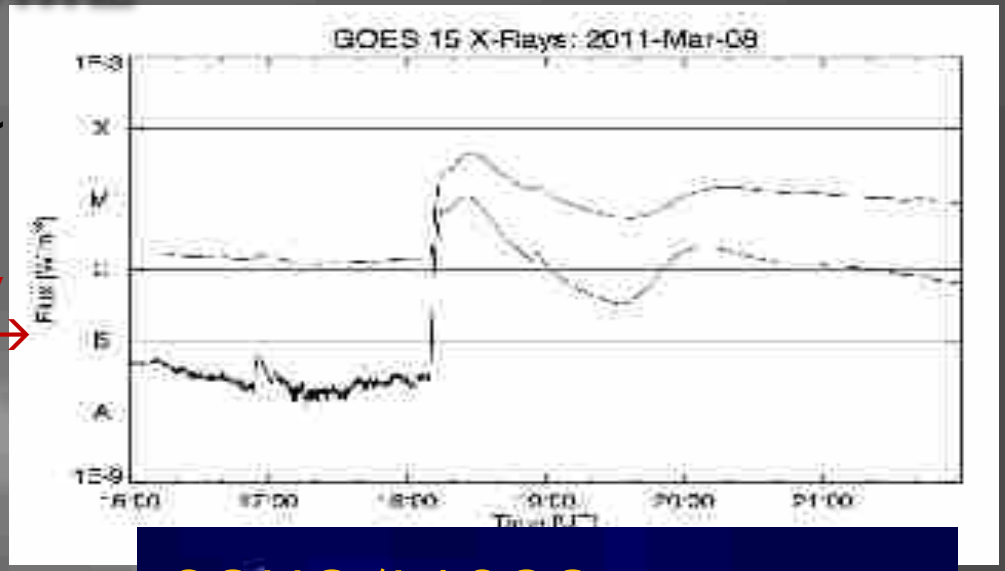


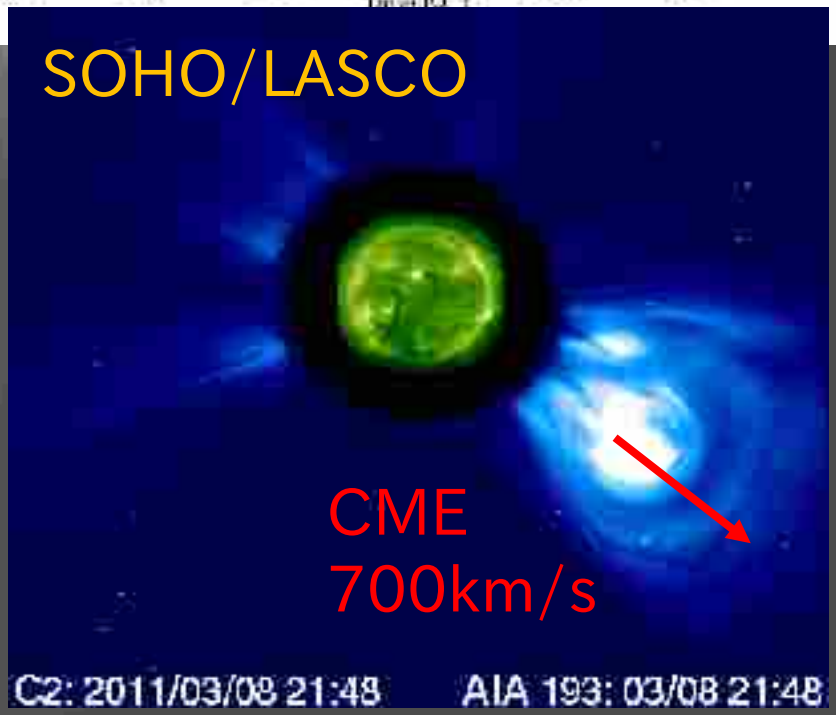
Hα movie of the flare taken by FMT-Peru →

(2) 3D View of the Filament Eruption and CME

- 2011-Mar-08 18:08UT~
- GOES M4.4
- NOAA 11165

GOES X-ray light curve →





Solar Observations at Ica Solar Observatory

- Data amounts

2010	Mar.	21 GB	6 days
	Apr.	18 GB	7 days
	May	65 GB	16 days
	Jun.	59 GB	14 days
	Jul.	41 GB	16 days
	Aug.	17 GB	9 days
	Sep.	44 GB	10 days
	Oct.	94 GB	20 days
	Nov.	166 GB	27 days
	Dec.	Operation suspended (from Dec 5th -).	
2011	Jan.	Operation resumed (from Jan 26th -).	

- FMT Operating time dramatically increased with the open of the ESI data analysis center (2010 October).
- The suspension occurred because of a key issue (the key of the ESI (including computer room) can belong to the U.N.ICA staffs or “hired staffs” of IGP, or Kyoto Univ.).
- The key issue has been solved by the new agreements (Jan 25th, 2011) on the ESI operation between IGP and U.N.ICA.

Solar Observations at Ica Solar Observatory

- FMT was operating quasi-regularly by the ESI members (volunteer) at UNICA, Ica, Peru.
  - Observations started from around 9 am until sunset.
  - Mainly weekday base but sometimes also on Saturday.
  - Total five young members. Two of them are staff members (lecturer) of U.N.ICA. The other three are non-supported IGP members.

- From Jan 26, 2011, FMT is operating regularly at UNICA, Ica, Peru by registered duty observers.
  - Observation starts from 8 am until 6 pm.
  - 7 days per week (at least when the University is open).
  - Five young members (the same members) and two interns (new 4th year physics department students) .
  - The three IGP members are now supported (Jan to Dic) with the duty of the FMT operation and solar physics researches at the ESI.

ESI Data Analysis Center

- Open from 2010 October
- Equip all the necessary environment for general solar physics data analysis
- 5 computers (Linux OS, NIS, NFS)

RAM size:8GB, 3GBx2, 1.5GB x2

- 6.4TB RAID (FMT data storage, and some other solar instruments data.)
- IDL (1 license)
- Solar Software (full version)
- Internet connection (uplink :downlink = 50kB/s: 150kB/s)
- Currently, five young researchers are regularly working here, and started solar data analysis trainings from October, 2010.

Data availability

CHAIN Project, Ica Peru

Continuous H-Alpha Imaging Network

Flare Monitoring Telescope

About the CHAIN Project

Latest images

Data archive

Event list

Feature events

Welcome to the FMT data base website

The Flare Monitoring Telescope (FMT) is a powerful instrument to record full-disk solar images at different wavelengths around the H-alpha absorption line simultaneously. The scientific target of the FMT is to monitor solar flares and eruptive filaments continuously all over the solar disk and investigate the correlation between the characteristics of the eruptive phenomena and the geoeffectiveness of the corresponding CMEs.

http://esi.igp.gob.pe

http://www.kwasan.kyoto-u.ac.jp/CHAIN/peru/CHAIN-Peru.html

Recent data from FMT at ESI

Movies

Full disk movie

- 07-Mar-2011 M1.5-class
- 07-Mar-2011 M3.7-class
- 08-May-2011 M5.4-class
- 30-Mar-2011 M1.1-class
- 27-Mar-2011 M1.9-class [Ha] [Hm]
- 28-Mar-2011 M1.6-class
- 29-Mar-2011 M1.7-class

Acknowledgment
The CHAIN-project is sponsored and supported by the Kwasan and Hida Observatories of Japan, Geophysical Institute of Peru (IGP) and National Ica University.

Flare Event List of 2010

	FMT-ICA		FLARE-EVENT LIST		
Date	Start Obs.	Stop Obs.	Start time	End time	Goes-class
04-May-2010	15:27:40	18:06:19	16:24	16:46	C3.6
17-Jul-2010	15:16:40	17:36:39	17:27	18:20	C2.4
22-Jul-2010	21:19:59	22:23:00	21:30	21:45	B9.8
10-Aug-2010	16:52:59	17:29:00	16:41	17:12	B8.1
20-Sep-2010	15:56:19	21:40:00	19:34	19:43	C2.1
			20:59	21:05	C1.2
04-Oct-2010	15:14:19	17:50:40	B16:34	16:38	C2.3
16-Oct-2010	15:40:19	18:29:00	16:53	17:06	B7.2
25-Oct-2010	15:15:19	22:29:00	21:46	22:00	B6.9
			22:06	22:18	C1.1
27-Oct-2010	15:13:19	22:36:20	17:03	17:08	C1.2
03-Nov-2010	16:11:19	22:48:00	20:41	22:21	B6.5
04-Nov-2010	14:43:59	22:36:00	15:56	16:09	B6.5
			20:55	21:29	B5.5
			21:58	22:15	B5.8
05-Nov-2010	14:50:40	22:47:40	20:12	20:16	B6.2
06-Nov-2010	15:12:40	20:46:19	15:32	17:11	M5.4

(D. Cabezas, M.V. Gutierrez, Y. Buleje 作

FMT-ICA			FLARE-EVENT LIST		
Date	Start Obs.	Stop Obs.	Start time	End time	Goes-class
10-Nov-2010	15:10:20	22:54:40	16:38	16:45	B9.0
			22:51	22:54	B6.0
11-Nov-2010	14:58:29	22:21:40	16:10	16:51	C4.3
			18:59	19:08	B9.4
			19:27	19:37	C1.1
			20:51	20:55	B9.0
12-Nov-2010	14:46:59	22:28:05			
13-Nov-2010	13:40:05	22:55:19	17:10	17:19	B5.7
15-Nov-2010	14:31:00	22:56:00	14:36	14:48	B7.6
			22:25	22:34	B8.3

(D. Cabezas, M.V. Gutierrez, Y. Buleje)

Observations in 2011

FMT-ICA			FLARE-EVENT LIST		
'Date'	'Start Obs.'	'Stop Obs.'	'Start time'	'End time'	'Goes-class'
'25 Jan 2011'	'14:54:20'	'23:06:59'			
'28-Jan-2011'	'14:58:35'	'19:58:30'	'17:54'	'18:04'	'B3.2'
'31 Jan 2011'	'16:02:10'	'17:42:30'			
'Date'	'Start Obs.'	'Stop Obs.'	'Start time'	'End time'	'Goes-class'
'01-Feb-2011'	'13:43:35'	'20:01:20'			
'02-Feb-2011'	'14:15:05'	'20:59:40'			
'03-Feb-2011'	'14:14:10'	'21:10:39'			
'04-Feb-2011'	'14:01:04'	'21:33:19'	'19:33'	'19:48'	'B8.4'
'05-Feb-2011'	'14:35:04'	'16:41:59'			
'07-Feb-2011'	'14:23:04'	'17:50:20'			
'08-Feb-2011'	'14:33:04'	'18:10:20'	'14:44'	'14:52'	'B3.0'
'09 Feb 2011'	'15:01:05'	'18:12:20'	'16:10'	'16:34'	'B8.6'
'10-Feb-2011'	'14:13:04'	'17:08:39'	'14:32'	'14:47'	'B8.7'
'11-Feb-2011'	'13:53:04'	'19:10:20'			
'12-Feb-2011'	'14:23:24'	'18:27:00'	'14:39'	'15:21'	'C2.6'
			'17:25'	'17:41'	'B5.6'
'15-Feb-2011'	'14:25:04'	'21:30:30'	'14:32'	'14:51'	'C4.8'
			'18:07'	'18:57'	'C1.7'
			'19:30'	'20:53'	'C8.6'
'16-Feb-2011'	'13:41:05'	'19:15:39'	'14:19'	'14:29'	'M1.6'
			'15:27'	'15:37'	'C7.7'
'17 Feb 2011'	'14:40:04'	'16:17:30'	'15:40'	'16:04'	'C1.3'
'19 Feb 2011'	'14:15:04'	'21:33:30'	'14:53'	'14:55'	'C1.0'
			'15:21'	'15:41'	'C1.5'
			'16:28'	'16:32'	'C1.0'
			'16:39'	'16:45'	'C5.1'
			'21:07'	'21:17'	'C1.9'
'21-Feb-2011'	'14:12:39'	'22:38:59'	'15:39'	'15:55'	'C1.5'
			'18:25'	'18:47'	'C1.4'

Observations in 2011

'Date'	'Start Obs.'	'Stop Obs.'	'Start Time'	'End Time'	'Goes class'
'21 Feb 2011'	'14:12:80'	'22:38:50'	'21:07'	'21:7'	'C1.9'
			'16:30'	'15:55'	'C1.5'
			'18:24'	'18:47'	'C1.4'
'22 Feb 2011'	'16:33:65'	'21:46:26'	'14:34'	'14:42'	'B2.7'
'25-Feb-2011'	'14:54:8/'	'22:12:'8'	'17:15'	'17:37'	'C1.1'
			'18:57'	'19:3'	'B4.5'
'26-Feb-2011'	'14:44:65'	'23:69:'8'	'14:3'	'15:12'	'B8.3'
			'19:29'	'19:28'	'B3.9'
			'28:45'	'29:52'	'B4.3'
'28-Feb-2011'	'14:27:04'	'22:16:30'	'15:44'	'15:59'	'C1.0'
			'26:11'	'2?:'	'B7.3'
			'21:15'	'21:45'	'C1.'
'01-Mar-2011'	'12:53:6/'	'23:15:30'	'14:35'	'1':19'	'C1.1'
			'16:25'	'15:59'	'C1.0'
			'17:42'	'17:54'	'C1.3'
			'18:00'	'18:25'	'C1.0'
			'18:51'	'18:58'	'B9.8'
			'19:34'	'??:?'	'C1.6'
'02 Mar 2011'	'13:08:20'	'23:58:30'	'13:11'	'13:21'	'C1.4'
'03-Mar-2011'	'14:19:05'	'22:52:'0'	'14:12'	'14:31'	'C5.4'
			'10:24'	'10:44'	'C1.2'
			'26:??'	'?1:?'	'C2.?'
'04 Mar 2011'	'14:42:15'	'17:61:34'	'13:57'	'14:33'	'C1.?'
			'17:15'	'17:23'	'C1.0'
'05-Mar-2011'	'14:26:65'	'21:55:'6'	'14:22'	'1?:39'	'C1.0'
			'28:05'	'29:15'	'C1.4'
			'28:51'	'21:58'	'C2.9'
'07-Mar-2011'	'13:37:64'	'21:59:59'	'13:45'	'14:55'	'M1.9'
			'16:05'	'15:22'	'C5.1'
			'10:10'	'10:41'	'C7.6'
			'19:43'	'??:?'	'M3.?'
			'21:45'	'21:55'	'M1.5'

Observations in 2010

2010Events registered in 2010 in Ice Soler Observatory

Flare List 2010-ESI					
	GOES-CLASS				
2010	B	C	M	X	Total
Jan	NR	NR	NR	NR	0
Feb	NR	NR	NR	NR	0
Mar	0	0	0	0	0
Apr	0	0	0	0	0
May	0	1	0	0	1
Jun	0	0	0	0	0
Jul	1	1	0	0	2
Aug	1	0	0	0	1
Sep	0	2	0	0	2
Oct	2	3	0	0	5
Nov	13	2	1	0	16
Dec	1	0	0	0	1
TOTAL	18	9	1	0	28

NR: Not Registered

Observations in 2011

Events registered in 2011 in Ica Solar Observatory

	GOES-CLASS				
2011	B	C	M	X	Total
Jan	2	0	0	0	2
Feb	14	16	1	0	31
Mar	12	37	7	0	56
Apr	13	11	1	0	25
May	13	3	0	0	16
Jun	NR	NR	NR	NR	0
Jul	NR	NR	NR	NR	0
Aug	7	4	0	0	11
Sep	5	41	8	2	56
Oct	4	16	0	0	20
Nov	4	27	0	0	31
Dec	7	10	0	0	17
TOTAL	81	165	17	2	265

NR: Not Registered

Observations in 2012

Events registered in 2012 in Ica Solar Observatory

	GOES-CLASS				
2012	B	C	M	X	Total
Jan	1	5		0	6
Feb					
Mar	7	8	1	0	16
Apr	3	13	1	0	17
May	4	13	0	0	17
Jun	0	2	0	0	2
Jul	0	2	0	0	2
Aug					
Sep					
Oct					
Nov					
Dec					
TOTAL	15	43	2	0	60

NR: Not Registered

New location of FMT from 2013

New location for FMT

From 2012

Solar Activity Scientific Research Institute

Summary

1. A tripod system of collaboration is going on and some good results were achieved.
2. Actually Peru's economy is stable and healthy, so it is time to do as much as we can.
3. Education in science issues are the most important part of collaborations, but also is the most difficult part.
4. A platform as ISWI supported by UN is really important to continue and improve what we achieved.

Thank you for your attention