# **Pro-Am Collaboration in Greece, in Solar Research**

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## Abstract:

The last five years there is a continuing advance in the Greek community on Solar Physics and Solar Observing techniques. In the spirit of collaboration between the Amateurs and the Professional Astronomers, there has been made two groups in order to cover as much as possible in the Solar Activity monitoring.

For this reason the groups, "Elizabeth Observatory of Athens" and "H.E.L.I.O.S." (Hellenic Eclipse Laboratory for Imaging and Observing the Sun) (www.tse2010.weebly.com) are now contributing the Greek Professional Astronomers with scientific data on Solar Chromosphere and Solar Corona. E.O.A. is a fully functional observatory held by amateur astronomer lakovos Strikis and provides daily images of the major chromospheric phenomena of the Sun in Ha' and CaK II lines, and also high resolution images of the Sunspots. (www.elobs.weebly.com) H.E.L.I.O.S. group is a collaboration between amateur astronomers and students of the Physics department of the National and Kapodistrian University of Athens. The group is following the Total Solar Eclipses, doing high resolution images of the white light Corona and also high resolution spectroscopic measurements of the Chromospheric spectrum, the Trantition region spectrum and Corona spectrum, in order to document the Coronal activity during each solar cycle.

# Total Solar Eclipse 11 July 2010



Total Solar Eclipse in Mangaia (2010) and the expedition members



H.E.L.I.O.S. Team Members

# **Eclipse Experiments and Results:**

Our team captured the Flash Spectrum of the Sun during the Total Solar Eclipses of 2006 (Greece) *Picture Above*, 2008 (Siberia), 2009 (China) and 2010 (Cook Islands). Our purpose was to measure the relative intensities of the Red and Green Coronal lines (FeX, FeXIV). From these line ratios we will determine the coronal temperature. For the study of the Flash Spectrum through all the eclipses we have made a slit-lesh spectrograph with a Refracting Grating of 300 lines/mm blazed at 4500 Angstrom. Also we used a Digital SLR camera with 135mm F/5.6 Telephoto Lens. Before the eclipse of 2009 (China) we added a second high resolution slit-lesh spectrograph. The second spectrograph was constructed with a Reflecting grating of 1200 lines/mm blazed at 5000 Angstrom and a Digital SLR camera with 400mm F/5.6 (used at F/22) Telephoto Lens. The systems mean resolution was 0.0539 Angstrom per Pixel. Also, high resolution white light imaging is performed by one of the most experts in that section, Constantinos Emmanouilides, who in collaboration with Dr. Miloslav Druckmuller (BRNO Univ.) are producing the most detailed images of the WL – Corona ever seen. From the above observations of the eclipses from 2006 through 2010 we have made a variety of researches concerning the general coronal morphology, the coronal structures above active regions, the general coronal temperature and each eclipse spectral characteristics. Most of these research activities have been announced at conferences and we present some references of them:

#### in the local airport.

#### Solar Corona Spectrum

## Past and Future Expeditions

2006: H.E.L.I.O.S has travelled to Kastelorizo Island in Greece to get our first data.

2008: Our second Total Solar Eclipse was observed and recorded at Novosibirsk in Russia.

2009: As in all our expeditions, we have been very lucky due to local weather, to observe one more total eclipse in Hangzhou in China.

2010: At the island of Mangaia in Cook Islands we were the first to observe the eclipse and managed to get our needed data.

2012: We will travel to Australia to observe the total solar eclipse from Port Daglas in Queensland. Being close to the maximum of the solar activity, precious data will be

#### Total Solar Eclipse of 2012 Nov 13



 "Observations of FeXIV/FeX Line Ratio During the Extended Solar Minimum (2006-2010) Total Solar Eclipses", lakovos – Marios Strikis, Athanasios Kouloumvakos, Spiros Patsourakos, 13th European Solar Physics Meeting, Greece 2011.
"Spectroscopic Analisys of the Observations of the Total Solar Eclipses 2006-2008-2009", J.D.Strikis, Ath. Kouloumvakos, G. Xystouris, 13<sup>th</sup> Panhellenic Conferance of Physics, Patras – March 2010.
"Total Solar Eclipse: Kastelorizo – Lybia 2006, High Resolution White Light structure and corelation with the structure seen in Fe and He Spectral Lines", J.D.Strikis, Ath. Kouloumvakos. 5<sup>th</sup> Panhellenic Amateur Astronomy Conferance. Patras – Octomber 2007 added in our study and research.

### **Elizabeth Observatory of Athens**

Elizabeth Observatory of Athens is a complete Astronomical Station working since 2002. Recent developments on "Imaging Systems" enabled us to start working with cheap but great technology in order to Study the Universe.

"EOA" has been cooperating with several Pros and Amateur astronomers around the world and especially in the Planetary and Solar science.



Now, more than ever, the contribution is amateur astronomers is needed in the Solar Physics, this is due to the technology that amateur astronomers have in their hands to work. Superb filters, with extremely sensitive CCD

Cameras are the ingredients that make them useful. "EOA" is mostly using high quality filters and cameras in order to make "Time Series" observations of Chromospheric activity, in the active regions (Flares, Moving Filaments and Sunspot Evolution) and the limb characteristics of the Sun (Prominences and Spicules).

All the data of the "EOA" are daily sent to the British Astronomical Association and monthly to the University of Athens on Prof. Moussas Xenophon, in order to be correlated with other data and used for further study. Of course "EOA" is open to anyone interesting in cooperation. Also all the data of the "EOA" can be found in www.elobs.weebly.com