

IHY OFFICIAL OPENING CEREMONY ACTIVITY SUMMARY

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1. INTRODUCTION

As ESS emerged a framework for addressing the scientific dimensions of global change, the COST 724 Action has initiated the scientific collaboration towards education between scientists of the universities, governmental and industrial bodies in Europe, concerning the Space Weather education. The university offers the unique opportunity to develop knowledge and understanding about Space Weather that can then be applied as graduates enter the main stream society. In short, it is expected that the initiative taken by the COST 724 Action would create a university based cooperative effort in Space Weather under the ESS curriculum development firmly.

The basic users of a Space Weather Education Program may be summarized as in the following areas: communications, satellite operations, power grids, manned spaceflight, navigation, etc. Scientific and technological developments are achieved as the results of research, observations, models and education. Forecasting and warning services use the technology developed and disseminates the results to the basic users mentioned above. Comments of users are returned back to the education program via feedback mechanisms. Thus, the quality and efficiency of the education system are sustained at satisfactory levels.

The following case studies illustrate the beginning of such a task towards a coherent and concrete unifying Space Weather education for the science and engineering curricula in Europe and Turkey:

2. COST 724 and IHY RELATED CAPABILITIES and CASE STUDIES

2.1. FORMAL EDUCATION

Formal education on the Near Earth Space at the Middle East Technical University, Department of Aerospace Engineering in Ankara has been offering some courses towards the Near Earth Space medium since 1990, that is,

“AE453 – Introduction to Atmospheric Physics I”,

“AE454 – Introduction to Atmospheric Physics II”,

“AE551 – Introduction to Space Sciences”,

“AE552 – Selected Topics on Space Sciences”,

“AE552 – Applied Orbital Mechanics”.

(for more detailed information, please visit <http://www.ae.metu.edu.tr/>)

With the COST 724 Action initiative, the syllabi of these courses have been re-interpreted under the philosophy of the ESS with Space Weather flavour.

In parallel to the course work with emphasize on Space Weather approach, the subjects of the graduate theses have been directed towards the objectives of the COST 724 at the METU Department of Aerospace Engineering.

These AE coded courses have been strengthened by the relevant courses offered at other departments of the METU. In particular,

Some of the Department of Electrical Engineering borne courses are the followings

“EE503 – Signal Analysis and Processing”

“EE543 – Neurocomputers”

“EE553 – Optimization”

“EE557 – Estimation Theory”

(for more detailed information, please visit <http://www.eee.metu.edu.tr/>)

2.2. COST 724 – IHY Case Study “I LOVE MY SUN”

In this case study, the school children are chosen to be the important target group. The children of today will be the flag carriers of tomorrow. Space Technology has been part of our daily life. The advanced technology of our time is vulnerable to the Space Weather events. Human roles and activities in space are increasing at a rapid rate. For example, International Space Laboratory at about 500 km. above the Earth; the plans of a base station on the Moon; manned missions to Mars are not the themes of science fiction any more. Therefore, space weather has been become more important since the beginning of the last century.

Objectives

We chose the space weather in particular the Sun as our subject of interest. The main objective of this action is to pose the question, how school children who came from three different backgrounds are conceive the Sun. The children, after an introductory seminar are to be asked to express themselves in drawing the Sun. Ankara is the capital of the Turkish Republic. Since 1960’s, like all other main urban regions of Turkey, Ankara has been exposed to rural immigration also. Therefore, Ankara of 1960’s with less than one million inhabitants has become a very cosmopolitan impersonal city, inhabiting almost five million people today. We choose two schools in Ankara representing two different social backgrounds on the average.

- School 1 is a public school with (TBD) student enrollment and it is a public school.
- School 2 is a private school with (TBD) student enrollment and it is a private school.

Bolu is an industrial city situated between Ankara and Istanbul. It is a fast growing city and a school in Bolu is chosen as the third subject.

- School 3 is a public school with (TBD) students and it is a private school.

Impacts

- To create some awareness on space weather among the school Children in Turkey.
- To have the school children feel themselves as part of a global scientific community in particular the European Research area.
- To establish any form of liaison with the UN/UNICEF and/or internationally linked activities.

- To integrate any relevant FP7 borne European actions.

Workplan

The action will take place in three phases:

1. The students will be asked to paint/draw/plot the Sun as they conceive it.
2.
 - a. A basic set of lectures on the Sun; Space Weather will be delivered to them. The lectures are to be illustrated with slides, photographs and are planned to last for two hours.
 - b. There will be an hour long brain storming session during which the students are expected to be interactive and ask questions if they have any.
3. After the preparatory, they will be asked to draw the Sun again.

2.3. TURKISH COST 724 and IHY GROUP CAPABILITES

Modeling Capabilities

Near-Earth Space processes including the Space Weather are highly complex and non-linear. Therefore, mathematical modeling based on first physical principles is usually difficult or impossible. For such cases data driven modeling methods are recommended to be used in parallel with mathematical modeling approach. It was demonstrated that data-driven (data based) modeling such as Neural Network (NN) based approach has advantages in dealing with highly non-linear processes in the Near-Earth space.

Turkish Group is employing their modeling capabilities in their works since 1990s. These capabilities include Neural Network Modeling, Fuzzy Neural Network Modeling, Recurrent Neural Network Modeling, Evolutionary Programming and Genetic Programming.

Some of the Space Weather related modeling case studies include,

- Temporal and Spatial Forecasting of the Ionospheric Critical Frequencies, foF2 with Feedforward and Fuzzy Neural Network Models [Tulunay et al., 2000],
- Forecasting Total Electron Content Maps by Neural Network Technique [Tulunay et al., 2006-a; Ciruolo, 2004],
- Forecasting GPS TEC Using the Neural Network Technique “A Further Demonstration” [E. Tulunay et al., 2004-b],
- An Attempt to Model the Influence of the Trough on HF Communication by Using Neural Network [Tulunay et al., 2001],
- Forecasting Magnetopause Crossing Locations by Using Neural Networks [Tulunay et al., 2005-b],
- Neural Network Modeling in Forecasting the Near Earth Space Parameters: Forecasting of the Solar Radio Fluxes [Tulunay et al. 2005]
- The ELF Characterization of the Earth-Ionosphere Cavity: Forecasting the Schumann Resonances (SR) [Tulunay et al., 2006-b],

- A Hybrid Approach in foF2 Forecast Mapping Including Halloween 2003 Storm and November 2003 Super Storm [Altuntas et al, 2007],
- Reconstruction of TIMED Solar EUV Spectrum with six wavelengths using Genetic Programming

Signal Processing Capabilities

Turkish Group is employing their data organization and signal processing capabilities to analyze various kinds of data. The relevant capabilities include,

- Data Organization,
- Signal Filtering,
- Welch's Periodogram Analysis,
- Signal modeling.

Ionospheric and Geomagnetic Response to the IMF

In this case study, the effects of Interplanetary Magnetic Field on the Ionospheric and Geomagnetic response have been studied. Three event definitions were introduced and effects of the events have been investigated; and results showed that in addition to the IMF Bz polarity reversal, IMF By polarity has an influence on the variability.

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