ISWI National Coordinator Presentations

Algeria, Naima Zaourar
Argentina LAMP, Sergio Dasso
Argentina TSWC, Maria Graciela Molina
Azerbaijan, Elchin Babayev
Bulgaria, Simeon Asenovski
Croatia, Dragan Rosa
Italy, Y. Migoya Orue, V. Romano
Kazakhstan, Olga Kryakunova
Nepal, Krishna Prasad Bhandari, Narayan Chapagain
Slovakia, Ivan Dorotovic
Tunisia, Hassen Ghalila
Rwanda, Jean Uwamahoro

and

Girgea Scientific Network, Christine Amory
Study of the Deployment of the Permanent GNSS Network in Algeria

**Network A:** 18 stations
- Observation rate 1 s
- Inter-distance 350 km - 650 km.
- Decimetric/real time accuracy
- Delayed/millimetric
- Attached to IGS/ITRF2014
- Concrete pillar on the ground
- Weather sensor (Vaisala PTU300)

**Network B:** 168 stations
- Observation rate 1 s
- Inter-distance 40 - 70 km/North
- 250 km/South
- Accuracy / real time: 2-3 cm (X,Y)
- Delayed/millimetric
- Pillar on terrace, mat.

**Contribution of permanent stations GPS data to estimate the water vapor content over Algeria**

The Algerian GPS data from six stations are used to estimate locally the IWV and to show its correlation with IWV derived from ECMWF (ERA-Interim model) and radiosondes. The analysis of results obtained shows great correlation between these three datasets and puts in evidence the suitability of GPS IWV to estimate the spatial variations of this parameter.

*ISWI coordinator Pr Naima Zaourar*
The TSWC continuously monitor Space Weather condition with an emphasis in the upper atmosphere. TSWC provides real-time data access from local instruments: AIS-INGV ionospheric sounder, a continuous HF Doppler radar system, 2 GNSS receivers, a Riometer, and a Magnetometer.

Services for civil aviation: TSWC provides near real-time ionosonde data as an affiliated asset at the PECASUS consortium for HF comm alerts for ICAO

TSWC participates in the LAGO Space Weather program.

- National cooperation: Argentinian GNSS recievers network (RAMSAC), CONAE, Universidad Tecnológica Nacional Bahia Blanca, Universidad Tecnológica Nacional Tucumán, Defense Ministry, among others.
- International cooperation: INGV (Italy), ICTP (Italy), INPE (Brazil), Institute of Atmospheric Physics (Czech rep.), Finnish Meteorological Institute, CINESPA (Costa Rica), etc.
- Capacity building and training:
  - Postgraduate curricula: Data Science for Space Weather
  - Courses on Scientific Computing and ML

- **Planned:** Deployment of new instruments (Cherenkov detector, GNSS receivers, etc), data-driven models (TEC, MUF, f0F2), machine learning based forecasting, etc.
- **Host of scientific meeting:** “XIII Latin American Giant Observatory (LAGO) Meeting – Tucumán 2022”
LAMP Space Weather initiatives in Argentina
ISWI Steering Committee – 19/Feb 2021
spaceweather.at.fcen.uba.ar  www.iafe.uba.ar/u/lamp

LAMP Activities and Linkages

- Since 2016: LAMP makes a daily monitoring of real-time information (space and ground-based instruments) on Space Weather

- LAMP weekly SWx bulletin using Argentinean and international instruments: Sun-IP-Magnetosphere-Ionosphere-Forecast

- Since 2020: LAMP is the Argentine regional warning center of ISES (International Space Environment Service)

- LAMP web-site offers 14 operative products – E-mail alerts by subscription - Operative real time v-TEC maps for Argentina (GPS-RAMSAC net)

- LAMP has a 24/7 Antarctic Space Weather laboratory at the Argentine Marambio base (particle detector, magnetometers, meteorological station, etc) - 5-minutes real time access to data

- LAMP participated in WMO-ICAO audits to PECASUS and SWPC/NOAA

- LAMP collaborates with the ACJF consortium (ICAO) and participates of the LAGO Space Weather program

- LAMP participate with members of different SWx panels, such as COSPAR(PSW), WMO (IPT-SWeISS), SCOSTEP (NSP), ICAO (auditing centers for global SWx services), ESWW, SCAR, etc
ISWI activities in Azerbaijan (national coordinator: Elchin Babayev)

Main organizations dealing with Astronomical and Space Researches/ Applications and Space Weather studies in Azerbaijan:
- Baku State University;
- Shamakhy Astrophysical Observatory (ShAO), Azerbaijan National Academy of Sciences;
- Batabat Astrophysical Observatory;
- AzerCosmos OJSC;
- National Aviation Academy;
- National Aero-Space Agency;
- Research Institutes of the Azerbaijan National Academy of Sciences - Physics, etc.
- Some departments of different universities, etc.

Among modern problems of astronomy and astrophysics we conduct studies on:
- Solar physics (theoretical and experimental);
- Helioseismology (theoretical), global solar oscillations;
- Solar-terrestrial physics – interplanetary magnetic field, solar wind, large-scale magnetic fields on the Sun, etc.;
- Space weather effects’ studies.

Space Weather Effects’ Studies particularly cover some tasks of international programmes and projects, like:
- Impact on technologies (space-borne and on Earth);
- Public health problems;
- Environmental problems.

SW studies mainly were/are conducted in the:
- Department of Cosmic Plasma and Heliogeophysical Problems, Shamakhy Astrophysical Observatory;
- Department of Astrophysics, Baku State University;
- Other organizations;
- Scientists and specialists from different fields of science and technology – astrophysicists, geophysicists, physiologists, engineers, etc.;
- Contacts, collaboration at regional as well as at international levels.

Activities:
- monitoring and analysis;
- theoretical and experimental studies of space weather effects;
- application of obtained results (industry, public health and security, etc.);
- preparation of young specialists (Ph.D. students, lectures);
- public awareness (mass-media, TV, radio, newspapers, web site).

Potential influence of space weather factors are studied in the following research areas:
- Space weather influence on technical and engineering systems (electric power supply grids, oil production activity, functioning of long pipelines, etc.);
- Space weather effects on human life and health (bioelectrical activity of human brain and its functional state, cardiovascular parameters, diseases, biologically active points of human body, traffic accidents, virus-epidemic diseases, influenza, etc.) and ecological systems (Caspian Sea level variations, climate changes, etc.);
- Distant investigation of propagation of very low frequency (VLF) electromagnetic waves in the Earth’s ionosphere;
- Investigation of solar wind magnetic field distribution near the Earth;
- Study of relationship between the contrast of coronal holes on the Sun and parameters of the solar wind streams;
- other tasks, such as solar activity and comet’s brightness, etc.
ISWI Space Weather Report
Bulgaria

Prepared by:
Simeon Asenovski,
Space Research and Technology Institute, BAS
Sofia, Bulgaria
Space weather investigations based on Liulin-MO FREND dosimeter onboard ExoMars TGO measurements

- Dosimetric parameters in Mars orbit
- Data for assessment of the radiation risk to future human missions to Mars
  
  *(Semkova et al., 2020)*

**Liulin-type spectrometers (LTS)**

- Solar modulation of the long-term galactic cosmic rays (GCR) flux and dose rates variations, observed during 14 space experiments by 10 Bulgarian build Liulin-type spectrometers (LTS)
  
  *(Dachev et al., 2020)*

- Neutron dose measurements completed by the Bulgarian instruments outside the Zvezda module of the International Space Station (ISS)
Conferences

Solar Influences on the Magnetosphere, Ionosphere and Atmosphere
Primorsko, Bulgaria 2020

• Due to the coronavirus pandemia, the workshop was held online.
• 24 papers with a total of 76 authors from 11 countries are included in these Proceedings (http://ws-sozopol.stil.bas.bg/).

Space, Ecology, Safety – SES 2020
Sofia, Bulgaria 2020

• The conference was held online
• 58 papers with a total of 112 authors are included in these Proceedings (http://www.space.bas.bg)
Projects and catalogs

Catalogs Of Solar Energetic Protons And Flare Emission Signatures

- In situ detected solar energetic protons from the SOHO/ERNE instrument

SpreadFast Project

- Investigation a vital component of the Space Weather requirements of ESA’s Space Situational Awareness program by contributing to the capability to protect Agency assets from solar activity space radiation.
- Development of a prototype and various scientific aspects of a physics-based, operational heliospheric solar energetic particle (SEP) forecasting system. (https://spreadfast.astro.bas.bg/)
Croatian Activities in Space Weather and Solar Physics

International Space Weather Initiative (ISWI)

Dragan Roša and Filip Šterc
Zagreb Astronomical Observatory (ZAO)
- Focuses on interplanetary disturbances and their galactic cosmic ray imprints
- The study of morphology and kinematics of interplanetary coronal mass ejections (ICMEs) and solar wind high speed streams
- Active in the theoretical research of Solar differential rotation and Solar dynamo

Hvar Observatory
- Study properties of solar eruptions and interplanetary transients
- Impact of solar variability on Earth's climate
- Solar-terrestrial physics - propagation of solar wind disturbances (CME, CIR) and their space weather effects (geomagnetic storms, Forbush decreases), development and improvement of Drag-Based Ensemble Model (DBEM)
- Solar physics with ALMA: A comparison of small-scale ALMA features in quiet Sun and active regions with H-alpha, EUV, soft X-ray images and magnetograms. Development of theoretical models of solar radio emission at mm wavelengths and comparison with ALMA measurements
- Solar cycle prediction and reconstruction: A prediction of the amplitude of the 25th solar maximum with various methods. Test of the methods on the known data for the 24th solar cycle
- Solar rotation

Department of Physics of the University of Rijeka.
- research of Solar differential rotation and Solar dynamo

Geophysics department of the Faculty of Science at the University of Zagreb
- research on the response of the Earth's magnetosphere to different conditions at the Sun and in the interplanetary space
INSTRUMENTS

Zagreb Astronomical Observatory (ZAO)
Two instruments used for space weather research: one of the Space Environmental Viewing and Analysis Network (SEVAN) particle detectors and a Sudden Ionospheric Disturbance (SID) monitor

Hvar Observatory
Solar observations - double solar telescope on Hvar (H-α, white light)
ITALY - Main relevant ISWI Activities

National Coordinators: V. Romano (INGV), Y. Migoya-Orué (ICTP)

- Continuing efforts in Space Weather Education and Capacity-Building
  - SWICO Italian Association [www.swico.it](http://www.swico.it)
  - International School of Space Science (L'Aquila) [www.cifs-iss.org](http://www.cifs-iss.org)
  - African Workshop on GNSS and Space Weather (ICTP, BC, UNOOSA, CRASTE-LF) 5-6 Oct 2020 (online)

- New Instruments and Data Services for Space Weather
  - SWELTO [http://swelto.oato.inaf.it/](http://swelto.oato.inaf.it/)
  - New Scintillation receiver installed in Kenya and Cyprus (INGV)
  - ICTP Calibrated GNSS TEC Database Service: [https://arplsrv.ictp.it](https://arplsrv.ictp.it)
  - eSWua - electronic Space Weather upper atmosphere: [www.eswua.ingv.it](http://www.eswua.ingv.it)

- Main International Programmes and Projects
  - COSPAR PSW and ISWAT
  - UN-COPUOS
  - PECASUS
  - ESA SSA

- Next Activities (2021)
  - National Conference on Space Weather (September 2021)
  - New ionosonde in Lampedusa, Sicily and Scintillation receiver in Thule, Greenland
  - URSI GASS 2021 (28 Aug – 4 Sep)
Measurements of the solar radio spectra of the Sun in the range of 40 - 800 MHz from the CALLISTO spectrometer in Almaty are included in a common information system that displays real-time measurements with high resolution of the solar radio emission flux density at frequencies of 1.08 GHz and 2.8 GHz, data from a cosmic-ray station, data of magnetic observatory “Alma-Ata” and new cosmic ray station at Kazakh State University.

Kazakhstan Space Weather Prediction Center works daily. We issue the short-term and long-term forecasts of the magnetic activities (Ap-indexes) and solar activity (F10.7) for 55 days, the forecast of probability of a large proton enhancement for 28 days and the forecast of fluence of magnetospheric electrons with energy> 2 MeV at geostationary orbit for 28 days. We provide this information to all interested organizations in Kazakhstan.
International Space Weather Initiatives

Annual Meeting -2020
National Coordinator(Nepal)

Associate Prof. Dr. Krishna Prasad Bhandari
• New Programme M.Sc. I Geospatial Engineering started from this year in Pashchimanchal Campus, Tribhuvan University introducing the space weather topics in this programme.
• MoU between Center for Space Science and Geomatics studies and The Tokyo university to establish COR station establishment.
• Planning for next year summer school (space weather and GNNS collaboration with Tokyo University)
School on Space and Atmospheric Physics
August 5-7, 2020

Jointly Organized by
Department of Physics, St. Xavier’s College, Kathmandu, Nepal
Universidade do Vale do Paraiba, Brazil

Background of the School:
The development of space and atmospheric science has resulted in new scientific knowledge and innovation. In this regard, the expansion of higher education would be aimed to create scientific society which enables to generate dependable technologies in the field of space and atmospheric science to support the need of nations. The purpose of this workshop is to develop and strengthen the space and atmospheric sciences in our nations.

Objectives of the School:
1. Conduct national and international virtual classes for sharing of knowledge and skills among students and researchers.
2. Discuss the status, challenges and opportunities on space and atmospheric sciences.

Who can participate?
1) Undergraduate and Graduate students
2) Faculty members
3) National and International researchers

Contact:
Email: physics@ssx.edu.np
Phone: +977-9851154865, 9843492311, 9841366132

Last date of registration: August 2nd, 2020
Online registration link: https://docs.google.com/forms/d/1QeE5QzDH9MHY9xS0sN3VRGx9zm7JH6Ztmzg3Uii8v/edit

Resource Persons:
- Dr. Virginia Klausner
  Assistant Professor, Unival - Universidade do Vale do Paraiba, Brazil
- Dr. Khem Poudyal
  Professor, Institute of Engineering (IOE), Tribhuvan University, Nepal
- Dr. Sheeram Sharma
  Assistant Professor, Amrit Campus, Tribhuvan University, Nepal
- Dr. Binod Adhikari
  Assistant Professor, St. Xavier’s College, Majuchha, Kathmandu, Nepal

Contributed by
Dr. Narayan Chapagain
Nepal
ISWI in Slovakia, NC: Ivan Dorotovič

Instruments:
1. **CALLISTO** in the Slovak Central Observatory in Hurbanovo
   - operational since **December 2011**
   - [Link](http://newserver.stil.bas.bg/SUNGEO/00SGArhiv/SG_v9_No1_2014-pp-105-107.pdf)
   - Data available at: [http://soleil.i4ds.ch/solarradio/callistoQuicklooks/](http://soleil.i4ds.ch/solarradio/callistoQuicklooks/)

2. **SEVAN** in the Department of Space Physics of the IEP SAS, Lomnicky Peak Observatory
   - operational since **March 2014**
   - Data available at: [http://crd.yerphi.am/Lomnicky_stit_SEVAN_Data](http://crd.yerphi.am/Lomnicky_stit_SEVAN_Data)

Events:
National Solar Physics Meetings (NSPMs)
- 25th NSPM in October 2020, online from Hurbanovo
- contributions on space weather events and studies as well

[http://stara.suh.sk/id/iswi/summer_school](http://stara.suh.sk/id/iswi/summer_school)
Ionospheric analysis via ELF-VLF waves
Hassen Ghalila
hassen.ghalila@gmail.com, hassen.ghalila@fst.utm.tn

Equipment
- AWESOME receiver
- SID and superSID receivers

Signals and data Analyses
- Software developments
- LWPC
- Tweeks
- SIDs

Applications
- GiganticJet & BlueJet
- Sidereal
- Solar Eclipse
- Lightnigs & Thunderstorms
- Solar Flares

Future installations
- New receivers
  - Radio Jove
  - VLF

Team
- Currently we are two
- The group is expected to enlarge to five

References
- A. Ammar et al., Advances in Space Research 66 (2020) 2528–2536
- A. Ammar et al., Acta Geophys. 64, 2794–2809 (2016)
- S. NaitAmor et al., JGR Space Physics, 122,1 (2016)
- S. NaitAmor et al., JGR Space Physics, 118,8 (2013)
PHD students: Mrs. A. C. Umuhire (Characterization of coronal mass ejections using solar radio bursts) & Mr. T. Ndacyayisenga (Global Modeling of the ionosphere based on Multi-Satellite data).

2 Published papers:

CALLISTO Rwanda: Callisto Spectrometer currently not operational following lighting strike. Strategies for repairing in progress.


Rwanda Space Agency (RSA): Established in 2020 and we expect good collaboration with the agency to promote ISWI activities.
GIRGEA scientific network (1991-today) / www.girgea.org

Capacity building

Presented by Christine Amory
Pape Abdoulaye BARRO defended his PhD, on August 5, at the University of Abomey-Calavi (UAC), the Abdus Salam International Center for Theoretical Physics (ICTP), in the field: "Information Technology and Communication (ICT) Contributions for sustainable, smart and future Internet-based (IoT) cities for developing countries."

from left to right : Mr. Théophile K. DAGBA, Mr. Léonard TODJIHOUNDE, Mr. Jules DEGILA, Dr. Pape Abdoulaye BARRO, Mr. Eugène C. EZIN, Mr. Marc K. ASSOGBA.

ISWI coordinator : Dr Joseph Adechinan
Pétronille KAFANDO from the University of Ouagadougou in Burkina Faso, defended her state thesis at the Félix Houphouët Boigny University in Abidjan on August 19, 2020, on the theme: « Gravity waves in the lower equatorial and tropical stratosphere of West Africa ». Project AMMA

From left to right Prof. Arsène T. KOBEA (thesis director), Prof. Jules Abodou TENON (President), Dr P. KAFANDO and Prof. Delfin OCHOU examiner).
CÔTE d’IVOIRE

Ministère de l’Enseignement Supérieur et de la Recherche Scientifique - CI

A. KOBÉA :
2000 : State Thesis
2020 : Director of the cabinet of the Minister Of HIGHER EDUCATION

V. DOUMBIA:
2008 : State Thesis
General director Of HIGHER EDUCATION

Next school of the GIRGEA IMAO_5 in Côte d’Ivoire : October 2022

ISWI Coordinator : Vafi DOUMBIA
René Tato LOUA defended his thesis, in atmospheric physics, at the University of Réunion, June 24, 2020. The title of his thesis is: "Variability and trends of meteorological parameters in Guinea: analysis of forcings by digital methods".

From left to right: Prof. G. PENNOBER (President of the jury), Mr. René Tato LOUA (the candidate), Dr. N. BEGUE and Prof. EL HASSAN BENCHERIF.NB: the other members of the jury followed the defense by video conference.

ISWI Coordinator : Dr René Tato LOUA
Raphaël MUKANDILA defended his thesis on September 30, 2020 at the University of Strasbourg, on the theme: « Analysis of GNSS data from the African continent from 1994 to 2017: Characterization of tectonic movement and deformation ».

From left to right, Pierre Briole, Olivier Dauteuil, the President of the Jury, Mustapha Meghraoui and the Thesis Director, Frédéric Masson.

DRC

Dr Jean KIGOTSI has been promoted Associate Professor in 2020 at the University of Kinshasa, DRC
Dr. Jean KIGOTSI defended his thesis on November 1, 2017 at the University of Kinshasa UNIKIN, on the theme: 'Analysis of the flash activity of storm systems in the Congo Basin'
3 new Positions

CÔTE D’IVOIRE

Dr Franck GRODJI was recruited, in 2020, at the grade of Assistant at the University of Houpouët Boigny, Abidjan. Dr Franck GRODGI defended his thesis on June 30, 2018 at Houpouët Boigny University in Abidjan, Côte d'Ivoire. The theme of his thesis is: "Study of the Equatorial Electrojet from the electrodynamical parameters of the equatorial ionosphere".

MOROCCO

Dr Mohamed KAAB was recruited, in 2020, as an assistant professor of higher education at the national school of applied sciences, ENSA, of Béni Mellal in Morocco. He defended his PhD thesis on November 30, 2019 on the theme: « Exploration of thermospheric-ionospheric coupling via optical instruments: RENOIR experiment ».

TUNISIA

Dr Ahmed AMMAR was recruited, in 2020, at the grade of Assistant at the University of Carthage, and assigned to IPEST - Preparatory Institute for Scientific and Technical Studies. Dr. Ahmed AMMAR defended his thesis on the ‘Study of ionospheric disturbances through VLF waves’ on November 30, 2017 at the University of Tunis El Manar