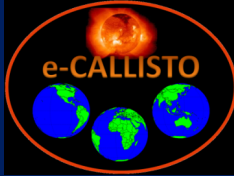




ISWI Instrument Updates

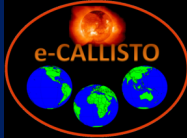
Presented at the ISWI Steering Committee Meeting

February 19, 2021

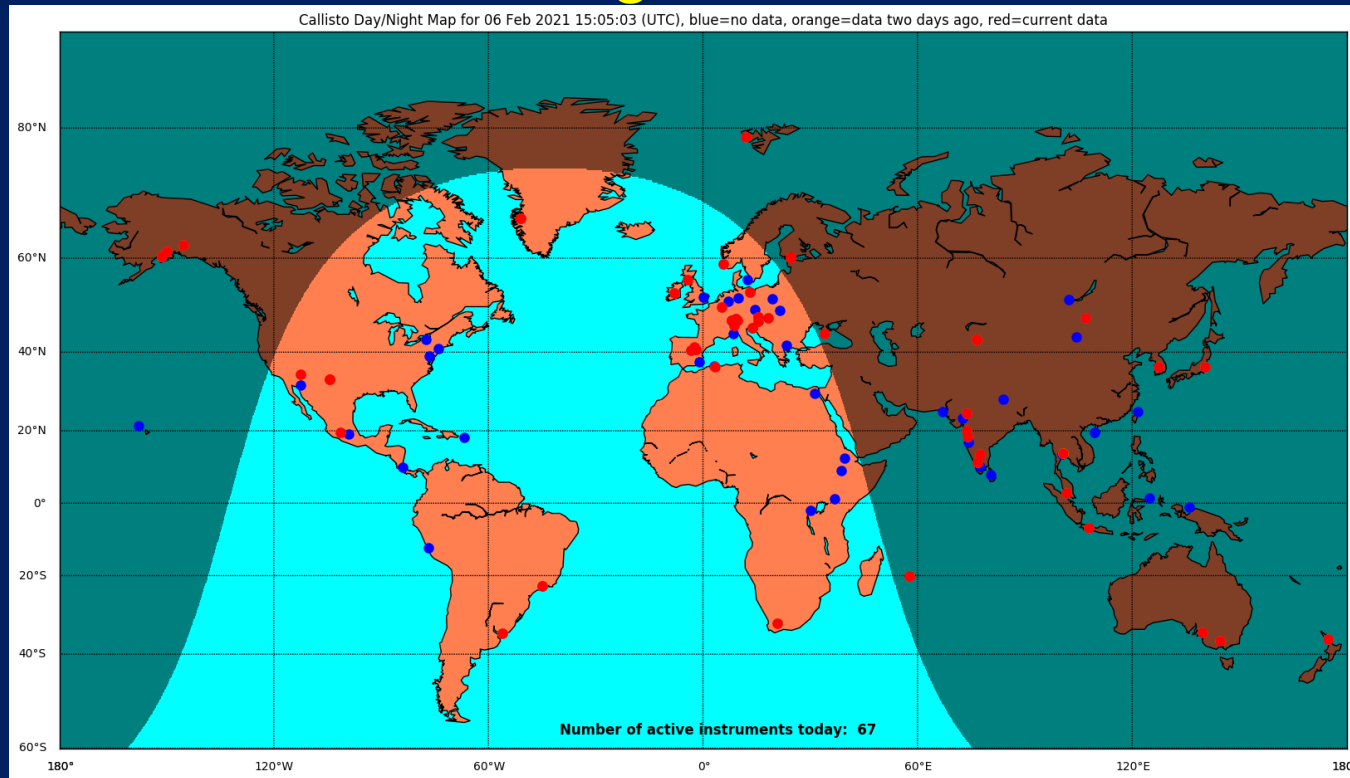


ISWI Progress Report “CALLISTO and The e-Callisto network”

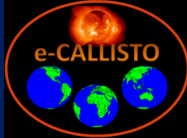
Christian Andreas Monstein
Senior Radio Engineer
8807 Freienbach
Switzerland



Current coverage, Instrument status



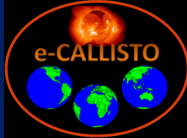
<http://e-callisto.org/>



New Instruments 2020



Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR)
Institut für Solar-Terrestrische Physik, Neustrelitz, Germany

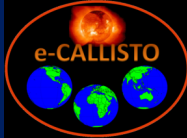


New Instruments 2020



Interferometer Kodaikanal, India

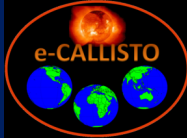




New Instruments/upgrades 2020

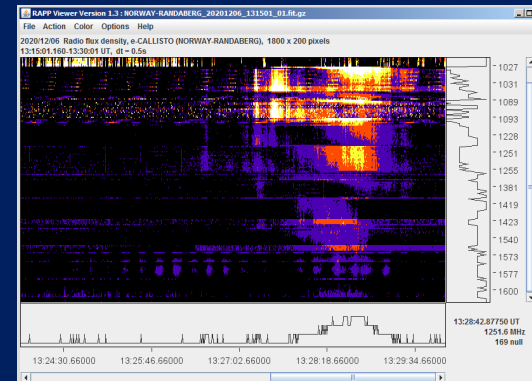
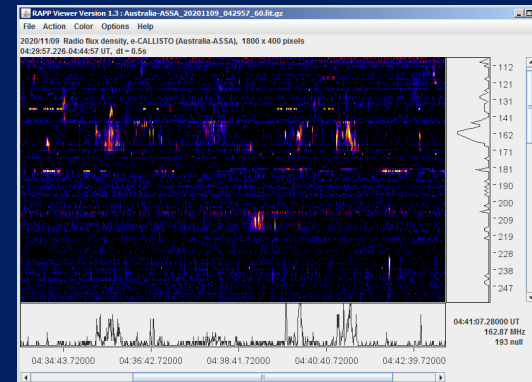
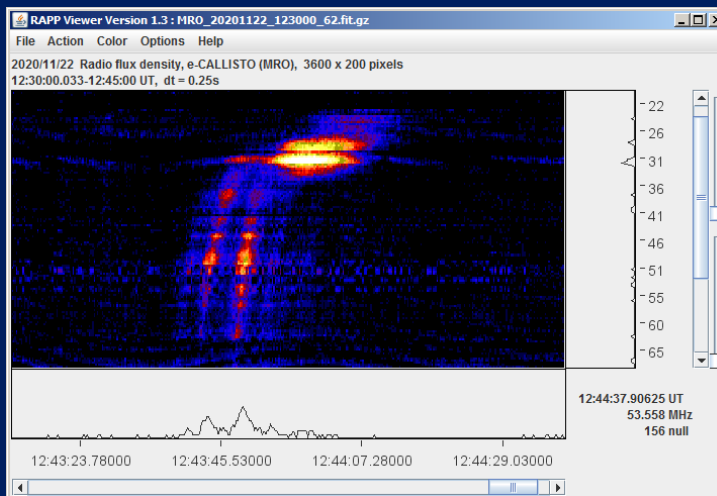
Sigüenza, Spain
Peralejos, Spain
Alcala, Spain →
ASSA, Australia
TRIEST, Italy
Angkasa, Malaysia

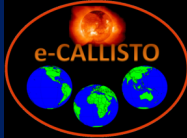




light observations 2020

ASSA-Australia noise storm
MRO-Finland type III below left
Norway synchrotron radiation below right

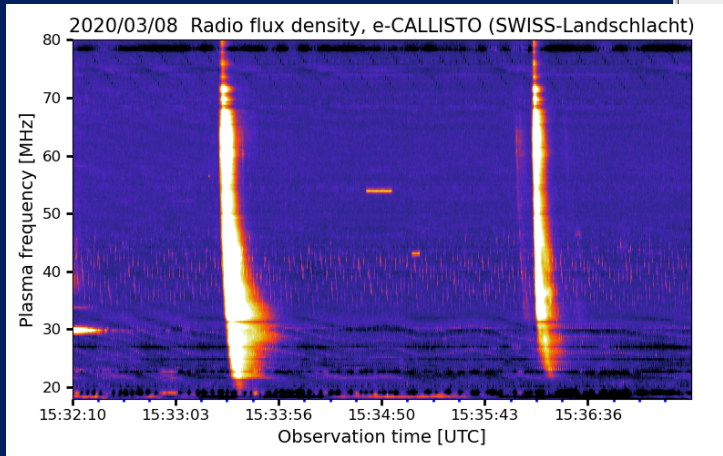
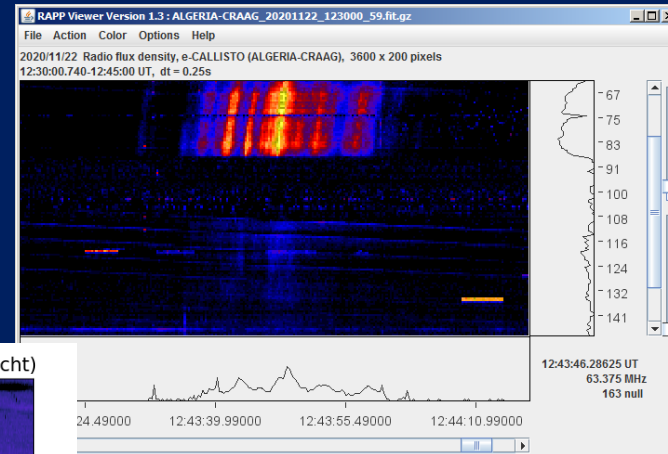


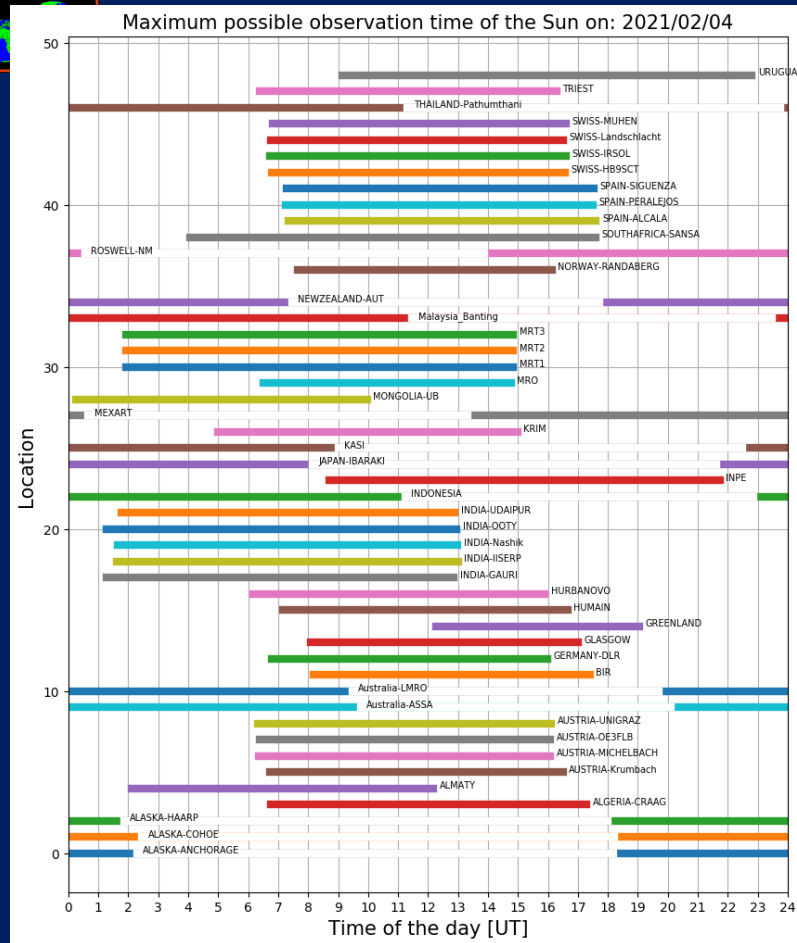
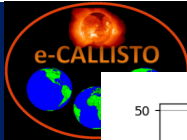


⊥ light observations 2020

CRAAG, Bourmerdes, Algeria ->

SWISS-Landschlacht below

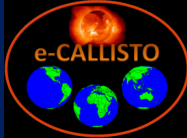




New Feature 2020

Observation time per host location

<http://e-callisto.org/documents.html>



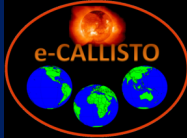
ow Feature 2020



Burst list

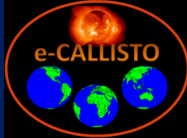
20201203	00:42-03:45	CTM	Australia-ASSA
20201204	01:25-05:36	CTM	Australia-ASSA
20201204	09:37-09:37	III	MRT1, SWISS-Landschlacht
20201204	10:52-10:52	III	BIR, GLASGOW, HUMAIN, INDIA-OOTY, MRT1, SWISS-Landschlacht, TRIEST
20201204	11:24-11:24	III	BIR, GLASGOW, MRT1, SWISS-Landschlacht
20201205	05:05-09:00	CTM	KRIM
20201205	12:20-12:21	III	BIR, GLASGOW, SWISS-Landschlacht
20201205	12:42-12:42	III	GLASGOW
20201206	13:26-13:29	DCIM	NORWAY-RANDABERG, SOUTHAFRICA-SANSA, SWISS-BLEN7M
20201207	15:50-16:59	DCIM	SOUTHAFRICA-SANSA
20201208	##:## #:##		
20201209	##:## #:##		
20201210	##:## #:##		
20201211	##:## #:##		
20201212	##:## #:##		
20201213	08:12-08:12	III	ALMATY, AUSTRIA-UNIGRAZ, INDIA-GAURI, INDIA-OOTY, INDIA-UDAIPUR
20201214	14:36-14:46	II	AUSTRIA-UNIGRAZ, BIR, HUMAIN, SWISS-Landschlacht
20201215	##:## #:##		
20201216	##:## #:##		

http://soleil.i4ds.ch/solarradio/data/BurstLists/2010-yyyy_Monstein/



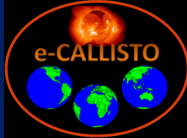
Plans 2021 if COVID-19 allows

- Installation low frequency spectro polarimeter Prof. Ayman M. Mahrous
Professor of Space Weather and Environment
Institute of Basic and Applied Science
Egypt-Japan University of Science and Technology (E-JUST)
New Borg El-Arab City, Alexandria, Egypt
- Installation low frequency spectro polarimeter Prof R Du Toit Strauss
Associate Professor, Center for Space Research
North-West University (Potchefstroom Campus)
11 Hoffman Street, Potchefstroom, South Africa
- RFQ IIA



Workshops, Training 2020

- COSPAR 2020 workshop Kodaikanal, India
https://www.iiap.res.in/COSPAR_KSO2020/
- Small Callisto-related workshop with Janaka Adassuriya at Astronomy Division, Arthur C Clarke Institute Katubedda, Moratuwa, Sri Lanka
- > March 14: Lockdown and home-office ...



Callisto related papers 2020

Increase in Interference Levels in the 45–870 MHz Band at the Spanish e-CALLISTO Sites over the Years 2012 and 2019

M Prieto, JB Gordo, J Rodríguez-Pacheco, A Martínez, S Sánchez, ...
Solar Physics 295 (2), 11

Investigation into CME Shock Speed Resulting from Type II Solar Radio Bursts

FAM Pauzi, ZZ Abidin, SJ Guo, GN Gao, L Dong, C Monstein
Solar Physics 295 (3), 1-14

Data background levels of the metre and decimetre wavelength observations by E-CALLISTO network: the Gauribidanur and Greenland sites

WZAW Mokhtar, ZS Hamidi, ZZ Abidin, ZA Ibrahim, C Monstein
Indian Journal of Physics, 1-10

A Statistical Study of Low-Frequency Solar Radio Type III Bursts

A Mahender, KS Raja, R Ramesh, V Panditi, C Monstein, Y Ganji
Solar Physics 295 (11), 1-10

A statistical study of solar radio Type III bursts and space weather implication

T Ndacayisenga, J Uwamahoro, KS Raja, C Monstein
Advances in Space Research



AOB

All Callisto instruments are now registered at ITU as Space Weather Sensor Systems here:

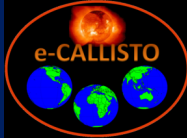
<https://www.itu.int/pub/R-REP-RS.2456-2019>

and here:

https://www.itu.int/dms_pub/itu-r/opb/rep/R-REP-RS.2456-2019-PDF-E.pdf

Problems:

- Network not sustainable because of missing permanent people who can take care.
Students assigned to an instrument often leave the institute without transferring their experience and know how
- Cannot apply for funding ...



Additional information:

<http://e-callisto.org>



Callisto is no more an ETH activity...

The PI Christian Monstein has retired.
But all Callisto related activities will be
continued by Christian as a private
person, even without funding at
IRSOL

ISWI Instrument & Data Product Updates (1/2)

Instrument name: **CALLISTO**

PI: Please indicate changes

Tech Lead/POC: Please indicate changes

Science objectives: Please indicate changes

Measurement objectives: Please indicate changes

Science Activity Updates

Increase in Interference Levels in the 45–870 MHz Band at the Spanish e-CALLISTO Sites over the Years 2012 and 2019, M Prieto, JB Gordo, J Rodriguez-Pacheco, A Martínez, S Sánchez, ...
Solar Physics 295 (2), 11

Investigation into CME Shock Speed Resulting from Type II Solar Radio Bursts
FAM Pauzi, ZZ Abidin, SJ Guo, GN Gao, L Dong, C Monstein
Solar Physics 295 (3), 1-14

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WZAW Mokhtar, ZS Hamidi, ZZ Abidin, ZA Ibrahim, C Monstein
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A Statistical Study of Low-Frequency Solar Radio Type III Bursts
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Solar Physics 295 (11), 1-10

A statistical study of solar radio Type III bursts and space weather implication
T Ndayisenga, J Uwamahoro, KS Raja, C Monstein
Advances in Space Research

Instrument and Data Product Updates

Instrument updates: New instruments delivered to:
Bangkok Thailand, IIA Bangalore India, Ibaraki university Japan, North-West
University South Africa. All not operational yet!
DLR, Germany operational in L-band 1000 MHz – 1600 MHz

Station updates: Several upgrades (antenna) in Sigüenza Spain, Alcala Spain,
ASSA Australia, Trieste Italy and ANGKASA Malaysia

Data product updates: Daily maximum observation time for each active
instrument

<http://e-callisto.org/documents.html>

Burst list in progress here:

http://soleil.i4ds.ch/solarradio/data/BurstLists/2010-yyyy_Monstein/2021/

Capacity Building Activity Updates

COSPAR 2020 workshop Kodaikanal, India
https://www.iiap.res.in/COSPAR_KSO2020/

Small Callisto-related workshop with Janaka
Adassuriya at Astronomy Division
Arthur C Clarke Institute
Katubedda, Moratuwa, Sri Lanka

ISWI Instrument & Data Product Updates (2/2)

- Activities started to replace 20-years old IDL-scripts by Python-scripts at central server level to produce quick views out of dynamic radio spectra.
- Feb. 2021 ASSA successfully commissioned a low frequency spectro polarimeter at Middleton, South Australia 15-87 MHz.
- Feb. 2021 Geo-Informatics and Space Technology Development Agency (GISTDA) in Pathumthani, Thailand operational 45-870 MHz.

ISWI Instrument & Data Product Updates (1/1)

Instrument name: **GIFDS**
 Global Ionospheric Flare Detection System

PI: Dr. Norbert Jakowski and Dr. Daniela Banyś
 (German Aerospace Center – DLR)

Tech Lead/POC: Dr. Daniela Banyś

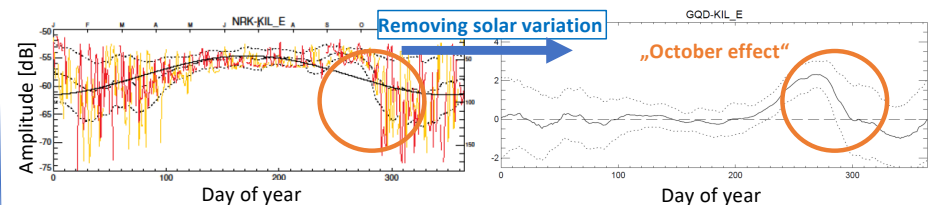
Science objectives: To issue warnings for mitigating space weather impact on sensitive technologies

Measurement objectives: 1Hz VLF amplitude and phase measurements

Science Activity Updates

Joint project: AMELIE - Analysis of the MEsosphere and Lower Ionosphere fall Effect
 (DLR Neustrelitz + IAP Kühlungsborn)

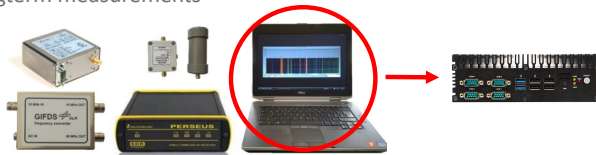
Data/Models: VLF (GIFDS, AARDDVARK, SAVNET), WACCM-X + D, LWPC, FIRI, etc.



Macotella et al. (2021) in preparation (presented at VERSIM 2020 and EGU 2021)

Instrument and Data Product Updates

Instrument updates: All station laptops will be replaced by an industrial PC in order to ensure longterm measurements



Data product updates: no updates

Station updates: no updates

Under construction: ●

- Hermanus, SANSA
- Fortaleza, Brazil

Planned for 2021/22: ●

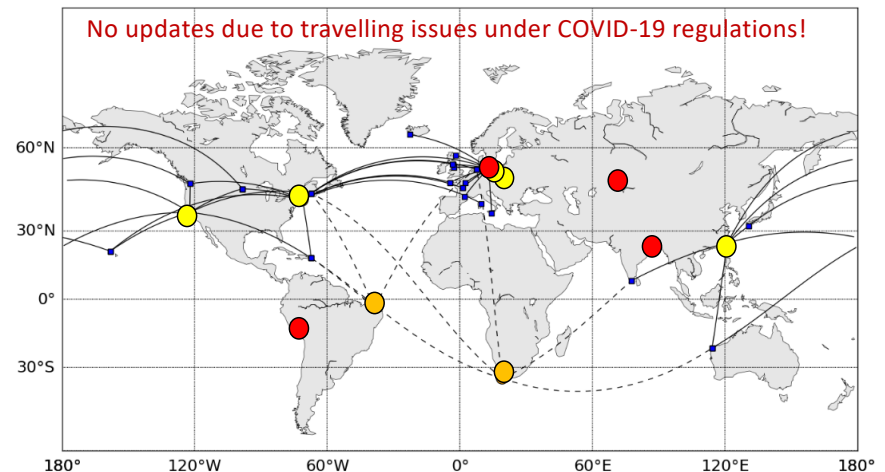
- Rostock, Germany
- Kolkata, India
- Peru
- Kazakhstan

GIFDS receiving sites: ●

- DLR Neustrelitz
- Boston College
- PAN Krakow
- Stanford University
- NCU Taiwan

Capacity Building Activity Updates

No updates due to travelling issues under COVID-19 regulations!



ISWI Instrument & Data Product Updates (1/1)

Instrument name: **Optical Mesosphere Thermosphere Imagers (OMTIs)**

PI: **Kazuo Shiokawa**

Tech Lead/POC: N/A

Science objectives: **To understand dynamical variation of the Earth's upper atmosphere**

Measurement objectives: **Imaging of the mesosphere and the thermosphere**

Science Activity Updates

- Takeo et al. (JGR, 2017) and Tsuchiya et al. (JGR, 2018; 2019; 2020) studied variation of horizontal phase velocity and propagation direction of **mesospheric AGWs and thermospheric MSTIDs** in airglow images observed by an airglow imager at **Shigaraki and Rikubetsu (Japan), Athabasca (Canada), and Magadan (Russia) over 10-16 years**. We show yearly and seasonal variations of AGW and MSTID propagation characteristics.
- Narayanan et al. (JGR, 2018) studied conjugate observation of nighttime EMSTIDs in Japan and Australia using airglow imagers, FPIs and ionosondes. The result reveals that the **sporadic-E layer is the main controlling factor and the F-region Perkins instability plays additional role** to generate nightside EMSTIDs.
- Moral et al. (JGR, 2019) showed comparison of equatorial MSTID observed by 630-nm airglow image with CHAMP neutral density over Indonesia and concluded that **this equatorial MSTID is caused by secondary AGW in the thermosphere**.

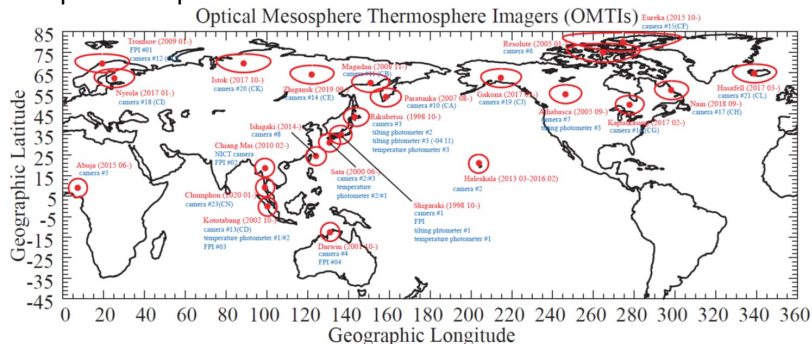
Full references are available at <http://stdb2.stelab.nagoya-u.ac.jp/member/shiokawa/ref.html>

Instrument and Data Product Updates

Instrument and station updates: Current site map and instruments are shown as below.

<http://stdb2.isee.nagoya-u.ac.jp/omti/>

Data product updates: CDF Data are available via ERG Science Center



Capacity Building Activity Updates

- PWING-ERG School will be held on March 8-9, 2021 via online. At the school, seven lecturers will introduce ground-based and satellite measurements and modeling of the inner magnetosphere. Details of the school are available at <https://is.isee.nagoya-u.ac.jp/pwing-erg/>. Registration is still possible.
- A new JSPS core-to-core program (B: Asia-Africa Platforms) has been approved and will start from April 2021 for three years to support capacity building activities in some Asian and African countries.

ISWI Instrument & Data Product Updates (1/2)

Instrument name: **Realistic Ionosphere (RION)** -- change of abbreviation

PIs: **Prof. Ivan Galkin, Prof. Bodo Reinisch, UMass Lowell**

Tech Lead/POC: **Ivan_Galkin@uml.edu**

Science objectives: **Nowcast and forecast of 3D global plasma density in the subpeak ionosphere**

Measurement objectives: **Coordinated, prompt, and accurate specification of ionosphere using ionosondes**

Science Activity Updates

Data fusion: Collaboration of GIRO and IGS for coordinated ionospheric weather nowcast using ionosondes and GNSS VTEC products.

TID impact assessment: comparison of HF-TID detections with impact on operational system as reported by others (4 year project concluded in 2020)

Data Assimilation: NECTAR system for RION

Storm Studies: <http://giro.uml.edu/GAMBIT/2020-Sep-27-storm.html>

Instrument and Data Product Updates

Instrument updates: **Next generation ionosonde models: DPS-5 (Lowell), Raduga (Moscow), PIRI (Penn State), low-cost (Norway)**

Station updates: **25 new GIRO locations since 2018, including 10 Australian and 10 Russian observatories**

Data product updates:

- **TechTIDE traveling disturbance alerts (Pan-European)**
- **GAMBIT slab-thickness and MUF(3000) global maps**
- **GPU-enabled online oblique ionogram synthesizer**

Capacity Building Activity Updates

COSPAR capacity building workshops:

IRI workshop, Nicosia, Cyprus, September 2-13, 2019

Student training: ionospheric weather modeling

ISWI Instrument & Data Product Updates (2/2)

REFERENCES:

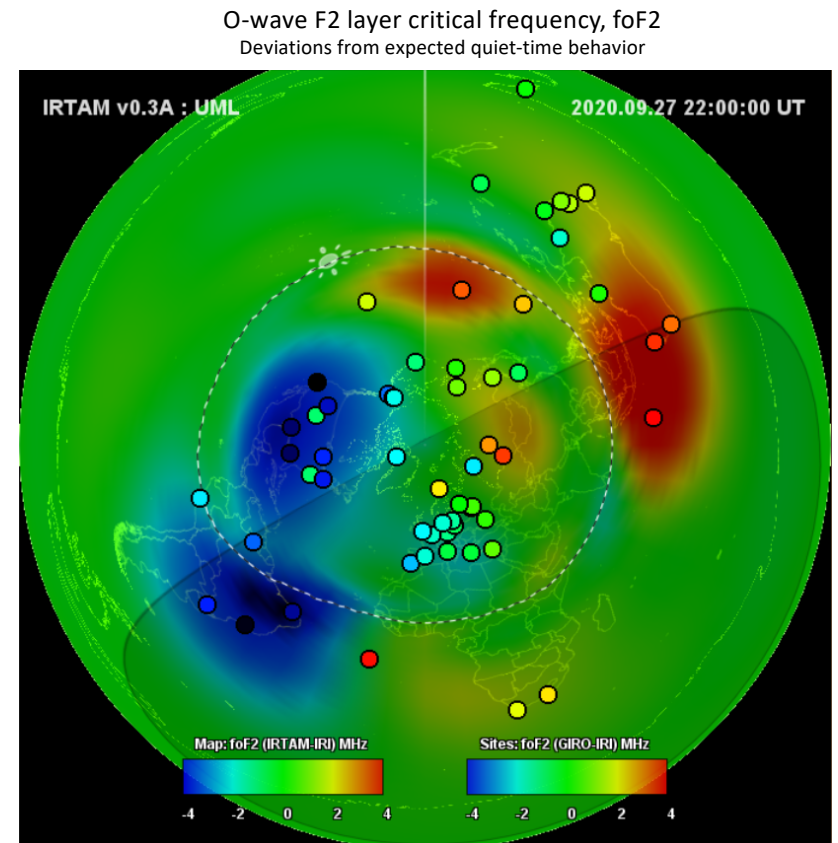
Galkin, I. A., B. W. Reinisch, A. Vesnin, et al., (2020) Assimilation of Sparse Continuous Near-Earth Weather Measurements by NECTAR Model Morphing, *Space Weather*, 18, e2020SW002463, doi:10.1029/2020SW002463 .

Belehaki A., Tsagouri I., Altadill D., Blanch E., Borries C., Buresova D., Chum J., et al. (2020), An overview of methodologies for real-time detection, characterisation and tracking of traveling ionospheric disturbances developed in the TechTIDE project, *JSWSC*, 10(42), doi:10.1051/swsc/2020043

Froń, A., I.A. Galkin, A. Krankowski, et al. (2020), Towards Cooperative Global Mapping of the Ionosphere: Fusion Feasibility for IGS and IRI with Global Climate VTEC Maps. *Remote Sens.* 12, doi: 10.3390/rs12213531.

Altadill D., Segarra A., Blanch E., Juan J.M., Paznukhov V.V., Buresova D., Galkin I.A., et al. (2020), A method for real-time identification and tracking of traveling ionospheric disturbances using ionosonde data: first results, *JSWSC*, 10(2), doi:10.1051/swsc/2019042

Venkatesh, K., Patra, A. K., & Reinisch, B. W. (2020). F_3 layer characteristics revealed by the Jicamarca incoherent scatter radar: First results. *Journal of Geophysical Research: Space Physics*, 125, e2020JA028082, doi:10.1029/2020JA028082



Color surface: IRTAM weather-minus-climate map of ionosphere
Color dots: deviation of measurement from climate model at GIRO sites

ISWI Instrument & Data Product Updates (1/1)

Instrument name: **SCINDA**

PI: Keith Groves

Tech Lead/POC: Keith Groves

Science objectives: Investigate low latitude ionospheric irregularities and their impacts on radio wave propagation

Measurement objectives: Monitor signals from radio beacon satellites and GNSS

Science Activity Updates

Recent science activities have focused on understanding the 3D distribution of turbulence in equatorial bubbles and associated correlation lengths and departure from uniformity, particularly as a function of altitude. These studies utilize a combination of ground-based SCINDA observations in conjunction with space-based radio occultation measurements from COSMIC-2.

Instrument and Data Product Updates

Instrument updates: SCINDA has continued without a sensor refresh for nearly 10 years. We will begin testing new GNSS receivers for suitability in the SCINDA network in 2021 and plan to deploy at least three for demonstration in 2022. We expect to deploy more thereafter along with VHF scintillation receivers where possible.

Station updates: Initially the new sensors will be deployed in South America; Africa and Asia will follow.

Data product updates: A key new product will be the true utilization of GNSS constellations to expand measurement opportunities three-fold relative to GPS-only.

Capacity Building Activity Updates

The SCINDA program now has resources to invest in new sensors, more robust infrastructure and more reliable installations. We will be developing and demonstrating improved technologies over the next two years (2021-22) in the American sector and look to expand to other sectors thereafter.

We expect to focus on Africa and Asia/Oceania after a successful demonstration of new capabilities.

ISWI Instrument & Data Product Updates (1/1)

Instrument name: Solar Flares detected by Ionospheric Effects (**SOFIE**)

PI: *Dr. Norbert Jakowski* (German Aerospace Center (DLR), Neustrelitz)

Tech Lead/POC: Alexander Kasten (DLR, Neustrelitz)

Science objectives: Detection of solar flares

Measurement objectives: measuring continuously the intensity of VLF radio signals considering ionospheric propagation effects on radio waves, detecting solar flare effects in the VLF signals.

Science Activity Updates

- Development of a guide for students grade 9/10
 - Which includes
 - a space weather compendium
 - 6 experiments, concentrating on data processing

Instrument and Data Product Updates

Instrument updates: na

Station updates:

- Server upgrade
- Planning of new stations in Italy, Egypt, Bangladesh, Australia
- Hardware upgrade in Huntsville (AL,USA) and Hermanus (ZA)
- Upgrading of all receivers for near real time data reception
- Going to upgrade the main station in Neustrelitz
 - Adding 24/7 optical observation of sun through telescope

Data product updates: na

Capacity Building Activity Updates

- Participation in a new myon-detector network (muonpi.org)
- Cooperation with University of Rostock for preparing lectures about space weather for 9/10 grade

ISWI Instrument : AFINSA

Instrument name: AFINSA

PI: Jean-Pierre Raulin (no changes)

Tech Lead/POC: José Carlos Tacza Anaya (no changes)

Science objectives: Interconnection between Space Weather dynamics and the Earth surface: The role of the Global Atmospheric Electric Field (GAEC)

Measurement objectives: Atmospheric Electric Field measurements (V/m) over South America on different timescales (monthly, seasonal, annual), and comparison with the “Universal” Carnegie curve

Science Activity Updates

- Local and global effects on the diurnal variation of the atmospheric electric field in South America by comparison with the Carnegie Curve (Tacza, Raulin, Macotella et al., AR, 240 (2020) 104938)
- Analysis of long-term potential gradient variations measured in the Argentinian Andes (Tacza, Raulin, Morales et al., AR, 248 (2021) 105200)
- Estimation of thunderstorms occurrence from lightning clusters recorded by WWLLN and its comparison with the Carnegie Curve (Ccopa, Tacza, Raulin, JASTP, 2021)
- Analysis of the variability in the atmospheric electric field and natural gamma radiation for different weather conditions (Oliveira, Tacza, Raulin et al., JASTP, 2021)

Instrument and Data Product Updates

Instrument updates: 2 new stations in São Paulo and Atibaia, SP, Brazil

Station updates: no update

Data product updates: no update

Capacity Building Activity Updates

- XXXII week of engineering. Engineering School of the Presbyterian Mackenzie University, 2020
- How and why measuring the Atmospheric Electric Field ? University Center, Faculties of Atibaia (UNIFAAT), at Radio Observatory Pierre Kaufmann (ROPK), 2020

ISWI Instrument & Data Product Updates (1/2)

Instrument name: **CHAIN** (Continuous H-Alpha Imaging Network)

PI: Kazunari SHIBATA => **Kiyoshi ICHIMOTO**
Satoru UeNo (Continuation)

Tech Lead/POC:

Science objectives:

Measurement objectives:

Science Activity Updates

As the result of our capacity building, Peruvian young researchers published the following scientific papers using our instruments:

- Gutierrez M.V., et al., 2021, PASJ, accepted.
- Cabezas D.P., 2020, Doctoral Thesis (Kyoto Univ.)
- Cabezas D.P., et al., 2019, Astrophysical Journal, 883, 32
- Cabezas D.P., et al., 2017, Astrophysical Journal, 836, 33

On the other hand, Japanese researchers also published some scientific papers as follows:

- Seki D., et al., 2019, Sun and Geosphere, 14, 93
- Seki D., et al., 2019, PASJ, 71, 56
- Seki D., et al., 2018, Sun and Geosphere, 13, 157
- Ichimoto K., et al., 2017, Solar Physics, 292, 63
- Seki D., et al., 2017, Astrophysical Journal, 843, L24

Instrument and Data Product Updates

Instrument updates: In the Peru station, we are developing spectroheliograph in order to detect larger Doppler-shift event (high-speed filament eruption) than the existing Flare Monitoring Telescope (filtergraph) can detect. On the other hand, in the Japan station (Hida Observatory), we already installed a quite wide-range tunable filter on the SMART telescope for the same purpose in 2016.

Station updates:

Data product updates:

Capacity Building Activity Updates

- In 2020 Jan., we invited a Peruvian young student to Japan and held a data-analysis meeting and made her present her studies at an international symposium.
- In 2020 Feb., a Peruvian student got his Doctoral degree at Kyoto University, Japan.
- In 2020 Mar., Prof. Ichimoto and UeNo held lectures in Ica, Peru.
- In 2019, Feb., we invited two Peruvian young students and a Saudi Arabian researcher to Japan and held a data-analysis workshop in Kyoto.

ISWI Instrument & Data Product Updates (2/2)

- Continuation of Instrument and Data Product Updates (if needed)
We continue to obtain solar multi-wavelength H-alpha imaging data in Japan, Peru and Saudi Arabia.
- Continuation of Science Activity Updates (if needed)
We continue to promote scientific cooperative researches between Japan and Peru, Saudi Arabia by concluding agreements between each university.
- Continuation of Capacity Building Activity Updates (if needed)
We continue to support especially Peruvian young researchers and students to study solar physics and space weather and support them to study abroad to Japan.
Moreover, we continue to develop new instruments for solar observation in Peru and Saudi Arabia.
- References

ISWI Instrument & Data Product Updates (1/1)

Instrument name: **GMDN**e.g., AWESOME

PI: **Chihiro Kato**Please indicate changes

Tech Lead/POC: No changePlease indicate changes

Science objectives: No change Please indicate changes

Measurement objectives: No changePlease indicate changes

Science Activity Updates

Kihara,et al., A Peculiar ICME Event in August 2018 Observed with the Global Muon Detector Network, Space Weather, 2021 accepted <http://arxiv.org/abs/2101.12009>

Kato, et al., New cosmic ray observations at Syowa Station in the Antarctic for space weather study, JSWSC, 2021, accepted <http://arxiv.org/abs/2101.09887>

Instrument and Data Product Updates

Instrument updates: No change

Station updates: No change

Data product updates: Data collection is continued

Capacity Building Activity Updates

ISWI Instrument & Data Product Updates (1/2)

Instrument name: **MAGDAS**

PI: Prof. Akimasa Yoshikawa

Tech Lead/POC: Dr. Shuji Abe, Dr. Teiji Uozumi

Science objectives: To understand the electromagnetic and plasma environment changes in the geospace, especially 3-D structure of equatorial electrojet (EEJ).

Measurement objectives: Global observation of ground magnetic field and ionospheric disturbances for the above science objectives.

Science Activity Updates

Number of published papers related on MAGDAS is 72 between 2017 and 2019.

Instrument and Data Product Updates

Instrument updates: We acquired four new magnetometers in 2020. We plan to install them Egypt and Russia after next fiscal year.

Station updates: We installed three magnetometer at Johor Bahru, Terengganu, and Ranau(Malaysia) in 2017, one new FM-CW station at Sicaya(Peru) in 2018, and two new magnetometer at Zaoh(Japan), Penang(Malaysia) in 2019. We also continue to maintain the existing instruments.

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Capacity Building Activity Updates

We held the National School on Space Weather and Electromagnetism (NSoSEE), in August 2017 at UiTM Pasir Gudang, Malaysia. Around 40 people joined the meeting. We held Japan-Malaysia Joint Seminar on Space Weather and Electromagnetism and Intensive Course on Space Magnetohydrodynamics (JMJSEE), in March 2018, at Kyushu University, Japan. 12 Malaysians talked about their research topics and took the classes. We attended the International Conference on Space Weather and Satellite Application for a keynote speech in August 2018.

ISWI Instrument & Data Product Updates (2/2)

- Continuation of Instrument and Data Product Updates (if needed)
 - Data product updates:
 - We registered metadata related MAGDAS to IUGONET (Inter-university Upper Atmosphere Observation NETwork) metadata database(<http://search.iugonet.org>).
 - We are currently updating the website for our database(<http://data.icswse.Kyushu-u.ac.jp>), and plan to release it at the beginning of next fiscal year.
- Continuation of Science Activity Updates (if needed)
- Continuation of Capacity Building Activity Updates (if needed)
 - We accepted three foreign researchers from Sri Lanka and Egypt between 2018-2020.
- References
 - Magnetometer installation at Zaoh(in Japanese)
 - <http://pparc.gp.tohoku.ac.jp/pub/blog/201910.html#entry-287>
 - International Conference on Space Weather and Satellite Application:
 - <https://icessat.uitm.edu.my/icessat2018/>
 - Installation and preliminary data analysis of Penang magnetic data Acquisition system (MAGDAS) in Malaysia
 - <https://doi.org/10.1016/j.asr.2021.01.009> (doi: 10.1016/j.asr.2021.01.009)