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* ISWI Newsletter - Vol. 18 No. 003 15 March 2026 *
* Editor: George Maeda, georgemaeda3[at]gmail.com
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Dear ISWI Newsletter Subscriber:

Please be reminded that this newsletter has two versions:

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[2] Web version -- this is the full version with attachments.

To view the Web version, go to this web page:
https://iswi-secretariat.org/
and click on "NEWSLETTERS".

If you have space-weather-related news or announcements,
please send them to me and I will distribute your
material through the ISWI NEWSLETTER.

Cordially,
George Maeda
Editor of the "ISWI Newsletter", since 2009.

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[01]---

ISWI Realistic Ionosphere (RION): Rising diplomatic challenges for international ionosonde networks

Ivan Galkin and Giorgio Picanço
Space Science Laboratory, University of Massachusetts Lowell

100 years since the invention of ionosonde and nearly 70 years since inauguration of the international World Data Center (WDC) consortium for open access to ionosonde data, a concerning trend has begun to challenge the long-standing tradition of open scientific exchange. Some ionosonde observatories that historically contributed their measurements to global repositories are reconsidering the scope of external access to their data. These decisions often reflect evolving institutional policies or broader geopolitical circumstances. Nevertheless, reduced accessibility to observations gradually weakens the global measurement network on which ionospheric research and space weather monitoring depend.

See the full article here:
ISWI RION Diplomatic Issues (2026).pdf
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[02]---

Expanding RION Capabilities Through the Integration of Ionosonde and GNSS Observations

Giorgio Picanço and Ivan Galkin
Space Science Laboratory, University of Massachusetts Lowell, Lowell, MA, USA

The International Space Weather Initiative (ISWI) has long recognized that global cooperation in instrumentation, open data exchange, and model development is essential for advancing our understanding of the near-Earth space environment. In this context, the Realistic Ionosphere (RION) program has emerged as an important ISWI instrument suite aimed at enabling the space weather community to access and develop accurate nowcasts of the three-dimensional plasma density distribution in the bottomside ionosphere. Built upon the Global Ionosphere Radio Observatory (GIRO), which serves as the observational backbone of the system, RION integrates real-time ionosonde observations, open-access data services, and assimilative modeling techniques. Through this system, observations collected by a multinational network of ionosondes are transformed into a broad suite of data products that can be used by researchers and operational users worldwide.

See the full article here:
iswi_rion_article_giorgio.pdf
002

[03]---

[Announcement ISWI Seminar]
“New dynamics of ionospheric electron temperature overshoot
uncovered by neural networks” by Dr. Artem Smirnov

FROM: Maria Graciela Molina, on Mon, Mar 2, 2026

Dear Colleagues,

We are pleased to announce the next **ISWI Webinar** of 2026
by Dr Artem Smirnov is scheduled for March 25th, 2026
at 3 PM Central European Time (9 AM EDT; 7:30 PM IST).

To attend the next Webinar, please register here
https://iswi-secretariat.org/home-page/meetings/iswi-webinars/iswi-webinar-registration/

The MS Teams link will be sent to registered participants 2 days before the event.

To watch past Webinars, please check the following link:
https://cdaw.gsfc.nasa.gov/webinars/ISWI/

With kind regards,
Graciela Molina
on behalf of the ISWI Seminar Committee
https://iswi-secretariat.org/home-page/organization/iswi-webinar-committee/

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Title:
New dynamics of ionospheric electron temperature overshoot
uncovered by neural networks

Speaker: Dr. Artem Smirnov, Helmholtz Centre Potsdam;
GFZ German Research Centre for Geosciences

Abstract: An intense surge in equatorial electron temperature (Te) at sunrise, known as the morning Te overshoot, has been one of the most widely studied ionospheric features since its discovery in the early Space Age. Despite extensive research, its behavior during geomagnetic storms remains poorly understood. Using global electron temperature observations by the CHAllenging Minisatellite Payload (CHAMP) mission in 2002-2010, we develop a global neural network Te model that shows excellent performance on independent data, including those from the incoherent scatter radars (ISRs). The model revealed an unexpected two-phase stormtime response of the morning Te overshoot. During the storm’s main phase, electron temperatures in the overshoot region exhibit a pronounced enhancement, followed by a dramatic depletion exceeding 1000 K and disappearance of the overshoot during the recovery phase. This evolution corresponds to the initial influence of a westward prompt penetration electric field (PPEF), which reduces electron densities, allowing for more efficient energy exchange between newly ionized sunrise particles and the lower-energy (depleted) ambient plasma. Later in the storm, the eastward disturbance dynamo field flips the ExB drift from downward to upward and lifts more electrons into the F-region. The resulting increase in electron density enhances cooling rates, leading to the overshoot's disappearance in the recovery phase. Our findings shed new light on the dynamics of the morning electron temperature overshoot and highlight the capability of new-generation

NN models of the near-Earth space environment to uncover previously unrecognized physical patterns even for the most commonly studied phenomena.

[04]---

AGS Newsletter, African Geophysical Society, Feb. 2026, Vol. 9, No. 2

Access the AGS Newsletter here:
https://mailchi.mp/35762585010c/ags-newsletter-vol1-no-001-27-november-19888489?e=3d8c869948

[05]---

"Space Weather and Space Systems" – Online Short Course (Starts 9 April 2026)

-From 9 April – 14 May 2026 (6 Weeks, 6 Classes, 12 Total Hours, approximately 24 Total Hours)
-Every Thursday from 3–5 p.m. Eastern Time
 (all sessions will be recorded and available for replay;
 course notes will be available for download)
-This new essential course, in partnership with Johns Hopkins University, explores the space environment in the context of its impact on space system operations.
-All students will receive an AIAA Certificate of Completion and an additional Certificate of Completion from Johns Hopkins University at the end of the course.

OVERVIEW

Topics include the impacts of ionospheric variability on HF propagation, satellite communications, and GPS, impacts of energetic charged particles on spacecraft, impacts of auroral precipitation on radar and communication systems, and impacts of varying geomagnetic activity on power grids and space domain awareness.

Between classes, students will have optional self-paced readings, exercises, knowledge checks, etc. available in the Johns Hopkins learning platform to enhance the course experience.

This course will explore the space environment in the context of its impact on space system operations. Topics include the impacts of ionospheric variability on HF propagation, satellite communications, and GPS, impacts of energetic charged particles on spacecraft, impacts of auroral precipitation on radar and communication systems, and impacts of varying geomagnetic activity on power grids and space domain awareness.

The goal of this course is to introduce students to space weather phenomena in the context of their impacts on space systems. Space weather is a new topic for many people, and it affects a wide variety of space systems. This course will demystify the topic of space weather from the perspective of a user of space systems. It provides a conceptual foundation for understanding all the critical impacts of the space environment on space systems without requiring pre-existing domain knowledge or any comfort level with the topic of space weather.

The course consists of six modules, each of which covers a different type of space weather, moving progressively from the Sun to orbital impacts and then to terrestrial impacts. By focusing on the impact of space weather, students will be able to understand both the technical context for the space environment and the relevance to systems that are familiar to a broader audience.

DETAILS:
https://learning.aiaa.org/diweb/catalog/item?id=18292291&utm_campaign=18708510-ProfessionalDevelopment2026&utm_source=SpaceNews&utm_medium=email&utm_source=ActiveCampaign&utm_medium=email&utm_content=New%20space%20systems%20engineering%20courses&utm_campaign=Partner%20-%20AIAA%20-%202025-03-11

[06]---

Dear ISWI Members,

Did you know that the world's first liquid fueled rocket was launched in the Commonwealth (State) of Massachusetts on the 16th March 1926? That is 100 years ago. We have come a long way since then.

That very first liquid-fueled rocket was conceived, designed, built, and launched, by **Dr. Robert Goddard** (this is why NASA's Goddard Space Flight Center is named after him). He had this extraordinary vision that humans could someday travel in outer space -- for which he endured an enormous amount of derision and mockery. The site of the first launch was Auburn, Massachusetts.

Accordingly, the Town of Auburn, is organizing events to celebrate the 100th anniversary of Goddard's historic achievement of 1926:
https://www.auburnma.gov/839/Robert-Goddard-Centennial

Events are planned for Monday, March 16, 2026:
Dr. Robert Goddard Centennial Celebration
10:00 AM - 5:00 PM
Pakachoag Golf Course, 15 Upland St., Auburn, MA 01501

I plan to go out to Auburn (from Boston) and check out some of the festivities on that day.
Cordially,
George Maeda, editor of the ISWI NEWSLETTER.
13th March 2026.

This text is from Wikipedia:

> **Robert Hutchings Goddard** *(October 5, 1882 – August 10, 1945) was an American physicist, inventor, and engineer credited with creating and building the world's first liquid-fueled rocket, which was successfully launched on March 16, 1926. By 1915 his pioneering work had dramatically improved the efficiency of the solid-fueled rocket, signaling the era of the modern rocket and innovation. He and his team launched 34 rockets between 1926 and 1941, achieving altitudes as high as 2.6 km (1.6 mi) and speeds as fast as 885 km/h (550 mph).*

Goddard's work as both theorist and engineer anticipated many of the developments that would make spaceflight possible. He has been called the man who ushered in the Space Age. Two of Goddard's 214 patented inventions, a multi-stage rocket (1914), and a liquid-fuel rocket (1914), were important milestones toward spaceflight. His 1919 monograph "A Method of Reaching Extreme Altitudes" *is considered one of the classic texts of 20th-century rocket science. Goddard successfully pioneered modern methods such as two-axis control (gyroscopes and steerable thrust) to allow rockets to control their flight effectively.*

Although his work in the field was revolutionary, Goddard received little public or financial support for his research and development work. He was a shy person, and rocket research was not considered a suitable pursuit for a physics professor. The press and other scientists ridiculed his theories of spaceflight. As a result, he became protective of his privacy and his work.

Years after his death, at the dawn of the Space Age, Goddard came to be recognized as one of the founding fathers of modern rocketry, along with Robert Esnault-Pelterie, Konstantin Tsiolkovsky and Hermann Oberth. He not only recognized early on the potential of rockets for atmospheric research, ballistic missiles and space travel, but also was the first to scientifically study, design, construct and fly the precursory rockets needed to eventually implement those ideas.

NASA's **Goddard Space Flight Center** *was named in Goddard's honor in 1959. He was also inducted into the International Aerospace Hall of Fame and National Aviation Hall of Fame in 1966, and the International Space Hall of Fame in 1976.*

Read more about Dr. Goddard at the source:
https://en.wikipedia.org/wiki/Robert_H._Goddard

**********[End of this issue of the ISWI Newsletter]**********

ISWI Realistic Ionosphere (RION): Rising diplomatic challenges for international ionosonde networks

Ivan Galkin and Giorgio Picanço

Space Science Laboratory, University of Massachusetts Lowell

100 years since the invention of ionosonde and nearly 70 years since inauguration of the international World Data Center (WDC) consortium for open access to ionosonde data, a concerning trend has begun to challenge the long-standing tradition of open scientific exchange. Some ionosonde observatories that historically contributed their measurements to global repositories are reconsidering the scope of external access to their data. These decisions often reflect evolving institutional policies or broader geopolitical circumstances. Nevertheless, reduced accessibility to observations gradually weakens the global measurement network on which ionospheric research and space weather monitoring depend.

Global Ionosphere Radio Observatory (https://giro.uml.edu), the key measurement component of the ISWI RION, reports loss of nearly 60% of its ionospheric weather monitoring capability for diplomatic reasons.

Map of GIRO ionosonde observatory locations with open (red stars) and restricted (black stars) capability to report prompt measurements

Countries that operate ionosonde observatories but limit open data access are member states of the International Civil Aviation Organization, which relies on international cooperation to ensure safe and reliable global air navigation. High-frequency radio links between dispatch centers and aircraft, particularly on transoceanic and polar routes, depend on accurate knowledge of ionospheric conditions. Ensuring continued access to observations that support these capabilities would therefore be consistent with the broader international commitment to aviation safety.

It may be timely to reaffirm a principle that has long guided international environmental monitoring: observations that support understanding of the Earth system are a **shared global resource** of benefit to the community at large. Organizations such as the World Meteorological Organization have historically promoted the open exchange of meteorological data for the common good. The UN COPUOS and ISWI are uniquely positioned to enforce a similar recognition for **space weather observations**—including ionospheric measurements—that would help sustain the collaborative framework that enables reliable monitoring and scientific progress worldwide.

RECEIVED BY THE ISWI NEWSLETTER ON 10 MARCH 2026

Expanding RION Capabilities Through the Integration of Ionosonde and GNSS Observations

Giorgio Picanço[1] and Ivan Galkin[1]

[1]Space Science Laboratory, University of Massachusetts Lowell, Lowell, MA, USA

Contact: giorgio_picanco@uml.edu, ivan_galkin@uml.edu

The International Space Weather Initiative (ISWI) has long recognized that global cooperation in instrumentation, open data exchange, and model development is essential for advancing our understanding of the near-Earth space environment. In this context, the Realistic Ionosphere (RION) program has emerged as an important ISWI instrument suite aimed at enabling the space weather community to access and develop accurate nowcasts of the three-dimensional plasma density distribution in the bottomside ionosphere. Built upon the Global Ionosphere Radio Observatory (GIRO), which serves as the observational backbone of the system, RION integrates real-time ionosonde observations, open-access data services, and assimilative modeling techniques. Through this system, observations collected by a multinational network of ionosondes are transformed into a broad suite of data products that can be used by researchers and operational users worldwide.

These products include vertical and oblique ionograms, autoscaled and validated electron density profiles, standard ionospheric parameters such as foF2 and hmF2, skymaps of signal propagation, plasma drift estimates, and measurements of traveling ionospheric disturbances (TIDs). By making these observations and derived parameters openly accessible, GIRO and RION provide a shared observational infrastructure that supports both scientific investigations and operational space weather applications. The observations are also incorporated into the IRI-based Real-Time Assimilative Model (IRTAM), which updates the global ionospheric state every 10 minutes with only a few minutes of data latency. Through this assimilation framework, the community gains access not only to real-time observations but also to continuously updated empirical representations of current ionospheric conditions.

Recent developments are further expanding the capabilities of RION through the integration of Global Navigation Satellite System (GNSS) observations. While ionosondes remain the principal source of continuous ground-truth measurements of the bottomside ionosphere, GNSS observations provide complementary information on the spatial distribution and variability of plasma through measurements of total electron content (TEC). The combination of these observational approaches significantly improves spatial coverage and strengthens the monitoring of disturbed ionospheric conditions across regional and global scales. An example of this multisensor observational approach is illustrated in Figure 1, which shows the global distribution of ionosonde stations contributing to GIRO together with global anomaly maps derived from ionosonde measurements (ΔNmF2) and GNSS observations (ΔVTEC).

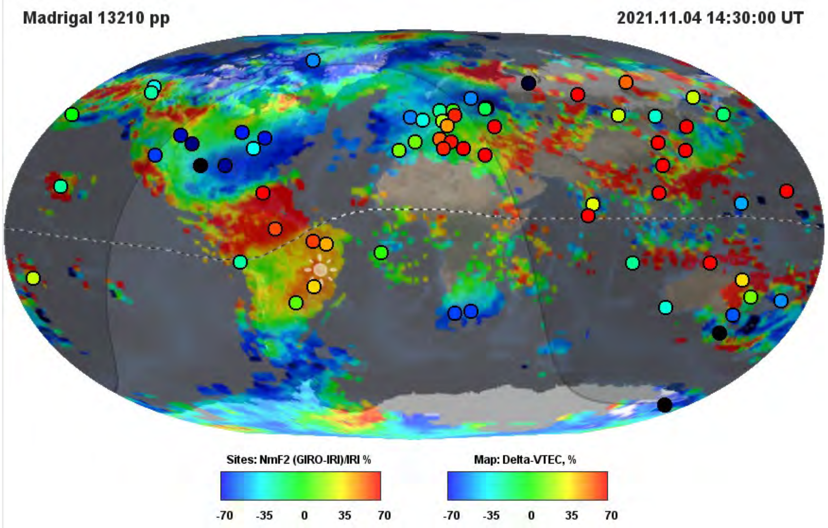

Figure 1. Global example of multisensor ionospheric monitoring using observations from ionosondes and GNSS receivers. Colored circles represent ionosonde stations contributing observations through the GIRO. The background anomaly maps show NmF2 anomalies (ΔNmF2) derived from ionosonde measurements and VTEC anomalies (ΔVTEC) derived from GNSS observations available through the Madrigal/MIT database.

The integration of multisource observations also creates new opportunities for advanced data-fusion methodologies that combine GNSS measurements, ionosonde diagnostics, and model-derived constraints. Such approaches can improve the estimation of key ionospheric parameters such as NmF2 and enhance the capability to monitor the evolution of ionospheric disturbances during geomagnetic storms and other space weather events. Additional datasets, including GNSS TEC products, radio occultation measurements, and empirical model outputs, can further contribute to data-driven frameworks designed to improve the accuracy and robustness of ionospheric parameter estimation and forecasting. The integration of these complementary observations provides a pathway toward the development of new community-driven products for both scientific research and operational space weather monitoring.

The importance of these developments extends beyond scientific investigation. Reliable ionospheric nowcasts are essential for applications involving radio communication, satellite navigation, HF propagation, and broader space weather situational awareness. In this context, RION provides a collaborative platform through which researchers, observatories, and operational centers can contribute observations, develop new analysis tools, and explore innovative approaches for monitoring ionospheric variability in near real time. The continued evolution of RION will depend on sustained international cooperation, open data access, and active participation from the global space weather community. Contributions from new observing systems, data products, and collaborative research initiatives will play an important role in expanding the capabilities of the network. By combining global ionosonde observations with GNSS measurements and real-time data assimilation, RION is evolving into an increasingly important community-driven infrastructure for monitoring the ionosphere. Through continued collaboration within the international space weather community, these capabilities can be further expanded to support both fundamental research and operational space weather services worldwide.

Useful links

GIRO Open Data Portal: https://giro.uml.edu

ISWI RION page: https://iswi-secretariat.org/home-page/projects/realistic-ionosphere-rion/

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