

# ICON at AGU Fall Meeting

San Francisco, 9-13 Dec. 2019

[AGU's Fall Meeting](#) is the largest international Earth and space science meeting in the world.

Here are ICON or GOLD science-related sessions, posters and the SPA Town Hall on Monday night.

**Update: Press conference on Tuesday at 2:30**

Monday, 9 December 2019

## [SA11A - Observed and Modeled Dynamics of the Thermosphere-Ionosphere System I](#)

08:00 - 10:00 Moscone South – 205-206, L2

*Katelynn Greer, Colin Charles Triplett, et al*

Exciting new developments in the study of Earth's thermosphere and ionosphere have been enabled by ground- and space-based observations (such as GOLD, ICON, COSMIC-2, TIMED, etc.) which are augmented by modeling experiments. These investigations include, but are not exclusive to, O and N2 and their relationship to the ionosphere, forcing of the thermosphere and ionosphere from above and below, the thermal structure of the thermosphere, the role of minor species in the thermosphere, disturbances by geomagnetic storms, and the influence of composition changes on the ionospheric F2 peak and the topside ionosphere. Papers in this session will address issues related to the dynamics of the thermosphere and ionosphere using observations, data analysis and models.

## [SA12A - Observed and Modeled Dynamics of the Thermosphere-Ionosphere System II](#)

10:20 - 12:20 Moscone South – 205-206, L2

*Katelynn Greer, Colin Charles Triplett, et al*

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### [SA12A-02 - UV Multi-Spectral Images of the Ionosphere and Thermosphere from LITES and ICON](#)

10:35 - 10:50 Moscone South – 205-206, L2

*Andy Stephan et al*

We present global images of the daytime Equatorial Ionization Anomaly (EIA) as manifested in the extreme- and far-ultraviolet (EUV/FUV) airglow collected by the Limb-Imaging Ionospheric and Thermospheric EUV Spectrograph (LITES) on the International Space Station. We compare these images of the resonantly-scattered OI 83.4 nm emission with simultaneous images of the ionospheric radiative recombination airglow at 135.6 nm visible above 250 km tangent altitudes to examine the symmetry and variability of the dense crests of the EIA across local times from late morning to pre-sunset.

The Ionospheric Connection Explorer (ICON) includes an Extreme Ultraviolet (EUV) and a Far-Ultraviolet (FUV) imager that together provide comprehensive data on the daytime and nighttime ionosphere and daytime thermosphere. Although these sensors and algorithms operate independently, their measurements are designed to be interpreted as part of the comprehensive set of measurements akin to what was observed by LITES.

We will discuss results from LITES and the implications and differences for interpreting data from the ICON mission that operates from a higher altitude and lower inclination orbit than LITES. This talk will also present a first look at any early results from the ICON mission that become available.

## Posters

### [SA13B - Observed and Modeled Dynamics of the Thermosphere-Ionosphere System III Posters](#)

13:40 - 18:00 Moscone South – Poster Hall

*Colin Charles Triplett, et al*

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### [SA13B-3248 - Validation of high-latitude TIEGCM inputs using geomagnetic storm observations by GOLD](#)

*Yen-Jung Wu et al*

The Global-scale Observations of the Limb and Disk (GOLD) and the Ionospheric Connection Explorer (ICON) are the new NASA missions focusing on the Earth's mesosphere/thermosphere and its response to the space weather. GOLD is in geostationary orbit above the mouth of the Amazon, whereas ICON will be in a 27° -inclination orbit at 580 km altitude. ICON's neutral wind and temperature measurements will be used through Hough mode extensions in the Thermosphere-Ionosphere-Electrodynamics General Circulation Model V2.0 (TIEGCM 2.0) to study tidal forcing from below the thermosphere as well as the response of the ionosphere-thermosphere (IT) system to space weather events. The built-in high latitude inputs for TIEGCM 2.0 are the Weimer potential model (Weimer05), the Heelis potential model (Heelis), and the

Assimilative Mapping of Ionospheric Electrodynamics (AMIE). In this work, we compare GOLD observations with three TIEGCM 2.0 runs which use Weimer05, Heelis, and AMIE as the high-latitude inputs. Both ICON and GOLD provide the ratio of the column-integrated concentrations of O and N<sub>2</sub> ([O]/[N<sub>2</sub>]) in the sunlit atmosphere. This overlap in data products will allow us to validate the different high-latitude inputs of the TIEGCM. We use a geomagnetic storm from November 2018 and corresponding GOLD observations as an initial test of the high-latitude inputs. Also, the large latitude coverage of GOLD from the equator to the auroral zone provides further validation at high latitude.

## Town Hall

### [TH15A: \(SPA Town Hall\): Space Physics and Aeronomy Section Agency Night](#)

18:15 - 19:15 Moscone West – 2005, L2

Come meet with our NASA and National Science Foundation (NSF) representatives. During this one hour session current and pending programs as well as recent developments at both agencies will be described. The additional opportunity to ask questions and provide feedback makes this an hour well spent.

## Tuesday, 10 December 2019

**NEW: Press conference, [Postcards from the edge of space: New images, new phenomena, and new insights on Tuesday, December 10th, at 2:30 pm](#)**

In this briefing, scientists will present new images from Earth's ionosphere, bringing color to processes that have widespread implications for the part of space closest to home. This collection of photos will span the first images ever captured by NASA's ICON spacecraft — just launched in October 2019 — and the first science discoveries from NASA's GOLD mission, along with observations of a never-before-studied type of aurora.

Jennifer Briggs, Pepperdine University, Malibu, California, United States

Richard Eastes, University of Colorado Boulder, Boulder, Colorado, United States

Thomas Immel, University of California Berkeley, Berkeley, California, United States

**Presentations: [SA11A-01](#), [SM51G-3219](#)**

### [SA24A-03 - 3D lower thermospheric wind fields using a meteor radar network](#)

16:30 - 16:45 Moscone South – 205-206, L2

*Brian Joseph Harding*

We present 3D lower thermospheric wind observations using a novel meteor radar technique. The recent deployment of networks of meteor radars, as well as advances in the signal design and processing [Chau et al., 2019, Urco et al., 2019], has vastly increased the spatial coverage and angular

diversity to the point where statistical estimation techniques are now able to resolve the 3D structure of the horizontal wind field over altitudes of ~85-105km. A particular technique based on Tikhonov regularization is introduced here. Waves with horizontal wavelengths ~20-200 km can be resolved by this method and are shown to be omnipresent in preliminary data from northern Germany. Characteristics of these wind fields in terms of gravity waves and background tides are discussed. Although the observation altitudes do not cover the full dynamo region, the 3D wind field allows for a local dynamo calculation to predict structure in ExB drifts at F-region altitudes. The small-scale structure evident in these observations can be used to calculate errors in wind observation modalities that involve integrated quantities (e.g., ICON/MIGHTI and FPI green line winds).

An example 2D animation of the results can be seen online:

<http://www.ssl.berkeley.edu/~bharding/meteor/wind.gif>

#### [SA24A-04 - Migrating Diurnal Wind in the Thermosphere](#)

16:45 - 17:00 Moscone South – 205-206, L2

*Ruth Segal Lieberman*

The diurnal migrating tide (DW1) is the dominant mode of variability in mesospheric and lower thermospheric winds, and an important agent of vertical and interhemispheric coupling. DW1 has been well-documented up to 110 km, but has not been globally defined above 110 km. This presentation will focus on DW1 between 90-300 km as revealed by the upper atmosphere research satellite (UARS) wind imaging interferometer (WINDII). The work was undertaken in part as a prototype for tidal analysis with NASA's anticipated Ionospheric Connection Explorer (ICON) winds. A key element is the interpretation of dawn-dusk wind differences as a proxy for the diurnal tide. The migrating diurnal tide is well defined in subtropical meridional winds. Amplitudes are about 30 m/s during northern hemisphere winter. The vertical wavelength increases from 30 km in the lower thermosphere to about 150 km at the higher altitudes.

#### Posters

#### [SA21B-3097 - MIGHTI \(Michelson Interferometer for Global High-resolution Thermospheric Imaging\): The Wind and Temperature Instrument Onboard the NASA Ionospheric Connection \(ICON\) Mission](#)

08:00 - 12:20 Moscone South – Poster Hall

*Christoph Englert*

The Michelson Interferometer for Global High-resolution Thermospheric Imaging (MIGHTI) is one of the four instruments on the next-to-launch NASA Heliophysics mission, the Ionospheric Connection Explorer which is currently scheduled for launch in late 2019. ICON will investigate the extreme variability of the Earth's ionosphere with a unique combination of sensors on-board a single low Earth orbit satellite. The MIGHTI instrument will measure the global distribution of neutral winds and temperatures over an altitude range not accessible to in-situ probes. It uses the Doppler Asymmetric Heterodyne Spectroscopy (DASH) technique for the wind measurements and a multi-color photometer technique to measure temperature. In this presentation, we discuss the instrument concept, design challenges and achievements, as-built specifications, and the data that we plan to obtain from orbit.

Thursday, 12 December 2019

[SA44A-01 - Benefiting from Constellation Data using pysat \(Invited\)](#)

16:00 - 18:00 Moscone South – eLightning Theater III

*Russell Stoneback*

An overview of an open source software package called the Python Satellite Data Analysis Toolkit (pysat) will be provided along with guidelines on how pysat may be used to extract information from constellation data sets to answer new science questions.

Posters

Friday, 13 December 2019

Posters

[SA51B-3135 - Detection of medium-scale traveling ionospheric disturbances with TIMED/GUVI limb observations at mid and low latitude regions](#)

08:00 - 12:20 Moscone South – Poster Hall

*Gilles Wautelet*

Medium-scale traveling ionospheric disturbances (MSTIDs) are the most recurrent type of ionospheric irregularities at mid-latitudes but also occur in low-latitude regions. Whether they are due to the propagation of atmospheric gravity waves originating from the lower atmosphere or related to sporadic E layers, their harmonic signature is a common feature that allows them to be easily identified.

MSTIDs have been extensively studied and characterized during the last two decades, mainly using GNSS measurements, ground-based all-sky imagers, radars or ionosondes. However, only few studies aimed to describe their vertical structure using remote sensing observations from space, which is helpful to understand their propagation and their dissipation processes.

NASA's TIMED mission was launched in December 2001 on a 74° inclination orbit at an altitude of 625 km, which allowed covering both low and high-latitude regions. The Global Ultraviolet Imager (GUVI) instrument aimed at remotely sense, among others, the ionospheric ion and electron densities. GUVI performed disk observations and limb scans in five FUV wavelength channels, making it an ideal tool to characterize the vertical structure of the ionosphere as well as to contextualize the study.

The purpose of this work is to use GUVI limb scans to characterize MSTIDs preliminary detected by GNSS before December 2007, until the limb scanning mode failed. We first select a few MSTID cases during maximum background conditions of the Total Electron Content (TEC) computed by GNSS ground stations. Then, coincidental GUVI limb scans of the OI-135.6 nm emission are analyzed to characterize the vertical structure of the MSTIDs. The comparison is completed by the analysis of ionosonde profiles collected in the vicinity of the region where the MSTIDs have been previously detected by GNSS and GUVI.

[A51P-2642 - Mechanisms of vertical and interhemispheric coupling revealed by satellite measurements](#)

08:00 - 12:20      *Moscone South – Poster Hall*

*Ruth Segal Lieberman*

In recent years there have been many investigations of coupling between the stratosphere and the ionosphere, and between the summer and winter hemispheres. Many of these studies were motivated by observations of mesospheric and ionospheric parameters that appear to track stratospheric temperature and planetary wave evolution. This presentation will showcase three mechanisms that imprint stratospheric variability upon far-field phenomena: 1. Interactions between planetary waves and tides; 2. Modulation of gravity wave transmission by planetary waves; 3. Generation of inertial instability in the planetary wave-breaking region. The importance of these highly divergent processes implies that gradient wind balance is not valid in the interaction regions, and underscores the need for direct measurements of middle atmosphere winds.