Ionospheric Product Developments at the Space Weather Prediction Center

ION-GNSS+ 2019 Miami

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Outline

ICAO Products

GNSS Customer Survey

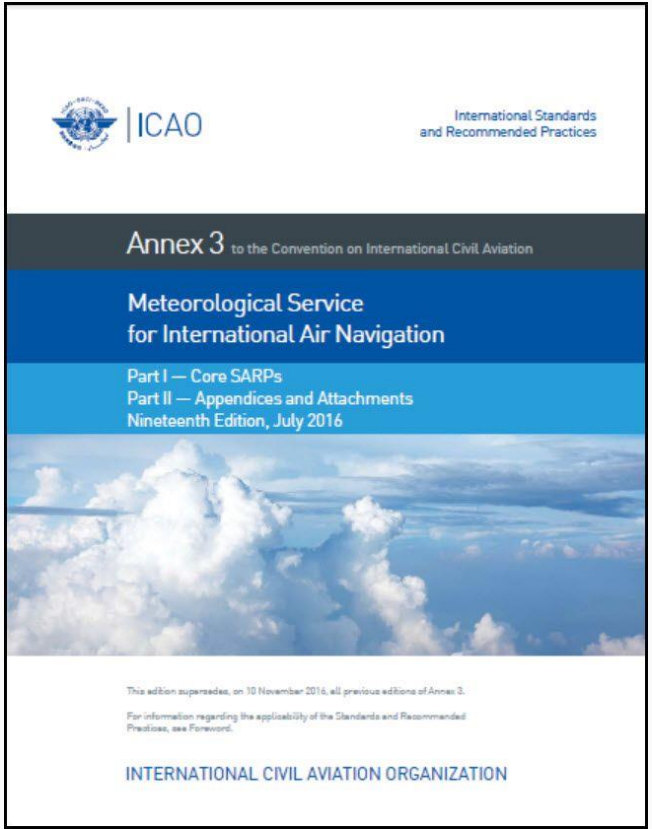
National Space Weather Strategy and Action Plan

Acknowledgements:

- Tim Fuller-Rowell
- Dominic Fuller-Rowell
- Mihail Codrescu

ICAO Products

HF/Ionosphere	Kp-index - Mod: 8 - Sev: 9
	dB from 30 MHz riometer data - Mod: 1.5 dayside - Sev: 2.0 dayside
	X-ray flux (0.1-0.8 nm) - Mod: 1x10^-4 W/m2 - Sev: 1x10^-3 W/m2
	MUF depression - Mod: 20% - Sev: 30%
GNSS	Amplitude Scintillation (S4) (dimensionless) - Mod: 0.5 - Sev: 0.8
	Phase Scintillation (Sigma-Phi) (radians) - Mod: 0.4 - Sev: 0.7
	Total Electron Content (TEC) - Mod: 125 TEC units - Sev: 175 TEC units



ICAO GNSS Products

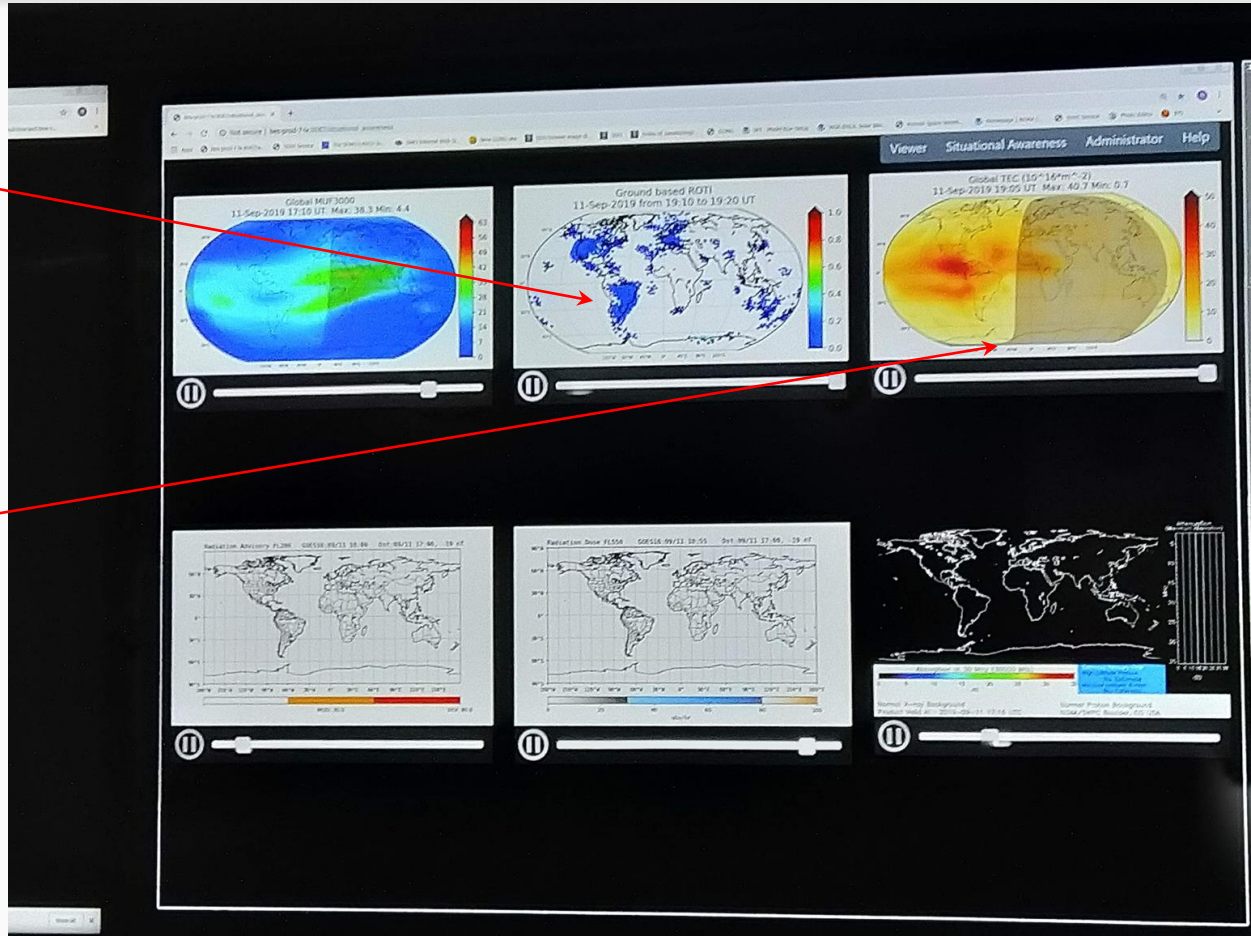
GNSS	Amplitude Scintillation (S4) (dimensionless) - Mod: 0.5 - Sev: 0.8	COSMIC 2, NOAA Buoys, Future scintillation product (ROTI?)	**Climatology**/WAM-IPE?/Propagation of observations
	Phase Scintillation (Sigma-Phi) (radians) - Mod: 0.4 - Sev: 0.7	COSMIC-2, CEDP, GOLD, Future scintillation product (ROTI?)	Climatology/WAM-IPE?/Propagation of observations
	Total Electron Content (TEC) [departure from average] - Mod: 125 TEC units - Sev: 175 TEC units	GloTEC (DIX)	???

Sources of S4 and Sigma-Phi: COSMIC 2, CWDP?, NOAA Buoys, ASTRA GNSS data, Future scintillation product based on numerical models

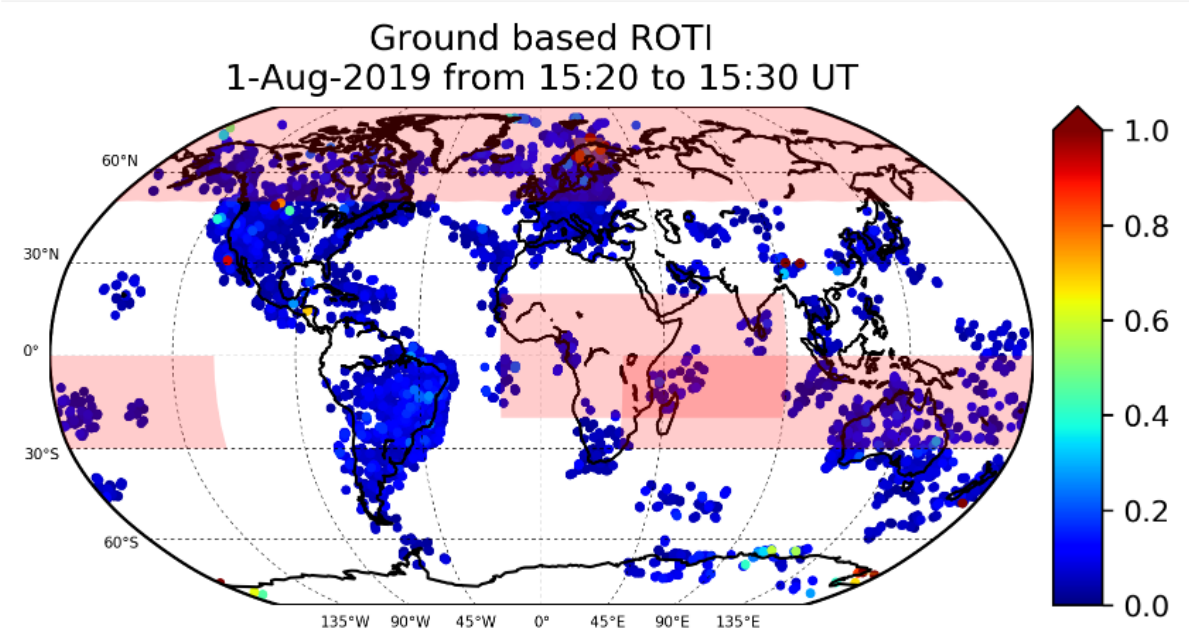
GNSS Products in Operations

ROTI

Global TEC
(GloTEC)

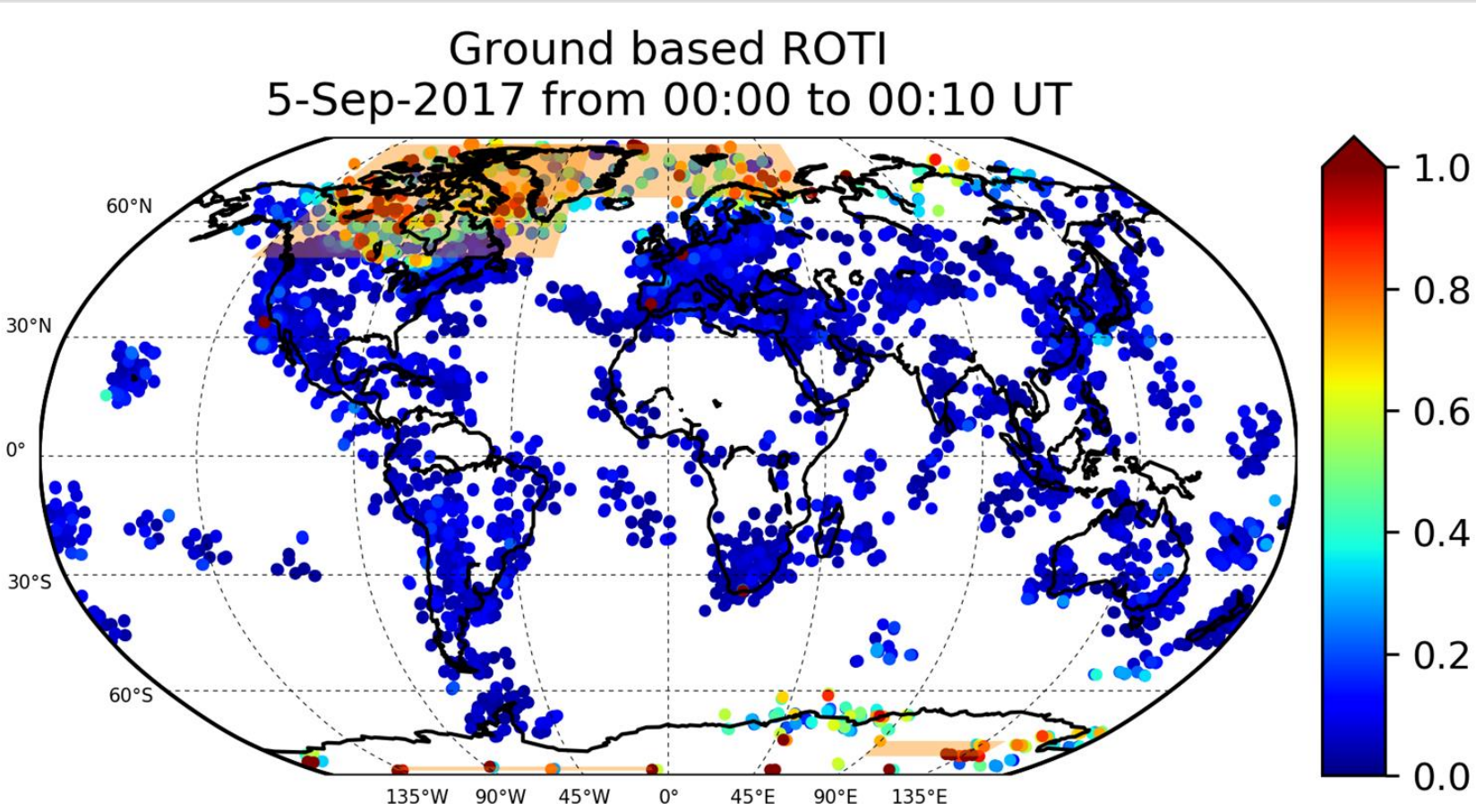


ROTI



COORDINATES : 30°E 0°N 120°W 30°S, 15°W 20°N 90°E 20°S, 50°N poleward
COORDINATES +6H: 120°E 0°N 30°W 30°S, 75°E 20°N 180°E 20°S, 50°N poleward
COORDINATES +12H: 150°W 0°N 60°E 30°S, 165°E 20°N 90°W 20°S, 50°N poleward
COORDINATES +18H: 60°W 0°N 150°E 30°S, 105°W 20°N 0°E 20°S, 50°N poleward
COORDINATES +24H: 30°E 0°N 120°W 30°S, 15°W 20°N 90°E 20°S, 50°N poleward

Next product | Close | Save changes


Ground based ROTI
5-Sep-2017 from 00:00 to 00:10 UT
60°N
30°N
0°
30°S
60°S
135°W
90°W
45°W
0°
45°E
90°E
135°E
1.0
0.8
0.6
0.4
0.2
0.0

Customer Survey - GNSS Community Input

4.5 Summary of User Data Product Requests
The four interviewees identified seven distinct data product requests for the GNSS sector. Requests:

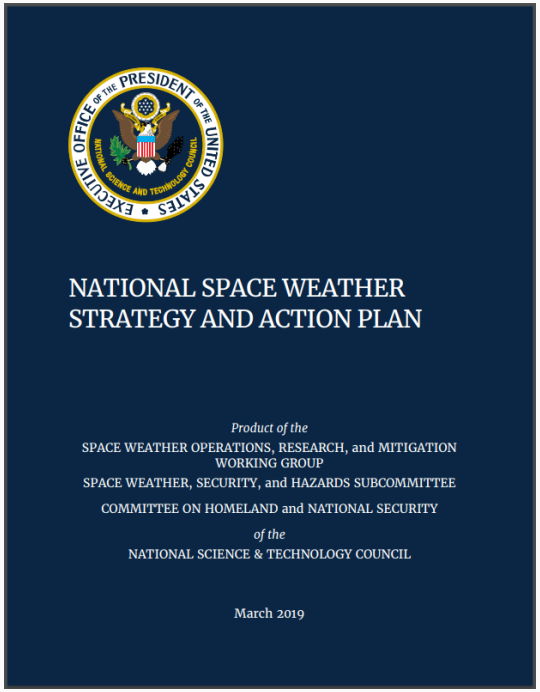
1. **Develop warnings for scintillation, especially in the equatorial zone**. An equatorial zone warning would ideally provide warnings on the order of an hour with 10-minute intervals, and have a spatial resolution of 100 km2 as an ideal case, although anything under 500 km2 would be good.

2. **Improve timing and accuracy for geomagnetic storm forecasts**. GNSS experts seek additional spatial and temporal accuracy in geomagnetic storm forecasts to better understand the scope for potential

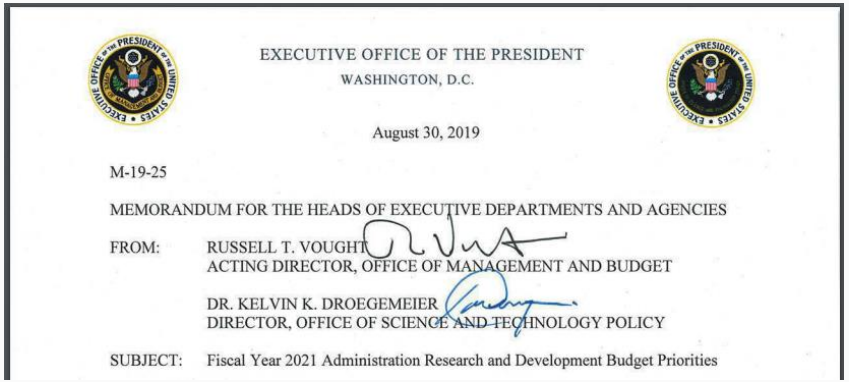
Customer Survey - GNSS Community Input

3. **Develop a product that includes GNSS-specific warnings and nowcast observations**. ...Examples...include scintillation phase and amplitude, geomagnetic storms, and TEC disturbances and gradients.
4. **Develop push alerts that are specific to users' *geographies*.**
5. **Provide tools to translate space weather phenomena to impacts.**
6. **Improve the SWPC website for use by non-experts**...interpretive tools that can relate or lead SWPC customers to the *nature, severity, and timing* of impacts they may experience.
7. **Create a mechanism for users to report GNSS issues**...through software that is already being used.

National Space Weather Strategy and Action Plan



"Understanding and preparing for space weather events are critical to national security, the economy, infrastructure services, remote sensing, space exploration, and technology innovations that rely on communications systems and ***GPS for positioning, navigation, and timing services****."*



EXECUTIVE OFFICE OF THE PRESIDENT
WASHINGTON, D.C.

August 30, 2019

M-19-25

MEMORANDUM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES

FROM: RUSSELL T. VOUGHT
ACTING DIRECTOR, OFFICE OF MANAGEMENT AND BUDGET

DR. KELVIN K. DROEGEMEIER
DIRECTOR, OFFICE OF SCIENCE AND TECHNOLOGY POLICY

SUBJECT: Fiscal Year 2021 Administration Research and Development Budget Priorities

"Departments and agencies should ***prioritize investments in space weather R&D*** *according to the 2019 National Space Weather Strategy and Action Plan and, where applicable, pay specific attention to improving research to operations and operations to research capabilities."*

Other Developments

- FY2020 Milestone - WAM-IPE - v1.0 package ready for National Centers for Environmental Prediction Central Operations (NCO) handoff

Questions?

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