



Scintillation Measurements in Madrigal: Expanded Capabilities and Initial Observations

Nestor Aponte* ⁽¹⁾, Anthea J. Coster ⁽¹⁾, Don Hampton², Susan Skone³, Emma Spanswick³, P.T. Jayachandran⁴, Luca Spogli⁵, Vincenzo Romano⁵

¹MIT Haystack Observatory, ²University of Alaska/Fairbanks, ³University of Calgary ⁴University of New Brunswick, ⁵INGV

(1) MIT Haystack Observatory, Westford, MA, 01886, USA, email: ajc@haystack.mit.edu, jsoohoo@mit.edu

(2) The University of Alaska, Fairbanks, AK, USA, email: dhampton@alaska.edu

(3) The University of Calgary, Calgary, Canada, email: shskone@ucalgary.edu, Emma Louise Spanswick <elspansw@ucalgary.ca>

(4) University of New Brunswick, Fredericton, New Brunswick, Canada, email: jaya@unb.ca

(5) Istituto Nazionale Di Geofisic e Vulcanologia, Via di Vigna Murata 605, 00143 Roma, Italia email: luca.spogli@ingv.it, vincenzo.romano@ingv.it

The Madrigal database has included scintillation observations from networks of scintillation GNSS receivers since 2018. However recently this database has been expanded as part of the new Space Weather Research and Technology Applications (SPARTA) Center of Excellence. Currently scintillation data from all of 2023 and 2024 are available on-line, and plans are to continue this through the future. Data from the following networks included in this database: the NSF MRI Collaborative: Development of Monitors for Alaskan and Canadian Auroral Weather in Space (MACAWS), the Canadian High Arctic Scintillation Network (CHAIN), the Low-Latitude Ionospheric Sensor Network (LISN), and in the Istituto Nazionale di Geofisica e Vulcanologia (INGV) network. The Madrigal database now includes daily movies, as well as individual plots, for both the global S4 and Sigma-Phi observations overlaid onto total electron content maps. These movies and plots provide a quick look at the global scintillation observations. We will present an analysis of these observations including those related to storm enhanced density plumes, tongues of ionization, and auroral substorms. We will also examine the role of the higher levels of solar activity (F10.7) in the development of space weather phenomena and discuss some of the newer mid-latitude scintillations that we are observing.