Canadian Association of Physicists
Association canadienne des physiciens et physiciennes

Contribution ID: **147** Type: **Oral (Non-Student) / Orale (non-étudiant(e))**

# Validation of plasma drift velocity calculation algorithm

*Friday 13 June 2025 09:45 (15 minutes)*

The paper discusses the validation of a 3D ionospheric drift velocity estimation algorithm developed by the authors. This algorithm will be integrated into the Sanimut system, which is being developed by the Radio and Space Physics Laboratory (RSPL) at the University of New Brunswick as a state-of-the-art, next-generation HF measurement platform. The system is set to replace the Canadian Advanced Digital Ionosonde (CADI) within the Space Weather Ionospheric Network Canada (SWINCan)—a successor to the Canadian High Arctic Ionospheric Network (CHAIN).

Both historical data from CADI ionosondes and data collected during field tests of a Sanimut-based ionosonde prototype were processed to validate the algorithm. A comparative analysis of drift velocities computed using the CADI software and those derived from the proposed algorithm demonstrated similar results. Notably, unlike the standard CADI software, the newly developed algorithm allows for velocity estimations even if one of the receiving channels fails. Additionally, it is designed to support calculations with arbitrarily positioned receiving antennas in 3D space, enhancing its flexibility and applicability.

The accuracy of the drift velocity calculation method was further validated through field tests of the Sanimut ionosonde prototype, conducted at the RSPL site near Blissville, New Brunswick. The validity of the results is supported by the consistency of diurnal drift velocity variations obtained during these tests, which align with simultaneous variations derived by the nearest digisonde, operated at Millstone Hill, Haystack Observatory, Massachusetts, USA. Furthermore, the algorithm was successfully tested at high-latitude SWINCan sites in Eureka and Resolute Bay, Nunavut.

Beyond analyzing experimental data, the study also addresses algorithm validation through computer simulations. The accuracy of the computed drift velocity is examined in relation to key factors, such as the phase difference measurement precision and the signal-to-noise ratio, across a range of expected drift velocity values.

## Keyword-1

Ionosphere

## Keyword-2

Plasma drift

## Keyword-3

Digital ionosonde

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**Session Classification:** (DASP) F1-2 Magnetosphere-Ionosphere Coupling | Couplage magnétosphère-ionosphère (DPAE)

**Track Classification:** Technical Sessions / Sessions techniques: Atmospheric and Space Physics / Physique atmosphérique et spatiale (DASP/DPAE)