



# Examination of ADM/Aeolus statistical characteristics for hemispheric scales and for the Arctic region

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# Context

In 2006-2007, a team from the University of Toronto proposed Aeolus Cal/Val project on evaluating global properties of spatial spectra.

We recently re-engaged in this effort, and this month (13 March) received notice of support from Canadian Space Agency for project led by Fletcher. This project

- Focuses on snow processes in Canada's Arctic and over the sea ice covered ocean.
- Covers CloudSat, Sentinel 3, and ADM/Aeolus.
- Is connected to the Canadian Sea Ice and Snow Evolution Network ([www.CanSISE.ca](http://www.CanSISE.ca)), which Kushner leads.

We are very pleased for the opportunity to contribute to Aeolus. Paul will be at Poster Space #16 to describe this project in more detail.

# Proposal objectives: statistical properties of Aeolus L2B winds

1. Develop validation tools for spectra of horizontal winds from the lower troposphere to the lower stratosphere. Analyze ADM L2B winds in comparison with published or otherwise available spectral characteristics (e.g. NWP model output).
2. Examine ADM-Aeolus derived wind statistics over the Arctic region, in particular in relation to high quality station, sonde and reanalysis products

# Description of CAL/VAL techniques applied

## 1. Horizontal atmospheric spectra:

- Develop atmospheric turbulent spectra emulator based on published observational and modelling literature.
- Sample this statistical atmosphere per Aeolus L2B retrieval approach to derive targets for validation. Test approach on high resolution NWP output and reanalysis. Account for Aeolus quality assurance data and retrievals.
- Recent literature suggests that constraints on 3D wind field can be derived from HLOS winds (see Paul at Poster Space 16 for details).

## 2. Arctic surface winds:

- Compare Arctic surface winds from Canadian station data to ADM PBL statistics, using ensemble of overpasses.
- Examine winds in precipitating synoptic systems over Arctic coastal and sea ice covered ocean regions.
- Examine Aeolus L2B winds in transition from ice covered to ice free regions over Arctic ocean.

# Contribution to Aeolus CAL/VAL requirements: Gross statistical properties

## 1. Atmospheric spectra:

- Assess how theoretical predictions will be impacted by retrieval algorithms for Aeolus, on global scale, from surface to stratosphere. (MR-80, MR-85)
- Monitor spectral characteristics over lifetime of mission. (MR-160)
- Address rotational/divergent winds from PBL to troposphere to stratosphere.

## 2. Arctic surface winds:

- Assess surface/PBL winds for Arctic land and ocean regions. (MR-100, MR-110)
- Note MR document:  
*... observations in the lower troposphere region close to the surface are relatively abundant in the current GOS (e.g. AMV and scatterometer wind vectors and Special Sensor Microwave / Imager (SSM/I) winds), so new DWL wind observations are not expected to have as much impact here as in the free troposphere. – MR Document, p.25.*
- What would we learn by examining transition of surface/PBL wind field from ice covered to ice free conditions in Arctic and sub Arctic oceans?

# Status of manpower, tools and funding

- Funding at CAD80K/year 2017-2020.
- Student or potentially postdoctoral funding.
- University of Toronto postdoc, Dr. Tom Newman (former U. Maryland postdoc with NASA Icebridge).
- Interested in strong wind events after snow fall (redistribution of blowing snow).



## Next steps

- Work with this group to refine project goals.
- Develop spectral emulator with undergraduate and graduate students in the coming year.
- Identify target surface sites in Environment Canada observational network for atmospheric PBL study to complement S. Melo's proposed supersites.
- More than 95 operational Canadian stations poleward of 60N with hourly surface wind and direction data (typically resolved 10 degree bands).
- Consider design of cal/val campaign for PBL winds for sea-ice covered regions of Canadian Arctic?