



U.S. CEDAR Program – Coupling, Energetics and Dynamics of Atmospheric Regions

Chair of the CEDAR Science Steering Committee
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Dear Eric:

The members of the Coupling, Energetics and Dynamics of Atmospheric Regions (CEDAR) science steering committee express our enthusiastic support for the proposed addition of UltraViolet Imagers (UVI) on both of the planned Canadian Polar Communications and Weather (PCW) satellites. As will be demonstrated, the PCW-UVI expected science goals complement those of the CEDAR program, adding unique value to resolving grand challenges within earth's geospace system.

The CEDAR program, funded by United States National Science Foundation (NSF), is an element of the U.S. Global Change Program which started in 1986 to undertake coordinated collaborative studies of the Earth's upper atmosphere and geospace system. Its primary objective is to understand the energetic and dynamic processes that determine the composition and structure of the atmosphere above 60 km, particularly how energy, momentum, and chemical processes from the magnetosphere, and those originating in the lower atmosphere, couple to and affect the mesosphere, thermosphere and ionosphere. CEDAR scientific efforts involve researchers, students and technicians, studying aspects of the upper atmosphere and ionosphere through modeling, data analysis and ground based observations.

The CEDAR program has reached the level of icon status and is recognized around the world as the leading forum for upper atmosphere research. In this role, the CEDAR community is preparing its future research plan. The community recognizes the scientific advancements made and the rapidly changing research landscape. This has led the CEDAR community to take on a more holistic view of upper atmosphere processes. It is the vision of the CEDAR community that the physics and chemistry of the upper

atmosphere be fully integrated with the response and evolution of the whole sun-earth system. Grand challenges within CEDAR are to address questions such as: What makes a planet habitable, variable and sustainable? and How does the sun-earth system influence our space-reliant society?

Resources on the ground and in space will be required to meet these challenges. I understand that the PCW mission is planned for launch in 2016, that its primary objectives relate to tropospheric imaging and to communications in the North, and that the CSA is inviting proposals for Phase 0/A for instruments for a "secondary payload". I am writing this letter, as Chair of the CEDAR Science Steering Committee (CSSC), to express the strong support of the CSSC and myself personally, for your proposal for a Phase 0/A study for UV auroral imaging on PCW.

The PCW UV imagers, with its 24/7 multi-spectral viewing of the northern hemisphere aurora, would provide a continuous estimate of particle energetics entering our earth's upper atmosphere. The energetics of these particles are so influential on the response and structure of the geospace system that the proposed measurements will be in great demand by the international science community. The capabilities of the UVI instruments with a spatial resolution of ~30 km and 15 second temporal resolution would be a significant step forward for global auroral imaging, better than anything ever achieved previously by any project, and the only global auroral imaging project planned for the near future. The PCW-UVI measurements will strongly complement the measurement suite of the ground-based CEDAR community and provide a new data set to constrain modeling efforts. It would provide quantitative estimates of the distribution of energy deposition into the upper atmosphere by the aurora, complementing global information about plasma convection, total electron content, and currents provided by the SuperDARN, GPS, and SuperMAG instruments, respectively. The data would be equally useful for studies of a more localized nature. Just one example would be studies of polar electrodynamics that would be enabled by simultaneous PCW-UVI observations and the new NSF ionospheric radar systems located in Poker Flat, Alaska and in Resolute Bay, NWT.

The recent Canadian partnership of installing another ionospheric radar system in Resolute Bay, solidified this past year, demonstrates the existing strong collaborations among US and Canadian geospace scientists. The CEDAR program is an integral part of the US National Space Weather Program (NSWP) and the unique vantage point afforded by the PCW- UVI over North America will enable continuous unprecedented study of geomagnetic storms and solar effects on the upper atmosphere. This mission will thus provide critical information on storm-induced particle energetics. PCW-UVI will be the premier satellite mission for advancing our understanding of the fundamental drivers of the thermosphere and ionosphere by auroral particles and to advancing models of the space environment.

The CEDAR Science Steering Committee requests that the benefits of adding a multi-spectral UV imager to the PCW mission be given substantial weight as decisions are made concerning the phase 0/A part of the mission. I am confident that PCW-UVI would be important and utilized by the US CEDAR community. Concurring members of the

CEDAR science steering committee were unanimously supportive of this proposal and are listed below, with the exception of Dr. Susan Skone, University of Calgary, given her assumed proximity to the proposal.

Sincerely,

A handwritten signature in black ink that reads "Jeffrey P. Thayer". The signature is fluid and cursive, with the first name being the most prominent.

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Concurring Committee Members:

Dr. Mark Conde, Geophysical Institute, Alaska; **Dr. John Foster**, MIT, Haystack Observatory, **Dr. Tim Fuller-Rowell**, University of Colorado; **Dr. Larisa Goncharenko** MIT, Haystack Observatory; **Dr. Joseph Huba**, Naval Research Laboratory; **Dr. John Noto**, Scientific Solutions Incorporated; **Dr. Meers Oppenheim**, Boston University; **Dr. Mike Ruohoniemi**, Virginia Tech; **Dr. Tony van Eyken**, SRI International; **Dr. Lara Waldrop**, Univ. of Illinois Urbana-Champaign