Science Planning for an International Space Station Lidar Winds Mission

The NOAA/NASA Working Group on Space-Based Lidar Winds is investigating the feasibility and impact of a mission to study dynamical, cloud, and aerosol processes at middle and low latitudes by deploying a wind-measuring lidar on the International Space Station (ISS). As part of preliminary mission planning, the Working Group is soliciting input from researchers or groups interesting in applying the lidar measurements for research, forecasting, analysis, data assimilation, process studies or other important scientific investigations. Ideas and suggestions from interested members of the climate and weather community on innovative uses and potential impact of the unique observational data set will be used to develop the agenda for a two-day workshop on Science Applications of ISS Lidar Winds, scheduled for February 10-11 at the Mayfair Hotel in Miami, Florida. The workshop will follow the Working Group on Space-Based Lidar Winds semi-annual meeting to be held earlier that week at the same site. The primary objective of the workshop will be to bring together interested scientists to discuss and plan how global scale wind profiles observed from space can be applied to impact climate and weather science. Output of the workshop will be an overview science document summarizing the discussions for mission planning. Because of the 52 degree inclination of the ISS orbit, a focus of the workshop will be the applicability of tropical and subtropical wind observations for climate research. Topics to be discussed will include tropical cyclones, monsoon flows, large scale circulations, tropical waves, tropical and subtropical jets, dust layer dynamics and assimilation of space-based wind and cloud observations into analysis/forecast models.

Space-based lidar winds background

Measurement of global wind profiles from space has long been identified as the major missing component in the present-day atmospheric observing system. Because Doppler lidar techniques offer the most promise for obtaining wind profiles globally, efforts to develop a space-based measurement capability have been ongoing for at least two decades. Recent advances in critical technology have made such measurements feasible for the first time, with the European Space Agency planning to launch its Atmospheric Dynamics Mission (ADM/Aeolus) in late 2012. The ADM/Aeolus mission, that will measure profiles of the wind component perpendicular to the nearly polar-orbit satellite track, promises to have a significant impact on weather forecasting for Europe and the United States.

Tropical and sub-tropical dynamics are important elements of the climate system. However, the single-component measurements from the ADM mission are likely to have the smallest impact in the tropics, where the wind field plays a unique dynamical role in forcing the mass field to adjust to it at all scales. Planning is underway to supplement the single component ADM observations at low latitudes by deploying a Doppler lidar system on the International Space Station (ISS) to provide profiles of the two component horizontal wind velocity between approximately 52 degrees N and 52 degrees S latitude. The multi-year mission would produce a data set of wind profiles, along with information on cloud and aerosol backscatter, extending through the troposphere and lower stratosphere below the satellite track at a horizontal

resolution of ranging from 60 to approximately 350 km. These observations, either analyzed directly or assimilated into models, are anticipated to have a major impact on knowledge and understanding of important low-latitude climate and weather processes.

Workshop Planning and Logistics

The Working Group on Space-based Lidar Winds welcomes input and discussion on science applications of lidar-measured global winds and how best to include science objectives in mission planning. Persons with an interest in conducting research with lidar wind and aerosol observations from an ISS lidar instrument and/or participating in the science planning workshop should contact Mike Hardesty (mike.hardesty@noaa.gov, 303-497-6568) or Lars Peter Riiishojgaard (Lars.P.Riishojgaard@nasa.gov, 301- 763- 8172 ext. 191).

The workshop will take place February 10-11 at the Mayfair Hotel in the Coconut Grove section of Miami, Florida. A block of rooms has been set aside at the hotel at the U. S. Government rate of $151.00 per day for workshop participants. Workshop activities will begin on the morning of February 10 and conclude at about 3:00 PM on February 11. The agenda will include opportunities for scientists to present material describing potential uses of ISS Doppler wind data for scientific studies, as well as discussion segments aimed at developing a group consensus on issues such as top science impact areas, instrument design, and data storage and distribution. Because of logistical and space limitations the maximum number of participants will be limited, so it is important to contact the organizers as soon as possible

For more information on lodging and other logistical issues and to register for the workshop, please contact Debra Hallmark (dhallmark@usra.edu).