

ICESat-2 Atmospheric Tutorial

May 31-June 1, 2017

Discovery Learning Betchell Collaboratory, Boulder, Colorado

Details on the event will be posted as they become available on the ICESat-2 Applications website: http://icesat-2.gsfc.nasa.gov/get_involved and to the event website: [https://www.regonline.com/ICESat2 Atmospheric Tutorial CU Boulder](https://www.regonline.com/ICESat2_Atmospheric_Tutorial_CU_Boulder)

Background

In 2007, the National Research Council released the first Decadal Survey for Earth Science. The Decadal Survey provided consensus recommendations on research directions and activities of national importance for the next decade and identified development of applications of satellite data as a priority for all future space-borne missions. NASA's Applied Sciences division responded to this by identifying applications leads for all Tier 1 Decadal Survey missions, including the Ice, Cloud and land Elevation Satellite-2 (ICESat-2) mission. Since 2012, the ICESat-2 applications leads, working in concert with the ICESat-2 mission, have developed a program to improve understanding of how the global earth observations planned for ICESat-2 can be effectively used by different organizations within decision processes that lead to actions with direct societal benefits. **An initiative of the Applications Program, the ICESat-2 Atmospheric Tutorial is designed with the intention of providing an in-depth description of the atmospheric observations planned for ICESat-2 and to identify how these new atmospheric data could be leveraged in combination with data from other satellite instruments to maximize its utility for the atmospheric applied and operational communities.**

Scheduled to launch September 2018, ICESat-2 will be one of the most spatially dense and fine precision instruments for global measurement of the earth's surface elevation. The space-borne light detection and ranging (LiDAR) mission will measure changes in ice sheet elevation, sea ice freeboard, and vegetation height. While not specifically designed to do so, the ICESat-2 mission is also developing products specific to the ocean, atmosphere, and inland water environments to maximize the value of data collected over all of the earth's surfaces. The ICESat-2 Atmospheric Tutorial will focus, specifically, on the planned ICESat-2 atmospheric products for calibrated backscatter profiles, atmosphere cloud and aerosol layer characteristics and blowing snow. **The tutorial will explore synergies and opportunities for combining the ICESat-2 atmospheric data with data sets from the joint European/Japanese Earth Clouds, Aerosols and Radiation Explorer (EarthCARE) mission, which is also expected to launch in late 2018, as well as with data sets from the Clouds-Aerosol Transport System or CATS International Space Station (ISS) instrument and the joint NASA and French Centre National d'Études Spatiales (CNES) Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations (CALIPSO) satellite.**

The EarthCARE mission will provide the first global dataset of vertical profiles of clouds and aerosol characteristics together with vertical temperature, humidity profiles and top-of-atmosphere radiance. As with ICESat-2, it will employ as one of its core instruments a high-performance LiDAR to detect vertical profiles of clouds and aerosols and to derive cloud and aerosol optical depths. In addition, EarthCARE will also use a cloud profiling radar to detect ice

clouds, identify precipitation and vertical motion. **The ICESat-2 Atmospheric Tutorial will be used to gain insights into how, in combination with EarthCARE, ICESat-2 could inform modeling and validation techniques, monitoring capabilities, as well as operational requirements relevant to climate studies and air quality and pollution forecasts. It will also explore synergies with CALIPSO and the CATS instrument.** Launched in 2006, the CALIPSO satellite has been providing key global observations on the altitude of aerosol layers in the atmosphere and on the height of clouds using an active lidar instrument with passive infrared and visible imagers. The CATS instrument serves as a “bridge” between CALIPSO and the EarthCARE mission. As with ICESat-2, CATS is designed to use a photon-counting LiDAR to measure the altitude of clouds and airborne particles.

The ICESat-2 Atmospheric Tutorial will be co-hosted by Ute Herzfeld from the Department of Electrical, Computer and Energy Engineering at the University of Colorado at Boulder. Ute is interested in exploring the use of ICESat-2 derived blowing snow data to increase transportation safety as part of research for the Early Adopter Program. The ICESat-2 Early Adopter program is a key component of the pre-launch applications efforts for the ICESat-2 mission. Early Adopters are groups and individuals who have a direct or defined need for ICESat-2 data, and who have an interest in using products from the mission to inform key decisions. Through the program, early adopters investigate how ICESat-2 data could feed into their operational system or decision processes and provide the mission with valuable insights and feedback on how ICESat-2 can be used for decision support.

Objectives

The one and one-half day meeting, co-hosted at the University of Colorado at Boulder, is intended to bring together experts from the private sector, academe, government agencies, and international partners, to explore innovative ways of combining data sets from different instruments with ICESat-2. The meeting will aim to provide a forum for discussions, exchange of information and ideas, on the development of new joint atmospheric products for applications relevant to operational air quality and pollution forecasting. Panel sessions, thematic break out groups and exploratory discussion on new joint product development are the main focus for tutorials and intend to give opportunity for multi-mission data users to explore ways of developing fused-products of benefit to applied researchers and operational communities.

Goals of the ICESat-2 Atmospheric Tutorial:

- ❖ Communicate the goals and describe the products of the ICESat-2, EarthCARE, and CATS missions.
- ❖ Increase collaboration opportunities with user groups by identifying the challenges and needs of the atmospheric user community
- ❖ Explore potential joint-mission atmospheric products and motivate joint mission efforts

The ICESat-2 Atmospheric Tutorial meeting continues the applications efforts aimed at expanding awareness of the ICESat-2 data products and of providing different user communities with the opportunity to provide direct feedback to the ICESat-2 mission scientists on opportunities for

using and leveraging the use of the planned data products. During the meeting, the ICESat-2, EarthCARE and CATS scientists will provide an overview of their missions. The scientists will outline each mission/instrument spatial coverage, the timeline for data product generation, and how the data products developed from the satellite observations work. The meeting will also include a discussion on the various initiatives of the ICESat-2 Applications Program, including the Early Adopter program. Research by ICESat-2 Early Adopters that have proposed to use the atmospheric data products will also be presented.

1`Workshop Products & Deliverables

Prior to the meeting whitepapers on air quality applications using the ICESat-2 atmospheric data products will be drafted for discussion during the meeting. Other pre-workshop material, such as seed questions, will be made available via email to all participants.