2017 Workshop: MLT dynamics, chemistry, and ion-neutral coupling

Long title
Collaborative investigations of MLT dynamics, chemistry, and ion-neutral coupling using lidars and surrounding cluster instruments
Conveners
Alan Z. Liu
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Description

Recent study shows that significant amount of ionospheric disturbances (more than 30%) are due to sources in the lower atmosphere. MLT region, where the atmospheric gravity waves become unstable and tidal waves amplitude increases dramatically, is the key conjunction for ion-neutral interactions. Lidar measurements in the past have helped answer may fundamental dynamical questions in the MLT, but also raised new questions as the instrument capabilities increase. A single instrument is unable to address the whole aspect of these complex problems. Therefore, more comprehensive measurements through collaborative campaigns with other remote sensing instruments, ground-based and/or spaceborne, are essential to almost all geophysical investigations. The goal of this workshop is to encourage colleagues to join these collaborative and coordinated investigations and propose new science topics and approach.

Agenda

Wednesday 13:30 - 15:30 Torreys I & II

13:30-13:35 Alan Liu (5 min) Introduction

13:35-13:50 Mike Taylor (15 min): Large-Amplitude Mesospheric Mountain Wave Development and Momentum Fluxes During DEEPWAVE

13:50-14:00 P-D Pautet (10 min): A new collaborative project in the lee side of the Southern Andes

14:00-14:15 Katrina Bossert (15 min): Gravity Wave Coupling Between the Stratosphere and MLT observed during the DEEPWAVE campaign

14:15-14:30 Christopher Heale (15 min): Numerical Simulation of a multi-scale gravity wave environment and its airglow signatures as part of the DEEPWAVE campaign

14:30-14:45 Yafang Guo (15 min): Turbulence Studies in the Mesopause Region with ALO Na Lidar

14:45-15:00 Richard Collins (15 min): Super Soaker: Transport, Chemistry, and Energetics of Water in the Mesosphere and Lower Thermosphere and Implications for Polar Mesospheric Cloud Occurrence

15:00-15:15 Xuguang Cai (15 min): Numerical Investigation on tidal and gravity waves contribution to the summer time Na density variations in mid-latitude E region

15:15-15:30 Vince Eccel (15 min): Bottomside Ionosphere with Winds, X-rays, and Metals BIWXM

Justification

The coupling and interaction processes between the lower and upper atmosphere, as well as those between the neutral atmosphere and ionosphere in the D and E regions are both recognized in the recent Decadal Survey in Solar and Space Physics by National Academy of Science as the key processes in the underlying Atmosphere-Ionosphere-Magnetosphere Interactions (AIMI). Lidar techniques have greatly advanced the understanding of these processes through its direct neutral temperature and wind measurements. Working as the core instruments at three facilities: the Andes Lidar Observatory (ALO) in Chile (30°S, 71°W, elevation 2530 m), the Arctic Lidar Observatory for Middle Atmosphere Research (ALOMAR) in Norway (69°N, 16°E, elevation 379 m), and the Utah State University (USU) in Logan, UT (42°N, 112°W, elevation 1463 m), the three Na lidars have been contributing high quality data to the CEDAR community for various studies on fundamental dynamics and chemistry in the upper atmosphere. With updates and extended capabilities, the new lidar measurements are expected to further benefit the community’s investigations on these critical processes. The workshop aims to highlight the science achievements over the past a few years and discuss plans for future collaborative observations with the surrounding instruments, including

ionosonde, radar, Rayleigh lidar and nightglow instruments etc. to address new science topics comprehensively.

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