2015 Workshop: MLT X Grand Challenge

Long title
Grand Challenge: Coupling and Transport Processes from the Upper Mesosphere through the Middle Thermosphere (80-200 km)
Grand Challenge
Conveners
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Description

This year the MLT-X (80-200 km) Grand Challenge Workshop will focus on acquiring the observational data necessary to address the key science challenges of the initiative; 1) What is the role of the neutral gas in coupling with plasma to establish the predominant state of the Eath's upper atmosphere and ionosphere between 80 and 200 km? and 2) How do wave-induced transport and turbulence influence the structure, composition and circulation of the Earth's upper atmosphere between 80 and 200 km? The observational capabilities of key state-of-the art instruments (optical, radar and in situ) will be described and the merits of organizing a major observational campaign utilizing these instruments, at one or more key sites,to address the MLT-X science goals, will be discussed. The goal is to develop an observational strategy and implementation plan that would enable significant progress to be made in characterizing and understanding transport processes and plasma-neutral coupling in the MLT-X region.

Justification

The natural upward extension of the Earth’s atmosphere ultimately leads to its interaction with space, where atmospheric neutral gasses become entwined with the dynamic plasma of space. This space-atmosphere-interaction region (SAIR) is common to all planetary systems, yet its properties, and the processes that govern them, are not sufficiently described to fully understand its role in an atmosphere’s development and evolution. The least understood and sparsely observed are the properties of the thermosphere neutral gas between 110 and 200 km. This middle thermosphere region is a controlling factor in many important processes of the

upper atmosphere. Unfortunately, there is no set of observations that adequately captures the neutral gas properties in this region, however, whole atmosphere model simulations have begun to illustrate the importance of understanding this region. This Grand Challenge Workshop will focus on establishing the measurements, theory, and modeling of the neutral gas needed to address a broad class of processes in the 80-200 km region. To provide focus, the Workshop will concentrate on two processes that have profound effects on planetary atmospheres everywhere and, in particular, on Earth; 1)Plasma-neutral atmospheric coupling and 2) wave-induced transport and turbulence.

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