2013 Workshop: Exploring Commercial Suborbital

Long title
Exploring mesosphere-lower thermosphere (MLT) applications for commercial suborbital spacecraft
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Description

The commercial space industry is rapid advancing reusable suborbital spacecraft capabilities. While these companies originally targeted space tourism they are now aware (largely through the work of community scientists) of potentially significant research and educational applications. These vehicles will achieve altitudes up to 110 km which make them uniquely suited for providing in situ access to the mesosphere-lower thermosphere (MLT) of Earth's atmosphere.

This region covers the colloquially named "Ignorosphere" because it is not easily accessible due to logistical constraints: too high for conventional aircraft and balloons, too low for orbiting satellites. Quantifying spatial and temporal variability has been a particularly significant challenge. Multiple companies are currently developing (and testing) various manned and unmanned spacecraft designs that could provide low cost (<$200k per mission) and daily (or more frequent access) to this region with payload capacities exceeding 650 kg. Additionally, the potential low cost of smaller payloads (<$5K) offer unprecedented educational opportunities. Most of these vehicles are currently conducting test flights from the Mohave Spaceport in California however, numerous spaceports are planned at multiple locations around the world. Thus, not only do these vehicles offer in situ access to the MLT region but could also be used to perform joint observations with ground based facilities such as Arecibo and SuperDARN.

NASA has already selected payloads for test flights on these spacecraft. With several companies anticipating operational flights within a year or two now is the time for scientists to explore ways to apply this potentially revolutionary advancement in low cost access to near space. We encourage participation from community members to discuss anticipated capabilities and explore what measurements can be made to help us better understand this region in general. Determination of specific (such as high altitude lightning, sprites, nocti-luminescent and polar-mesospheric clouds) and broad based (and coordinated) research applications that can greatly benefit from low cost frequent access to 60 km -110km is a priority of this workshop. The long term goal is to help establish a long term plan for a persistent program to fully exploit these new capabilities. Such new capabilities could open up entire new areas of atmospheric research and education so we hope to help facilitate the transition. Additionally, we wish to determine how to leverage these new spacecraft for helping to sustain and grow current facilities.

Justification

The goal of this workshop is to help define the applications of commercial suborbital spacecraft for in situ observations of the mesosphere-lower thermosphere (MLT). Commercial sub-orbital spacecraft will offer unprecedented in situ and remote sensing opportunities with frequent low-cost access to the region of space between ~80 km to ~110 km. This region is difficult to study because it is too high for aircraft and balloons and yet too low for orbital satellites. While some observations of this region exist from sounding rocket missions, low-cost, frequent commercial spacecraft missions promise to dramatically improve our understanding of this critical and physically complex transition region. The result of such applications will help explore the boundaries between 60km -100km as well as develop concepts for instrumentation and observations using these spacecraft. Thus CEDAR Thrusts #2 (Explore exchange processes at boundaries and transitions in geospace) and #4 (Develop observational and instrumentation strategies for geospace system studies)are directly addressed in this workshop.

Our approach focuses on immediate community involvement because some of these spacecraft companies are anticipating operational flights within a year or two. Therefore, scientists need to start exploring the new research opportunities enabled by these vehicles so efforts can begin to assemble and develop the required instrumentation. Such preparation will not only position the scientific community to quickly begin scientific research but also provide feedback to the spacecraft

companies to allow for better accommodation of scientific investigations. Early community involvement with these new vehicles not only facilitates near term scientific investigations but also assists with establishing the long term viability of a US commercial space fleet which will likely increase research capabilities in ways we are only beginning to understand. Through this workshop, we hope to help this process move forward.

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