Title: Recent advances in High Altitude Pseudosatellites (HAPS) and potential roles in future earth observing systems.

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Abstract:

In August 2001 the NASA Environmental Research Aircraft and Sensor Technology (ERAST) Program flew the Helios aircraft to an altitude of nearly 100,000ft, demonstrating a new type of remote sensing platform. Nearly 20 years later the earth science community has unmet observational requirements to loiter over regions of interest for days or weeks as well as to follow airmasses to study chemistry and dynamics in concert with spaceborne observations. Recent advances in materials science and engineering have enabled improved battery power density, solar panel efficiency, and light yet strong structural materials required to effectively operate high-altitude (50-70k ft altitude) Pseudo-Satellites (HAPS) for 30+ days. The rapid commercialization of small unmanned aircraft has also contributed to the maturation of HAPS by making avionics, GPS, and other sub-systems smaller and less expensive. HAPS payloads provide high-resolution data that complement geostationary and polar orbiting satellites, while also enabling in-situ sampling of atmospheric chemistry and dynamics. Recent commercial interest in HAPS for 4G/5G and WIFI has funded development of a new generation of aircraft available to the science community. Here I report on a project under the NASA Airborne Science Program to test and demonstrate earth observations from a prototype aircraft being developed under a NASA Small Business Innovative Research Phase II. This aircraft will demonstrate the ability for a solar electric aircraft to deliver a 2u cubesat-based passive optical imaging satellite to 70,000ft for 30 or more days. Discussion will include the anticipated maturation timeline for HAPS, development and operational challenges, and examples of mission concepts that might contribute to future earth observing systems.