Small Satellites and NASA Earth Science

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The Earth is a complex, dynamic system of which we lack full understanding. It comprises the atmosphere, lithosphere, hydrosphere, cryosphere, and biosphere as components interacting in complex ways as a single connected system. In addition, our planet is in continuous change on all spatial and temporal scales. The purpose of NASA's Earth science program is to develop a scientific understanding of the Earth system and its responses to natural and human-induced changes, as well as to improve prediction of climate, weather, and natural hazards. A major component of NASA's Earth Science Division (ESD) is a coordinated series of satellite and airborne missions for long-term global observations of the land surface, biosphere, cryosphere, solid Earth, atmosphere, and oceans. The ESD's Flight Program provides these space based and airborne observing systems and ground infrastructure for mission operations and scientific data processing and distribution. The Flight Program currently has 20 operating Earth observing space missions. There are 22 more missions and instruments planned for launch over the next decade. These include missions from the U.S. National Research Council's 2007 Earth Science Decadal Survey, Climate Continuity missions and selected instruments to assure availability of key climate data sets, operational missions to ensure sustained land imaging provided by the Landsat system, and small-sized competitively selected orbital missions and instrument missions of opportunity belonging to the Earth Venture (EV) Program. Small satellites (~500 kg or less) are critical contributors to these current and future missions. Some examples are the Orbiting Carbon Observatory-2 (OCO-2) and the Gravity Recovery and Climate Experiment Follow On (GRACE FO) minisatellite missions, the Cyclone Global Navigation Satellite System (CYGNSS) microsatellite constellation, and the TROPICS nanosatellite constellation. ESD is evaluating the feasibility of obtaining EO information products from non-governmental small satellite constellations. Microsatellites and nanosatellites support space validation and risk reduction of enabling instrument and other technologies. ESD is working with NASA's Launch Services Program to develop a class of small launchers to provide dedicated access to space for future small satellite missions. The status of these activities and the role of small satellites will be discussed.

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