

IAF EARTH OBSERVATION SYMPOSIUM (B1)
International Cooperation in Earth Observation Missions (1)

Author: Ms. Veronica Foreman
Massachusetts Institute of Technology (MIT), United States, vforeman@mit.edu

Dr. Afreen Siddiqi
Massachusetts Institute of Technology (MIT), United States, siddiqi@mit.edu
Dr. Olivier de Weck
Massachusetts Institute of Technology (MIT), United States, deweck@mit.edu

FROM INTERNATIONAL SPACE STATION TO INTERNATIONAL CONSTELLATIONS: A NEW
PARADIGM FOR COOPERATION FOR EARTH OBSERVATION?**Abstract**

Since its inception in 1998, the International Space Station (ISS) has represented a tremendous feat of engineering and international collaboration. With the space station as a shared objective, the 15 partner nations that have supported its development have shaped technical innovations and global space policies. The extent to which it was conceived, financed, and operated as an international effort offers unique perspectives that can be leveraged in future Earth science missions. In this work, we assert that those perspectives can offer particular guidance for future Earth science satellite constellations, which are entering an era of unprecedented technical capability. These missions provide data that is critical to understanding global phenomena, and the resultant scientific insights can extend far beyond the borders of the sponsoring nation. Given recent advances in low-cost small satellites, Earth science constellations represent a unique platform for international collaboration that includes emerging space nations seeking to foster program growth.

There is some precedence for the use of multinational Earth science constellations in facilitating both research and cooperation. The Afternoon Train, focused on studying various aspects of Earth's climate, has included seven satellites since the launch of the first member spacecraft in 2002, and NASA, JAXA, and CNES have all played critical roles in developing and managing the constellation. Some spacecraft within the constellation have also been collaborative efforts, but as NASA notes, the true value of the constellation derives from the complete system: "The real advantage of constellation flying... is that the data from the various satellites are synergistic and can be combined together to allow for even more comprehensive studies of climate" [1].

Within this work, we identify lessons and parallels that can be drawn from the ISS for new models of international cooperation using LEO constellations, and discuss the degree to which those patterns are already emerging in existing constellation systems, such as the A-Train. We leverage data from the NASA Space Science Data Coordinated Archive and the Federal Aviation Administration's STAR database to identify additional examples of international collaboration on Earth science constellations. In conclusion, we discuss the applicability of the legal framework developed for the ISS to future international constellation missions, highlighting areas that may need further definition to ensure the continued safe and effective use of LEO constellations for Earth science research by both well-established and emerging space nations.

1. Platnick, S. (Ed.). (n.d.). The Afternoon Constellation. Retrieved March 08, 2018, from <https://atrain.nasa.gov/intro.php>