24th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Small Space Science Missions (2)

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THE QB50 MISSION FOR THE INVESTIGATION OF THE MID-LOWER THERMOSPHERE: PRELIMINARY RESULTS AND LESSONS LEARNED

Abstract

CubeSats are settled as a powerful tool for a new class of flexible, low cost space missions which are respected by academia and the space industry. They serve many objectives, from educating young space engineers through hands-on design to an application in commercial/military and even exploration missions. The QB50 project was conceived 6 years ago with the objectives to facilitate access to space for future CubeSats' missions, to carry out unprecedented science and to demonstrate new space technologies. More than 30 Universities around the world joined the QB50 Consortium, led by the von Karman Institute for Fluid Dynamics in Belgium, and they have contributed to the mission with their CubeSats. All these CubeSat, that now close to the launch pad and ready to be launched in spring 2017, they will carry on board one of the three sets of scientific instruments provided by the Mullard Space Science Laboratory, including an ion/neutral mass spectrometer (INMS), a flux probe for atomic/molecular oxygen (FIPEX) and a multi-needle Langmuir probe (mNLP). The two driving forces of the QB50 mission are the unprecedented opportunity to explore the largely inaccessible mid/low thermosphere with a constellation of nano-satellites and the unique international collaboration in space research. In particular, the constellation will be deployed by two consecutive launches at altitudes between 520km and 400km. These fragmented sensors will offer the opportunity to investigate the thermosphere with an unprecedented spatial and temporal resolution through multi-point measurements of the gas composition. The paper offers both the view on the different technical/scientific challenges of the QB50 project and a collection of all the lessons learned accumulated during the last 6 years. These lessons learned are not only a synthesis of the heritage on experience on CubeSat design, testing and assembly but also a summary of the experience built up at the von Karman Institute during the coordination of an international constellation of nanosats. In spring 2017 (launch dates are March 19th and April 21st) the whole constellation will be deployed in space and in addition to the lessons learned the first measurements will be presented.