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BIRDS-4 SATELLITES CONSTELLATION: APRS MISSION PRELIMINARY RESULTS FOR REMOTE DETECTION OF TRIATOMINES IN THE PARAGUAYAN CHACO.

Abstract

Until March 2021, Paraguay was the only South American country that did not have a satellite in space. The transition from its non-space faring nation status began in 2018 after joining the Joint Global Multi-National Birds or BIRDS program, a multinational small satellite project led by Kyushu Institute of Technology (Kyutech) in Japan. The BIRDS program gives non-space faring nations the opportunity to design, integrate, build, test, launch, and operate their country's first satellite. The fourth edition of the BIRDS program (BIRDS-4) is developed by Kyutech jointly with the Paraguay Space Agency (AEP) and the University of the Philippines Diliman (UPD). It consists of three CubeSats, GuaraniSat-1 (Paraguay's first satellite), Maya-2 (Philippines), and Tsuru (Japan). All three satellites have the same design and among nine missions, one of them aims to collect data from ground sensor terminals (GST) and transmit it to a database storage server via satellite link. The GST comprises traps to detect the presence of arthropod insects in a remote indigenous village of the Paraguayan Chaco, where the insects that spread Chagas disease are persistent to infest the area. This paper describes the satellite mission design considering the space segment and ground segment, operation concept, initial operational results, lessons learned and the background of Paraguay's participation in the BIRDS-4 project. This paper also investigates technical challenges through experiments on appropriate data format and multiple access schemes while complying with limited operational time and power constraints using the APRS protocol, such that if proven successful, will be used for future satellite missions to gather data in remote areas.