

22nd IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
16th Workshop on Small Satellite Programmes at the Service of Developing Countries (1)

Author: Mr. Luis Carlos Rosales Alpízar
Costa Rica Institute of Technology (ITCR), Costa Rica, luis.carlos.rosales@gmail.com

Dr. Julio Calvo-Alvarado
Costa Rica Institute of Technology (ITCR), Costa Rica, jucalvo@itcr.ac.cr

Ms. Ana Julieta Calvo-Obando
Costa Rica Institute of Technology (ITCR), Costa Rica, ajcalvo@itcr.ac.cr

Mrs. Arys Carrasquilla-Batista
Costa Rica Institute of Technology (ITCR), Costa Rica, acarrasquilla@itcr.ac.cr

Mr. Carlos Alvarado
Central American Association for Aeronautics and Space (ACAE), Costa Rica, carlos.alvarado@acaeca.org

Mr. Adolfo Chaves Jimenez
Delft University of Technology (TU Delft), The Netherlands, a.chavesjimenez@tudelft.nl

ADVANCES FOR THE FIRST CENTRA-AMERICA SATELLITE: PROVIDING SOLUTIONS TO THE
CHALLENGES OF ENVIRONMENTAL MONITORING IN TROPICAL DEVELOPING COUNTRIES

Abstract

Tecnológico de Costa Rica (TEC) is a public university dedicated to research on multiple science and engineering fields. Over the last 15 years, TEC's forestry engineering department has conducted field research on the reaction and adaptation of tropical forest ecosystems to the climate change variations. Researchers have monitoring stations installed over vast protected areas with difficult access which challenges the data retrieval after long ground trips to remote locations, often facing problems such as valuable pieces of information missing due to data loss, not to mention maintaining sensing stations operational using batteries, solar cells among other resources. In parallel, TEC's electronics computers engineering department has an increasing interest in providing low cost power efficient applications for remote data collection and monitoring by using free software and hardware resources. A third branch joins this project through the TEC-ACAE (Central America Space and Aeronautics Association) agreement, which aims to boost the development of aerospace science and engineering capabilities in Costa Rica. This year (2015), both: Scientific and Engineering departments have started a joint effort under TEC's sponsorship, which intends to design and produce a series of self-sustainable wireless sensor networks, able to collect scientific data from different sensors located in remote protected forest areas from Costa Rica's territory and transport it by using a data-relay service provide by Costa Rica's first CubeSat mission, currently under development. This project's ultimate goal is to demonstrate how the use of low-cost technological applications combined to reduced costs of CubeSat space missions can accelerate and improve the impact of this type of research, allowing scientists to have access to near real-time data to monitor climate change effects on key forest indicators such as vegetal mass growth, photosynthetic active radiation, soil moisture, temperature, rainfall and carbon dioxide concentration. First stage of this project is targeted for a 3-year execution cycle, ending with a results and impact analysis which may enable another 3-year stage to replicate ground research and engineering results on wider territory areas, studying different types of forest and vegetable species as well as to replicate the space segment results by planning, conducting and cooperating with other small satellite missions.