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SHAAKE- A CUBESAT MISSION BY YORK UNIVERSITY TO MEASURE AIRGLOW AND TO VERIFY ITS POTENTIAL AS AN EARTHQUAKE PRECURSOR

Abstract

SHAAKE stands for Space-based Hardware for Airglow and Advanced Knowledge of Earthquakes. It is a CubeSat mission that is currently under development at York University for its entry into the Canadian Satellite Design Competition. In the paper, the mission, the science, the team and the York University Space Engineering program are outlined. The CubeSat is described with evaluations of each sub-system. The primary mission of the CubeSat is to measure airglow. A modified CCD camera with a custom filter is used as the airglow camera which will be observing the ionosphere at the Earth limb over the range of 125km to 525km. Emissions at a wavelength of 630nm are recorded. This data is processed for airglow anomalies. There is growing evidence that small airglow perturbations are related to seismic activity such as earthquakes. The secondary mission of SHAAKE is to verify if it is possible to use this phenomenon to predict earthquakes. This mission will also study the atmospheric tide which is a large scale non-migrating and eastward propagating wave visible in airglow. A CMOS camera is flown as an additional payload which will take pictures of the Earth and assist in determining satellite attitude. A cellphone application has been developed which will download the pictures taken from the camera, these can be viewed by consumers on their hand held devices.

An insight into the sub-system management, design changes and the milestones is provided. Students from a wide range of disciplines such as engineering, atmospheric chemistry, Earth-plate dynamics, mechanical and electronic system design, material fabrication and testing are involved in this project. Lessons learnt from pitfalls and problems encountered during development in the areas of financial management, resource allocation, payload selection, marketing and outreach, and design review will be discussed. These are lessons that are often difficult to teach in the classroom and only emerge in projects of this nature.

This mission provides an interdisciplinary, cooperative and educational environment, and a platform to help apply these skills and knowledge for the benefit of the community.