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ISS-based STEM Research Examples for the Earth Sciences

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RCEU Summer 2016 Project Proposal

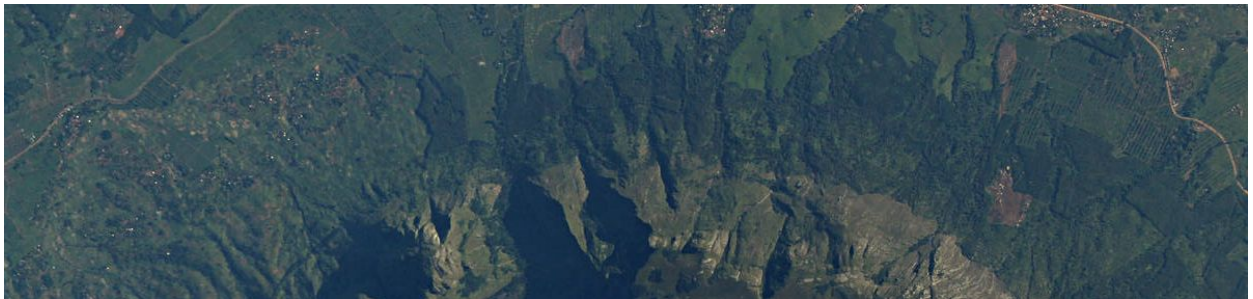
Title: Developing ISS-based STEM Research Examples for the Earth Sciences

Faculty Mentor:

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Project Summary:

This project will center on the use of coincident data sources from the International Space Station for the development of research tutorials in the Earth sciences. Here at the National Space Science Technology Center (NSSTC) on the UAH campus we have multiple projects which focus on the use of the ISS for data collection through UAH and NASA partners. Two data collection platforms are particularly applicable and will be the focus of study this summer; these are ISERV and EarthKAM, operated by NASA and US Space and Rocket Center/UAH respectively. Over the summer, the student will become familiar with these two imaging platforms, learn how to access their data, and how those data can be used to address current environmental issues on Earth. After learning what the data are, and how to work with them, the student will assist with the development of research tutorials intended to support the fusion of these two data sources for a variety of environmental and social science studies. The figure below show some examples of imagery collected by the EarthKAM sensor over Australia (top) and the ISERV sensor over Africa (bottom).



Student Duties:

To ensure that the student has the appropriate background to conduct the research, the 12-week summer term will be divided into three phases, scaling up from basic review of contemporary issues in Earth sciences, to learning and practicing GIS and satellite remote sensing skills, to finally working to come up with creative ways to use satellite-based assets for STEM labs, curriculum development and engagement.

First phase: The student will work with Dr. Griffin to review the range of current environmental issues relevant to the Group on Earth Observation (GEO) societal benefit areas: Disasters, Health, Energy, Climate, Agriculture, Ecosystems, Biodiversity, Water, and Weather. We will focus in particular on one of more examples from each area which can be addressed with satellite and remote sensing imagery. In this first phase, the student will review a range of problems and, with Dr. Griffin's support, will select the ones they will focus on for research tutorial development.

Second Phase: The student will learn basic GIS techniques and satellite remote sensing principles, focusing on how such concepts can be illustrated in guided labs. The student will also talk to partners at NASA and the USSRC to understand how the platforms operate and what types of information they have and can provide. Using both open-source and UAH-licensed software, the student will learn how to process and derive useful information from these datasets, as well as how the acquisition of coincident multi-sensor data can be fused.

Third Phase: In the final phase the student will select individual examples of imagery from both EarthKAM and ISERV which have coincident overpass dates and will compare their usage using standard image processing techniques. In particular we will focus on the development of research tutorials using these data for the above-noted societal benefit areas, which will ultimately be compiled into a research tutorial package ready for Earth science students and instructors.

Benefit to the Student: The student will get exposure and training on a wide range of datasets and software packages, including ArcGIS, ENVI (+FX), and Zotero; the student will have the opportunity to work as part of an active research team in the Earth sciences, interacting and getting ideas from other undergraduate and graduate Earth science students; the student will also learn how to structure a research question and design to address a question in the Earth sciences; finally, past students who have worked on these projects with Dr. Griffin have gone on to get GRAs through UAH, NASA, and other universities as well as follow-on internships at NASA and elsewhere.

Student Contribution: The student will be responsible for developing tutorial materials and designing research questions for use with ISS datasets. The student will work jointly with graduate students and Dr. Griffin on these projects.

Faculty Supervision and Interaction:

The student will be supervised throughout the duration of the project by Dr. Robert Griffin. Dr. Griffin has a PhD in environmental anthropology and has worked in the vein of applied GIS and remote sensing in the Earth sciences over a decade. The student will be assigned a fully-equipped computer in the department's geospatial analysis lab with which to conduct his/her research. Supervision by Dr. Griffin will take place at the NSSTC facility where he and the student will establish best methodologies and review progress in weekly team meetings. Finally, Dr. Griffin's graduate assistants located in the NSSTC's Human Dimensions, Discovery, and Decision-Making Lab (HD3) will be present throughout the summer and will be available to assist the student as he/she moves through the phases of the proposed analysis.