F22.024: Discovering Active Asteroids with Citizen Scientists

Faculty mentor: Chad Trujillo

Overview

The main goal of this project is to identify Active Asteroids in public data. Of the ~750,000 main belt asteroids, there are ~30 known Active Asteroids. Of the several possible causes of activity, by far the most interesting is the possibility that water ice sublimation could be involved. These water-driven Active Asteroids are important scientifically because they could help explain the origin of the Earth's water. Main Belt Comets evolve dynamically into unstable orbits which become Earth-crossing leading to meteor fall. If a large percentage of asteroids harbor water ice in their interior, it is possible that a significant fraction of the Earth's oceans originally hailed from the Asteroid Belt. Water ice in the main belt would be an important resource for future space exploration since water can be used to support human activity and as an in-situ source for spacecraft propellant. In this project, we will do the following. (1) Continue a search of all asteroids imaged in the public Dark Energy Camera (DECam) dataset to find evidence of activity (comet-like tails) - about 300 terabytes of images. (2) We will ask for help from Citizen Scientist volunteers to examine the data, a project we have already begun to roll out at http://activeasteroids.net. We will also (3) conduct an observational follow-up campaign using telescopes in Arizona to confirm if newly discovered Active Asteroids show activity.

What the student will DO and LEARN

The student will help with two aspects of the project. First, the student will engage with Citizen Scientist volunteers online at http://activeasteroids.net/ when new datasets are deployed to answer questions and provide feedback for the Citizen Scientist volunteers. Secondly, the student will help conduct our observational follow-up campaign to confirm activity that has been identified by the Citizen Scientists. This will entail taking images of the Active Asteroid candidates to see if a tail is still present. This will primarily use the 1.8 meter diameter Vatican Advanced Technology Telescope atop Mount Graham, AZ (about 300 miles from NAU) and the 4.3 meter diameter Lowell Discovery Telescope near Happy Jack, AZ (about 40 miles from NAU). The student will learn how to interact with Citizen Scientist volunteers and will learn how to use a professional grade telescope along with other members of our research group.

Additional benefits

This work will eventually be published in a peer-reviewed journal and will be the subject of a conference presentation. We expect that the student's work will be involved in both.

Additional qualifications

The intern should be familiar with basic astronomy in order to understand the larger context for the project. The intern must be proficient in social media. Experience in advanced computing environments is very beneficial, especially Linux/Unix experience.

Time commitment

6 hrs/week for 30 weeks