"BUILDING THE FOUNDATIONS FOR STUDENT OBSERVATIONS USING NASA'S DEEP IMPACT SPACECRAFT"

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Educational Purpose of this Project

• In the classroom students are often given classical physics problems.

• Students want and deserve to work on real world problems.
The proposed program

• There are 3 phases for implementation of the student run observation using the DI equipment.

• Each Phase gets progressively more complex and becomes more independent in regards to student participation.
Phase 1: “Eye Candy”

• Public is allowed access to raw data.
• Students are encouraged to compile the images and communicate with other aspiring scientists via a public mission site and/or blog.

Member: machi
Member: NGC3314

Courtesy of UnmannedSpaceFlight.com
Phase 2: Target Selection

• Public (Students) are given several targets to choose from.
• Discussion between students occurs for 2 – 4 weeks.
• DI Team will make selection based on survey results of targets.
• Students will then conduct a process similar to Phase 1.
• Student will produce a brief summary of their findings on the public website.
Phase 3: Field Proposals from Students

- Students write a proposal for conducting scientific observations of exoplanets and other deep space objects.
- DI Team will select one of the proposed missions.
- Team selected will receive the data form this observation 6 months before it is made public.
- Students will have the opportunity to publish their results as a CO-I researcher in a journal (i.e. Astronomy Education Review or The Astronomical Review)

Making the Connection
Lesson Plans for Phases 1 and 2

• There were two routes in terms of using the archived images provided by the science team.
• Image processing (making a color photo)
• Image analysis (generating light curves)
Image Processing

- Not just pretty pictures. (Composition Maps)
- All images produced by the spacecraft are in a 16 bit FITS format

Colored image processing requires

- Stacking software capable of opening and manipulating 16 bit FITS
- Software that is capable of reducing the noise from cosmic rays
- Example Software: GIMP, Registax, FITS Liberator, Photoshop, Nebulosity
Good:
• Light curves are very useful in terms of characterizing the orbits and atmospheres of exoplanets.
• High Student Interest

Bad:
• Light curves are hard to make!!!!
Image Analysis

• Solution: Use previously composed light curves that are available via the Deep Impact Science Team.

• With the data that is archived by the DI Science Team I was able to make 3 activities that relate light curves to Kepler’s 3rd Law.
General Guideline for Phase 3

- “Eye Candy 2” modeling the guidelines for student observations
- Two objects NGC 3690 and M82 will be observed on 8/22

Things to consider when creating a science campaign
- Scientific purpose of observation
- Objects available based on spacecraft's location
- Angular size of object and amount of pixels covered on CCD
- Memory necessary for capturing images
- Time for downlink to Earth
Conclusion

• Phases 1 and 2 could be implemented without any major work.

• Educators have two options in terms of using the data provided by the DI Flight and Science Teams.

• This program is recommended for the time that teachers have after state testing is finished.

• Phase 3 is challenging yet highly rewarding for a high school student
Future Work

• Setting up a website that allows students and educators to work collaboratively with scientists.
• Phase 3 is very demanding and would take a lot of work on the part of educators if this is going to succeed.
• Creating more structure for the activity since it is time consuming in an educational world governed by standardized tests.
• Processing “Eye Candy 2” images
References


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