

Joining the 18.9 Mile High Club

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COLLEGE *of*
CHARLESTON

South Carolina Space Grant Consortium

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Department of Geology and Environmental Geosciences

South Carolina



SPACE GRANT



- The South Carolina Space Grant Consortium (SCSGC) was founded in 1991 and currently has 15 member campuses across the state of SC and the University of the Virgin Islands.
- SCSGC has developed competitive and open programs that encourage a broad spectrum of participation in NASA related research and exploration activities.
- The Consortium offers a wide range of education services from faculty and student research awards to pre-college student activities.

A New Project

- In 2009, SCSGC was looking for a new and innovative way to get students involved in research and development.
- The desired activity would be one that would immerse students in “hands-on” learning while they worked with NASA related research and faculty mentors.
- It was decided that involving the students in a high altitude ballooning program would not only meet those goals, but sounded like a fun idea as well.
- The program’s purpose is to provide students across SC the opportunity to “Design / Build / Fly” science experiments.

FLY TO THE EDGE OF SPACE...

- **DESIGN** your experiment
- **BUILD** your payload
- **FLY** your pod to the edge of space.
- Position yourself for the new challenges of NASA-related research and employment.

▪ *Join the 18.9 mile-high club...*

<http://www.cofc.edu/~scsgrant/research/balloon.html>



SUMMER 2009

South Carolina



South Carolina Space Grant Consortium

High-Altitude Balloon Program

SPACE GRANT

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Proposals

- The competition is open to all students who have an interest in high altitude ballooning.
- The SCSGC did not want to limit the competition to strictly engineering departments and wanted to cultivate the creativity and imaginations of students from a diverse range of disciplines.

Proposals

- SCSGC's program is designed around a yearly competition of student proposals

Awards: Research money awarded by the SC Space Grant Consortium will be administered through your faculty mentor. The full research award amount is \$5,000. You will need to include a budget breakdown with your application – an example is included below (this is just an example – you may do whatever you feel is appropriate; however the reviewers will be looking at the distribution of funds and appropriateness of that distribution).

****If you need or would like assistance with the budget, please feel free to contact the SC Space Grant office at 843.953.5463; we are more than happy to help!****

Budget Item	Amount
Student stipend	\$2,500
Supplies (circuit boards to run sensor, sensor, batteries, data analysis software)	\$1,500
Faculty Mentor time	\$500
Travel expenses for conference presentation	\$500

when project. Students can use the stipend entirely on equipment, as travel funds to conferences, faculty honorariums, or as money to use towards their education.

Proposals

- Proposals are sent to faculty who have volunteered from Colleges and Universities with existing ballooning programs to act as outside reviewers.
- Once the reviews have been collected the top 4-5 applications are selected by the SCSGC to become part of the program.
- The entire application process can be found on the SCSGC's High Altitude Ballooning Program website

<http://spinner.cofc.edu/~scsgrant/research/balloon.html>

Equipment

- Since SCSGC was new to the world of high altitude ballooning, we worked with StratoStar Systems to purchase our equipment and to have them travel down to Charleston, SC so that they could train our staff on managing a balloon flight.
- StratoStar Systems also provided technical support to SCSGC during all phases of the project.



SCSGC Balloon Launches

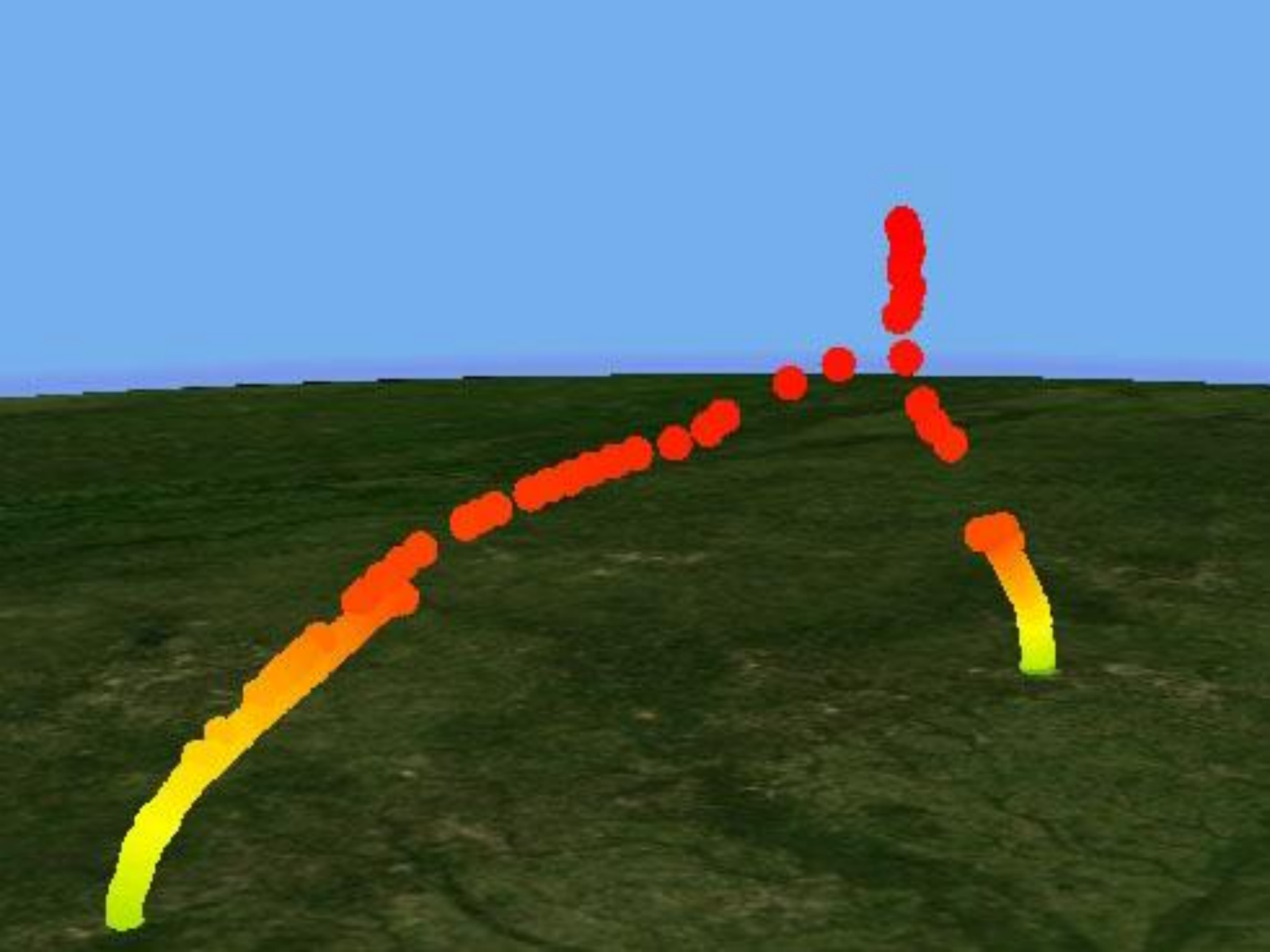
- This talk is designed not to discuss in detail the specifics of each student's project, but to mention the different types of experiments that the SCSGC was able to fly during our high altitude ballooning program.
- The SCSGC recognizes that this program differs in scale and variability of other programs, and we would like to show some of the successes and challenges that SCSGC have had in managing what has turned out to be a very popular but high risk project.

SCSGC 2009 Inaugural Launch

- 1) Aerial Imaging and Atmospheric Data Collection: High Altitude Ballooning, by Matthew Torok and Joshua Summers. Clemson University
- 2) Measurement of Cosmic Radiation Using Electronic Digital Camera CCD Detectors, by Matthew May, Dustin Hilliard, and Daniel Woodworth. The Citadel
- 3) Measurement of Atmospheric Gravity Waves via Directional Thermistors, by William Graeber. Furman University
- 4) Getting a Glimpse at Atmospheric Turbulence, by Eric Demarco. Coastal Carolina University
- 5) Using a Handheld GPS to look at GPS Error and HD Video Camera to Create an Interactive Flight Path, by SCSGC. College of Charleston



The weather did not cooperate and due to the small launch window SCSGC has set up the balloon was launched directly into the path of an oncoming thunderstorm.



SCSGC Inaugural Launch

College of Charleston
Coastal Carolina University

The Citadel
Clemson University
Furman University

South Carolina



Space Grant



March 28, 2009
We were off course,
but the Force was with us!

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4) Flying to th
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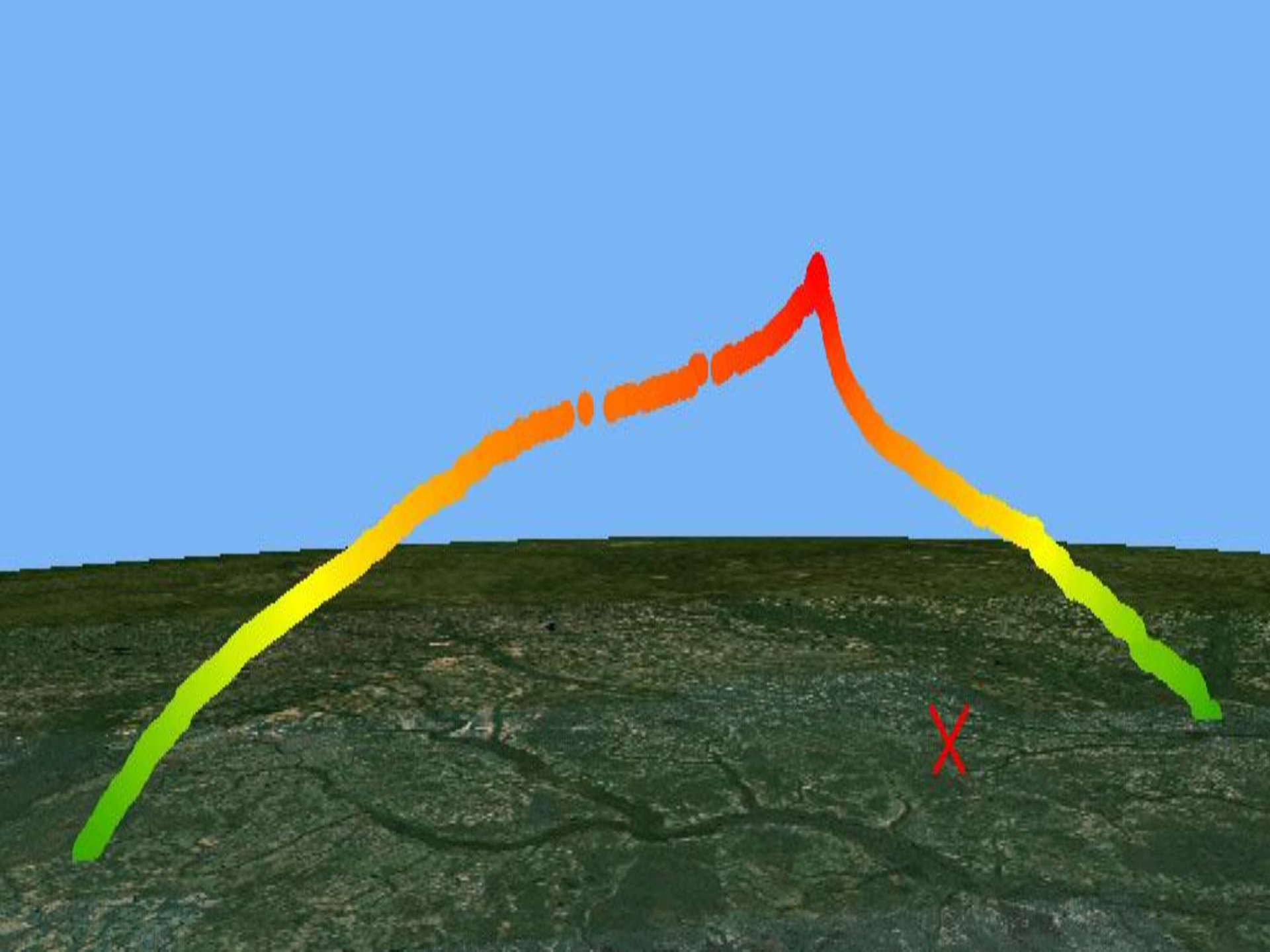
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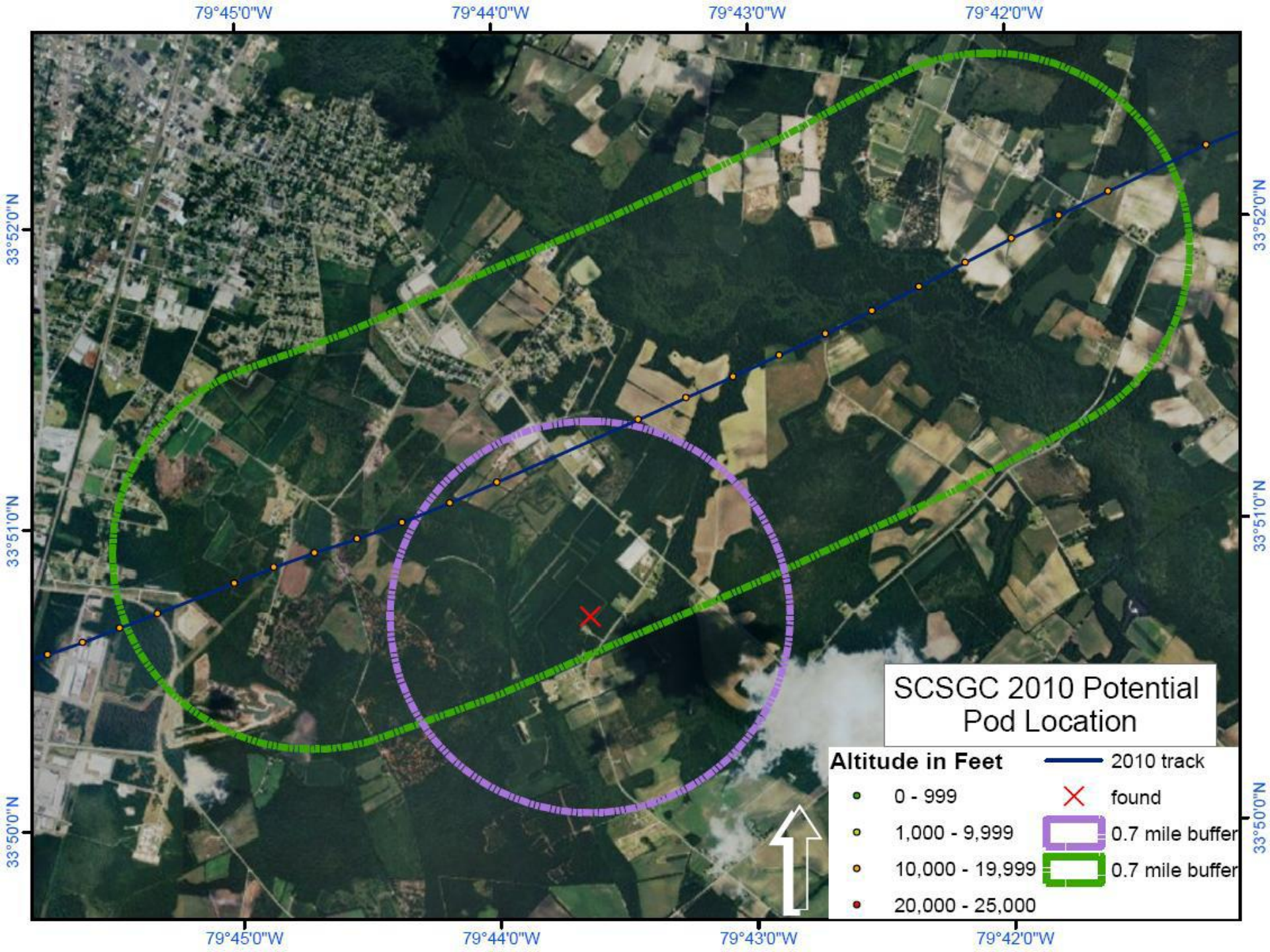
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Lessons Learned

- The lessons learned from the 2009 launch were taken into account for the 2010 launch.
- A second alternate launch day was scheduled in case weather became an issue during our primary date.
- SCSGC also purchased field supplies such as bug spray, sunscreen, first aid kits, safety vests, and bottled water to help the students and faculty work in the field for a lengthy period of time should there be any issues such as a delay in the launch or an extended recovery effort.







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2) The Citadel
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3) High
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4) How Do
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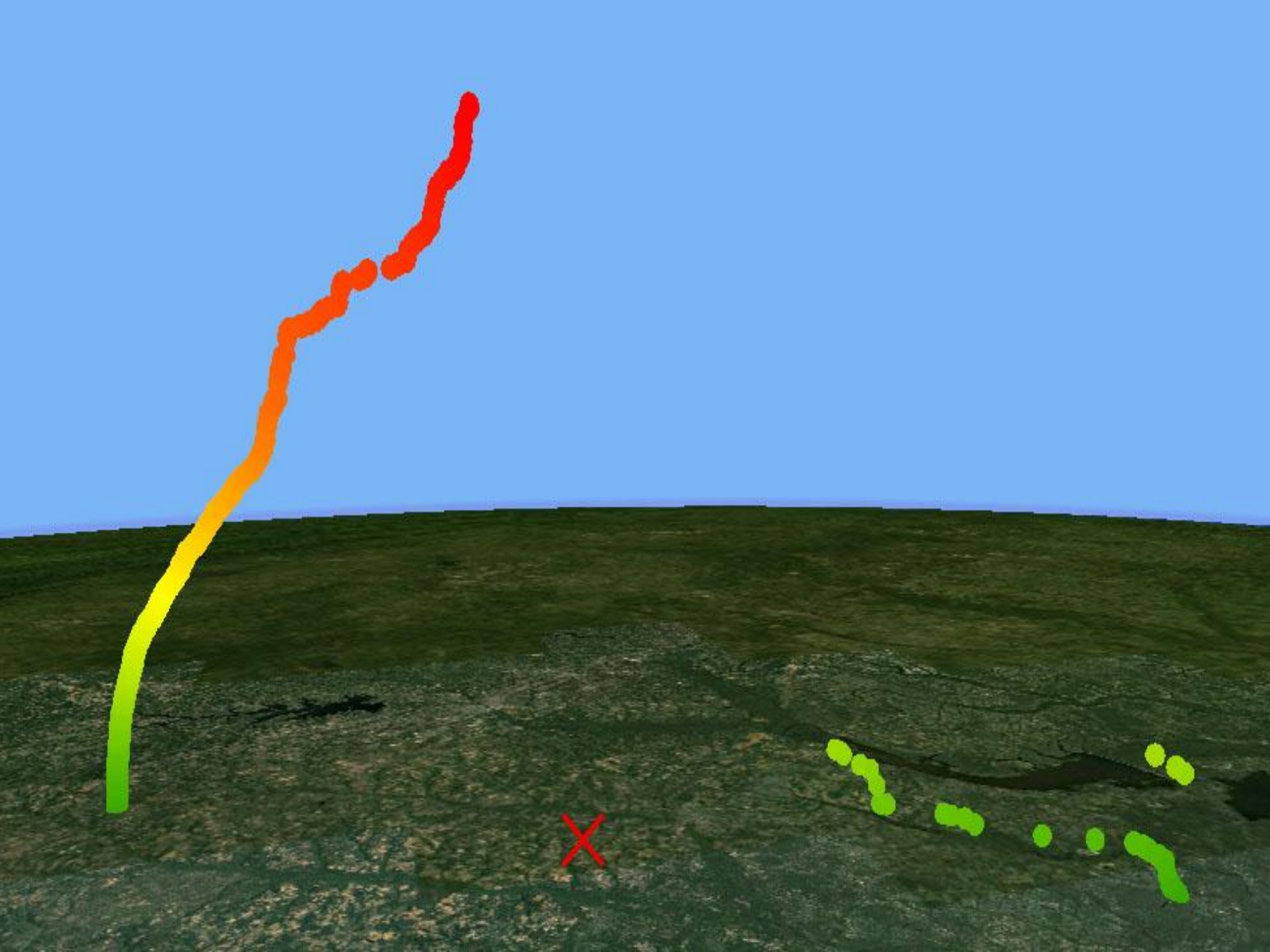
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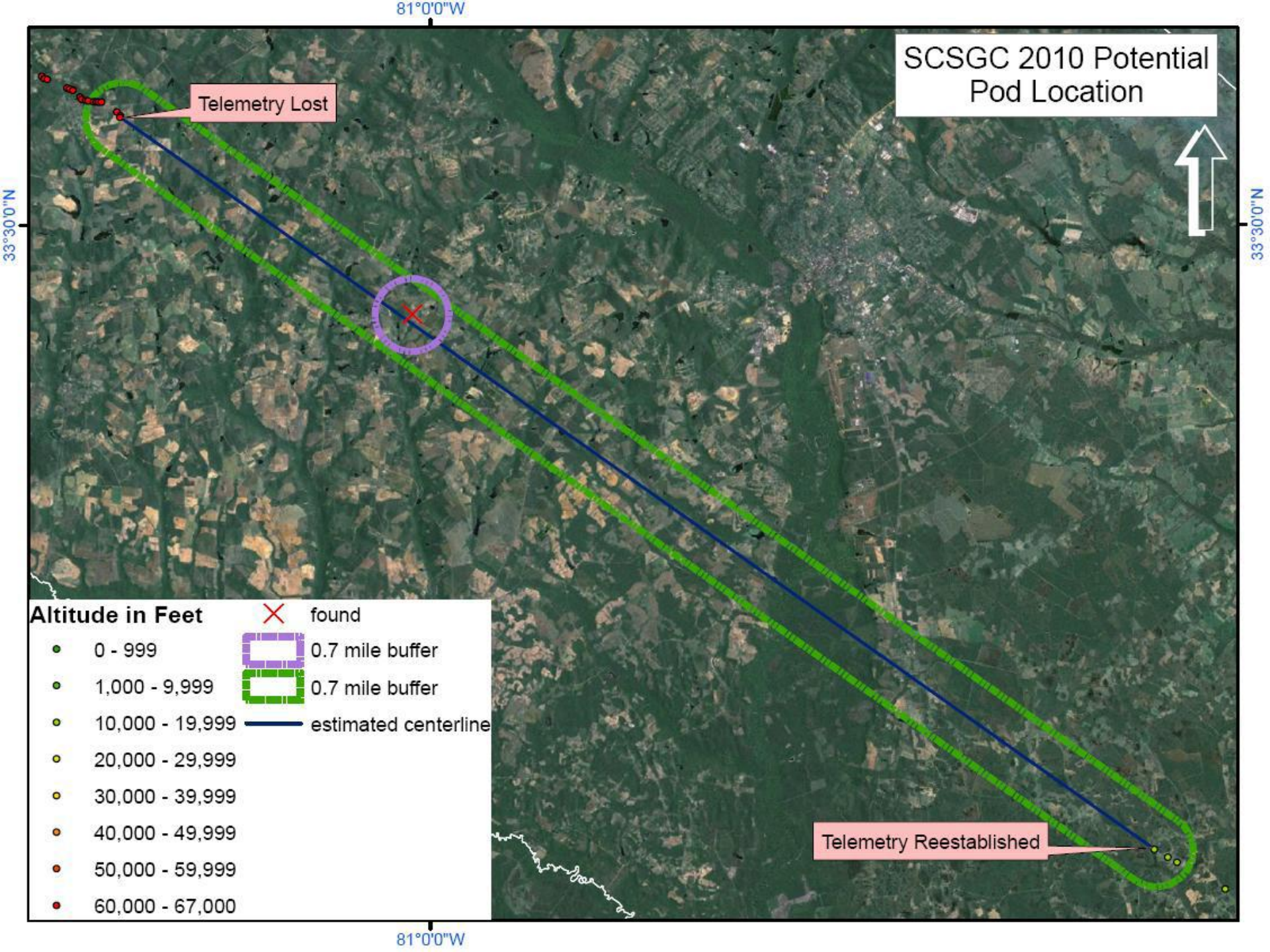
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Lessons Learned

- After discussing with StratoStar Systems about the potential failure points from the 2010 launch, we ordered new pods that were put together with StratoStar's improved design. These pods were pre-strung with metal cables and cord and could be hooked together with swivel snaps.
- In addition a LED emergency roadside flashing beacon, and a model rocket "screamer" (a 3oz battery operated light and noise producer) was added to one pod and the command module. These additions were put in place to help increase the chances of recovery should another forested landing occur.





SCSGC 2010 Potential Pod Location

Telemetry Lost



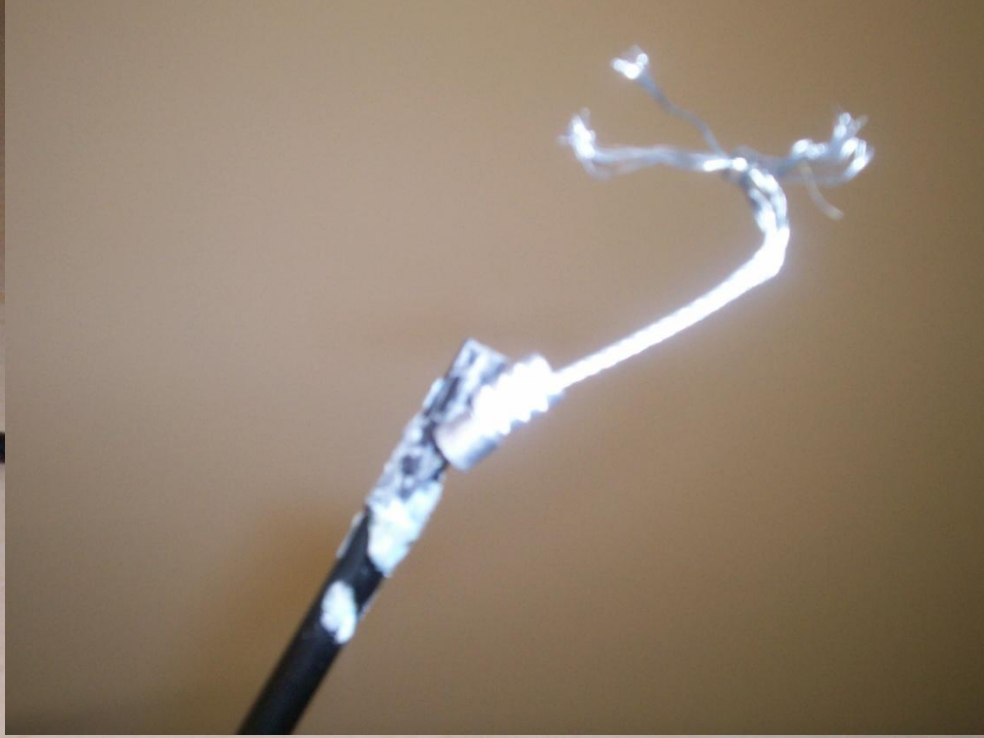
Altitude in Feet		found
● 0 - 999	■ 0.7 mile buffer	✗
● 1,000 - 9,999	■ 0.7 mile buffer	
● 10,000 - 19,999	— estimated centerline	
● 20,000 - 29,999		
● 30,000 - 39,999		
● 40,000 - 49,999		
● 50,000 - 59,999		
● 60,000 - 67,000		

Telemetry Reestablished

81°0'0"W

33°30'0"N

33°30'0"N



Conclusions

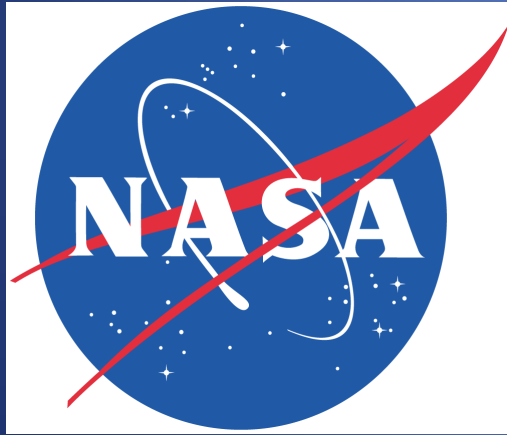
- One of the first issues that SCSGC had in managing this project was the logistics of getting several students and their mentors from all across the state of South Carolina into one location for the launch.
- The act of scheduling so many different people and having them agree on a weekend that they can get together has been a limiting factor on the ability to choose a flexible launch date.
- Another issue that our program has to deal with is the topography of our area. The Carolina's have mountains to the west, the Atlantic Ocean to the east, and are full of lakes, tree farms, and natural wooded areas that make recovery efforts a challenge.
- SCSGC has done its best in finding launch locations. However, we realize that these small launch windows may be a factor in the problems we have been having in our recovery efforts.

Conclusions

- The SCSGC believes in these types of student participation, hands on, faculty mentored projects. However, this project is considered “high-risk” after being 3 for 3 in tree landings, and 1 for 3 in successful recoveries.
- The SCSGC is currently undergoing an internal review of this project. Realizing that 3 launches still makes SCSGC fairly new to this type of work, we welcome any comments or advice from people who have been able to overcome similar problems.
- The SCSGC hopes that we can run this or similar student research projects in the future.

Special Thanks to

- South Carolina Space Grant Consortium
- NASA
- StratoStar Systems
- College of Charleston Geology and Environmental Geosciences Department
- Santee Cooper GIS Lab at the College of Charleston



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Questions?

<http://spinner.cofc.edu/~scsgrant/research/balloon.html>

