

# Destination SPACE

(Satellite Program for Aerospace-Centered Education)

Satellite Data Analytics and Applications; Building Capacity for Data  
Exploitation and Utilization through STEM



Kathy Dooley,  
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Nesbitt Discovery Academy Students:

Eve T. Currans, 11th grade  
Isabella L. Field, 11th grade  
Duncan Clark Horvath, 11th grade  
Hunter Milo Miller, 11th grade

# Our Team

- ◆ Seven 10-11th grade students at Nesbitt Discovery Academy
- ◆ Students who are interested in:
  - ✧ Aerospace
  - ✧ Astrophysics
  - ✧ Engineering
  - ✧ Technology
  - ✧ Weather and Climate
  - ✧ Data Analytics







## Martin L. Nesbitt Jr. Discovery Academy



- ◆ Ranked among the top STEM schools in the country (Newsweek)
- ◆ Located in Asheville, NC
- ◆ Serving 400 students
- ◆ Honors, Advanced Placement, and Dual-Enrollment courses begin in 9th grade

# Destination SPACE

(Satellite Program for  
Aerospace-Centered Education)

- ◆ Deep Space CubeSat mission
- ◆ ThinSat mission
  - ✧ Collaboration between students in 5 states across Appalachia
- ◆ Destination SPACE Satellite Week summer camp
  - ✧ Other camps and summer opportunities to come



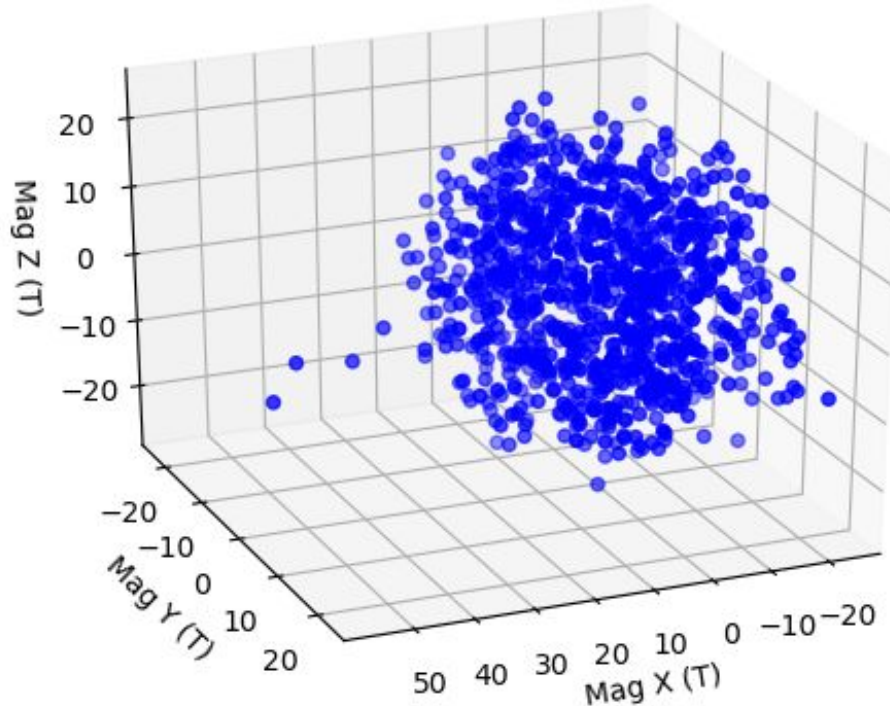
# Our Mission



- ◆ Deep Space and ThinSat missions
- ◆ Conduct experiments that address solutions to global issues
- ◆ Introduce students to aerospace and data analytics
- ◆ Prepare students for the growing STEM workforce

# Data Exploitation

Heritage Magnetometer Data (GEARRS2)



- ◆ This graphic shows heritage magnetometer data from the GEARRS2 Satellite 2015.
- ◆ We are:
  - ◇ Interpreting Data
  - ◇ Utilizing Graphics
- ◆ Data exploitation- the utilization of all available resources to best understand and apply the data.

# Data Outliers

- ◆ Inhomogeneity - breaks or gaps in data
- ◆ Caused by errors in sensors or external factors
- ◆ Impacts sensors and data

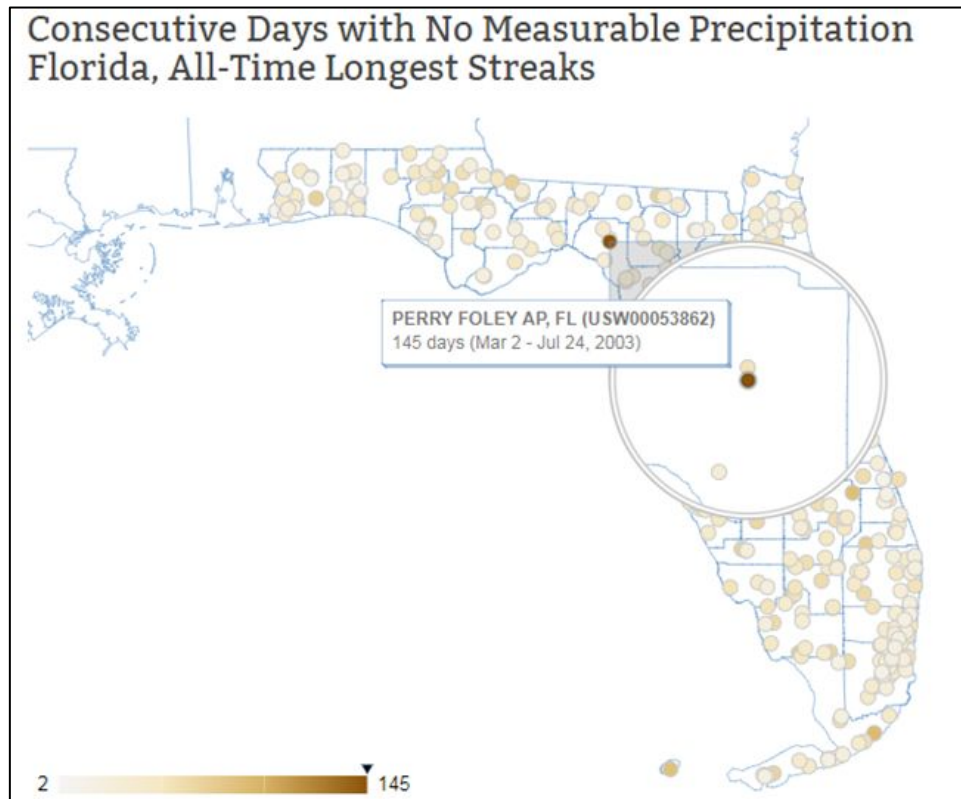
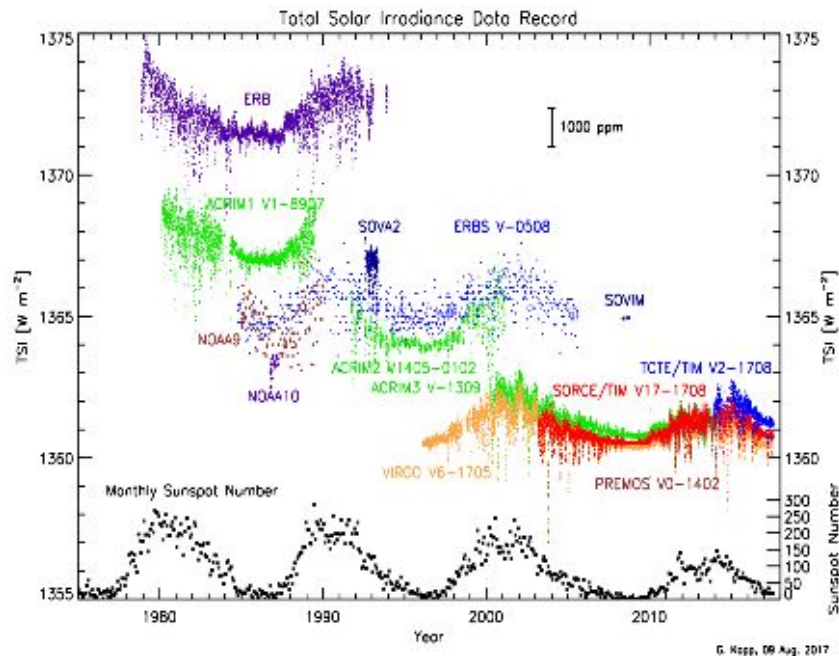


Image courtesy of NOAA

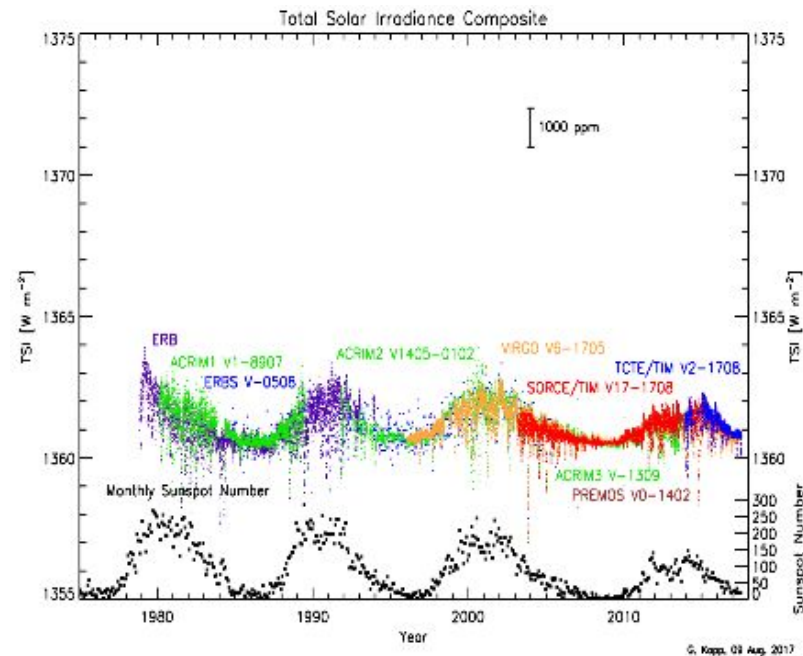


# Example of Data Exploitation

Before:



After:





# Thin SAT

- ◆ Year-long after-school program for STEM students of all ages
- ◆ Students design and conduct aerospace experiments
- ◆ 3 phases
  - ◇ Tethered and low altitude balloon launch
  - ◇ High altitude balloon launch
  - ◇ Extreme Low Earth Orbit

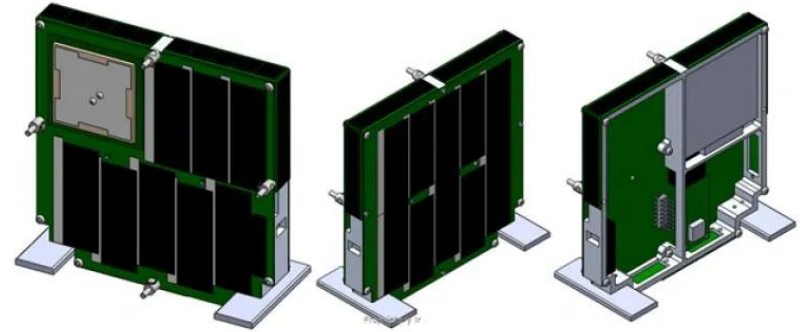


Image courtesy of Virginia Space

# Ascent Profile

## Antares Launch Mission

### Mission Parameters:

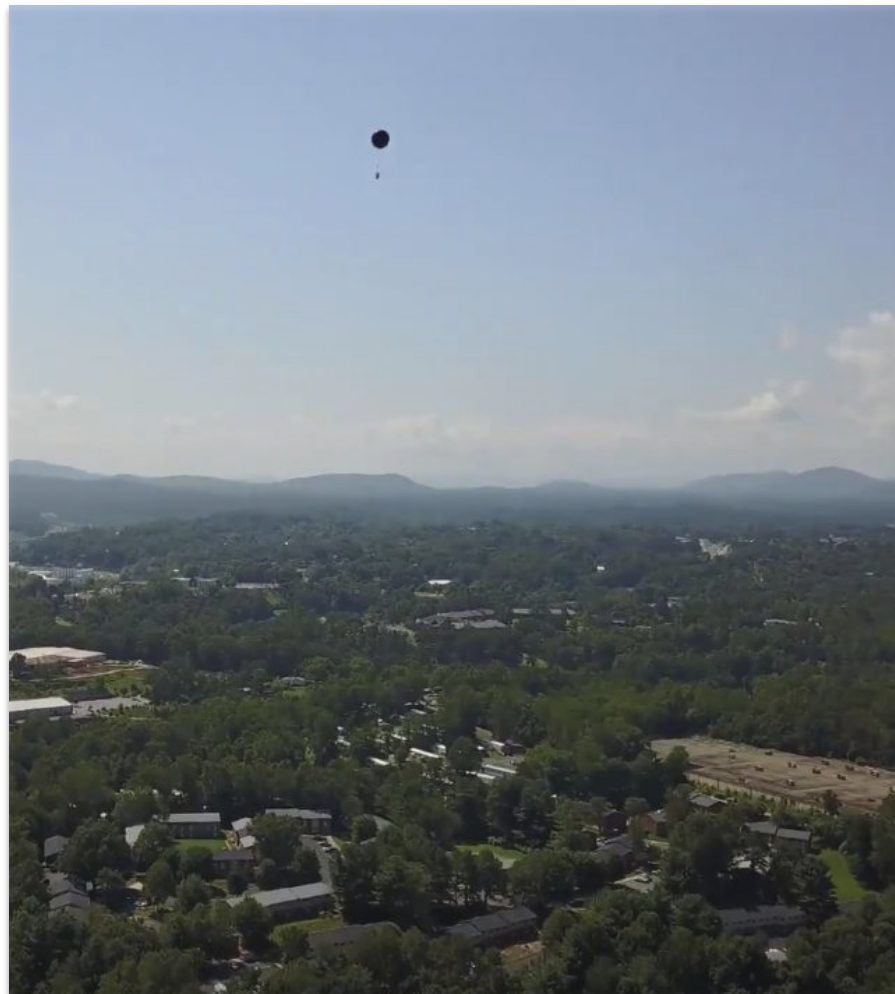
Orbit Altitude: 250 km x 303 km  
Inclination: 53.6°



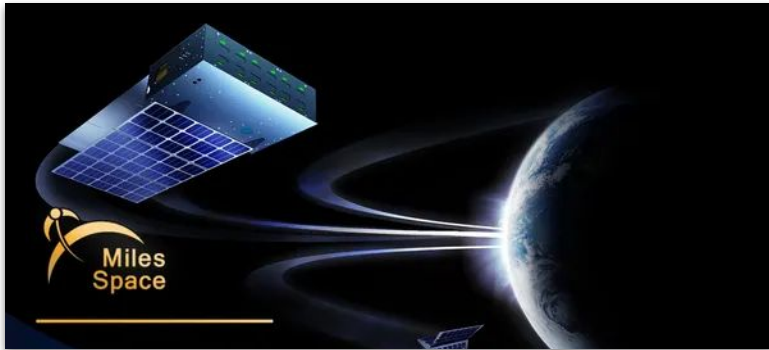
- ◆ Released off of ISS resupply rocket
- ◆ 100-50 miles above earth
- ◆ 5-6 days of data collection
- ◆ 90 min/orbit traveling 17500 mph

# ThinSat Data Analytics

- ◆ Observation Station
  - ✧ Conduct local experiments using same sensors that will be on ThinSat
  - ✧ Gives hands on experience with our ThinSat sensors and data exploitation
- ◆ Utilize VOC sensors
  - ✧ VOC's in local Asheville area
  - ✧ Observe VOC level in various levels of the atmosphere



# Deep Space CubeSat



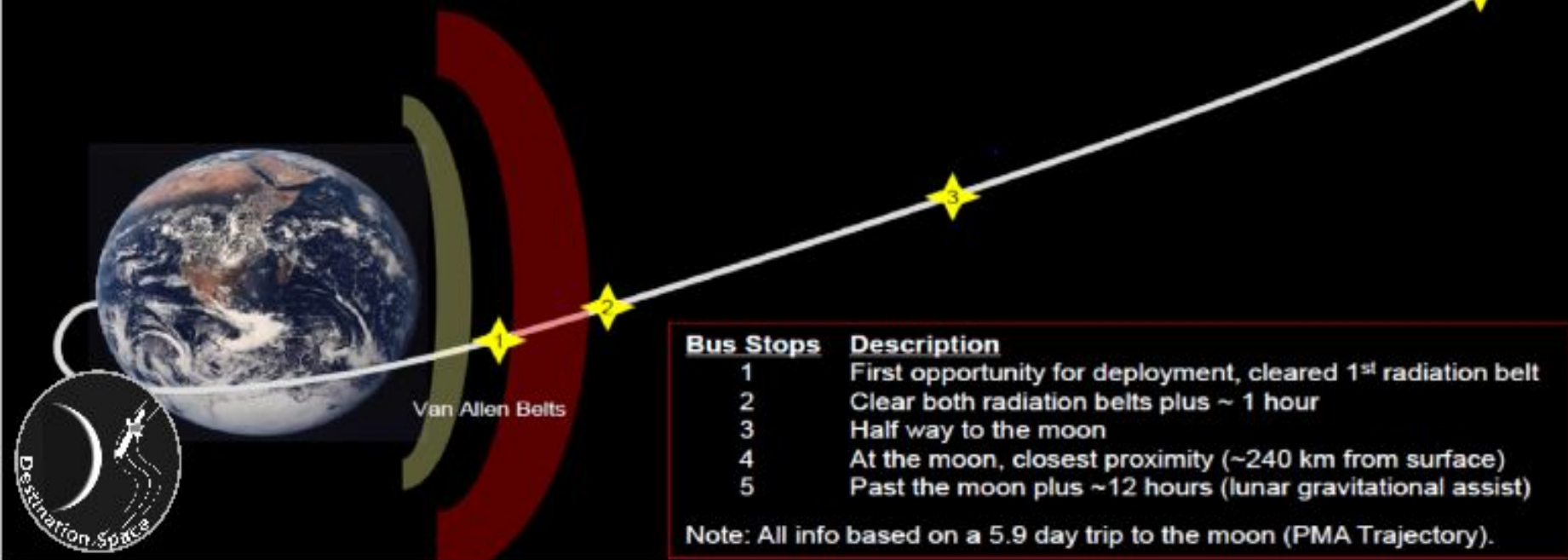
- ◆ First ever Deep Space STEM mission
- ◆ Our CubeSat is manifested for launch on NASA's Artemis 1 mission
- ◆ Partnered with NASA and Miles Space, NearSpace Launch, Twiggs Space Lab



# Artemis - 1

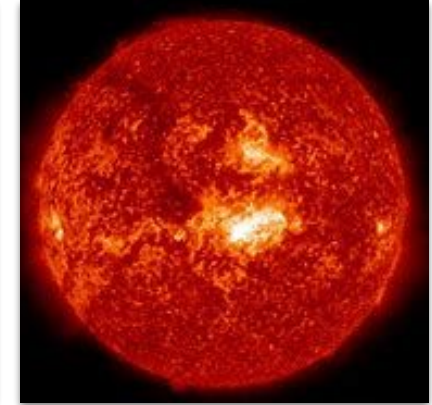
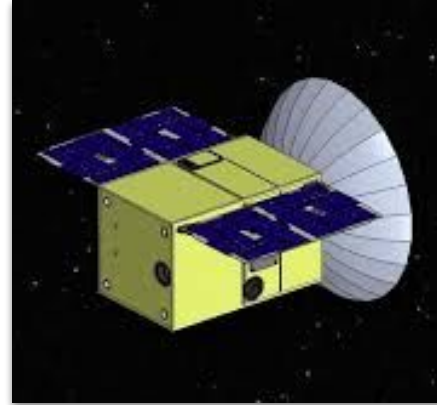
<u>Bus Stops</u>	<u>Altitude (approx.)</u>	<u>Flight Time (PMA)</u>
1	36,507 km	4 Hrs. & 1 Min.
2	70,242 km	6 Hrs. & 59 Min.
3	192,300 km	1 Days, 0 Hrs. & 54 Min.
4	395,248 km	5 Days, 21 Hrs. & 50 Min.
5	355,807 km	6 Days, 9 Hrs. & 49 Min.

To Hello



# Deep Space Data Application

- ◆ Research space weather
  - ✧ Solar flares
  - ✧ Open space magnetic field
  - ✧ Earth's magnetic field
  - ✧ Particle and radiation detectors
- ◆ Destination SPACE Space Weather Curriculum
  - ✧ Gave us prior knowledge on space weather
  - ✧ Helped us understand the importance and impacts of space weather



Images courtesy of NASA

# Collaborators

Destination SPACE

[destinationspace-stem.org](http://destinationspace-stem.org)



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of NC State University



Nesbitt Discovery Academy (NDA)

<https://mlnda.buncombeschools.org>