Lesson 1: Student Handouts

1) Student Image Sheet
2) Image Data Observation Sheet
3) Proposal Slide Template
4) ESRI Satellite Map
5) CubeSat Instructions
6) CubeSat Template
7) CubeSat Constraints and Platform Design Planning Sheet
8) CubeSat Standard Components

Student Image Sheet

Agricultural Land From Space - Kansas

Agricultural Land From Surface

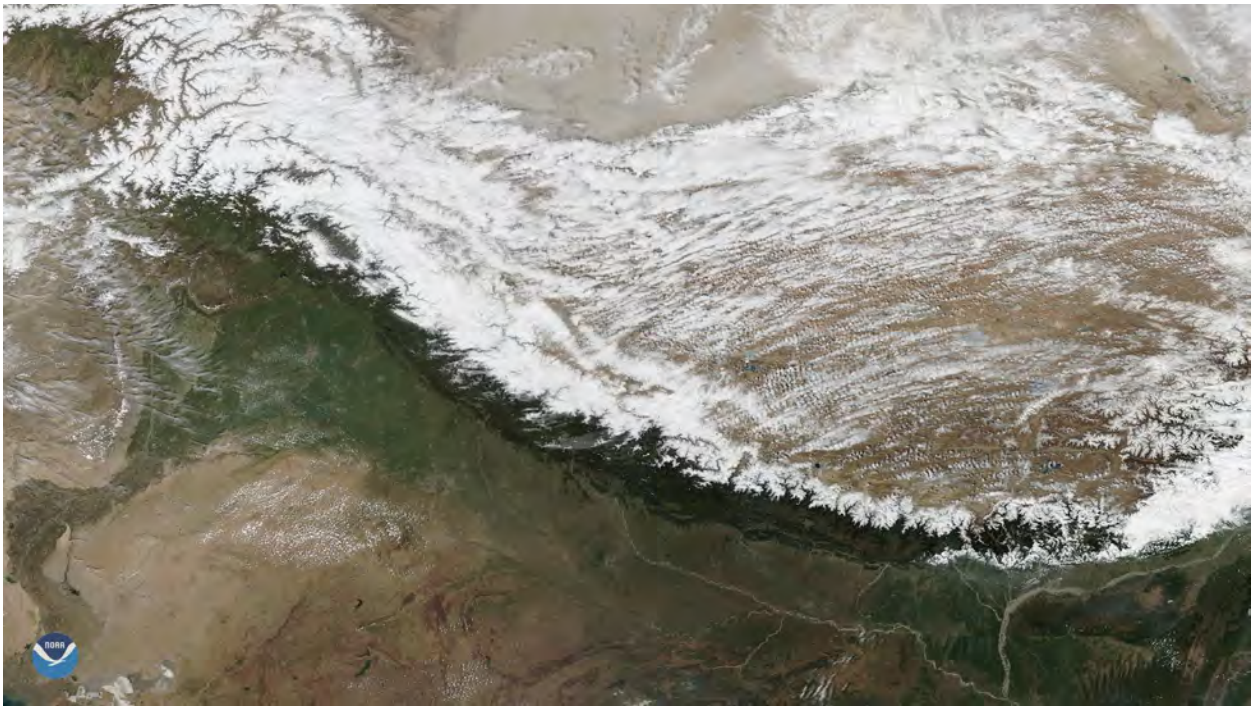
Deforestation From Space - Brazil

Deforestation From the Surface

Elephant Herd From Space - Botswana

Elephant Herd From the Surface

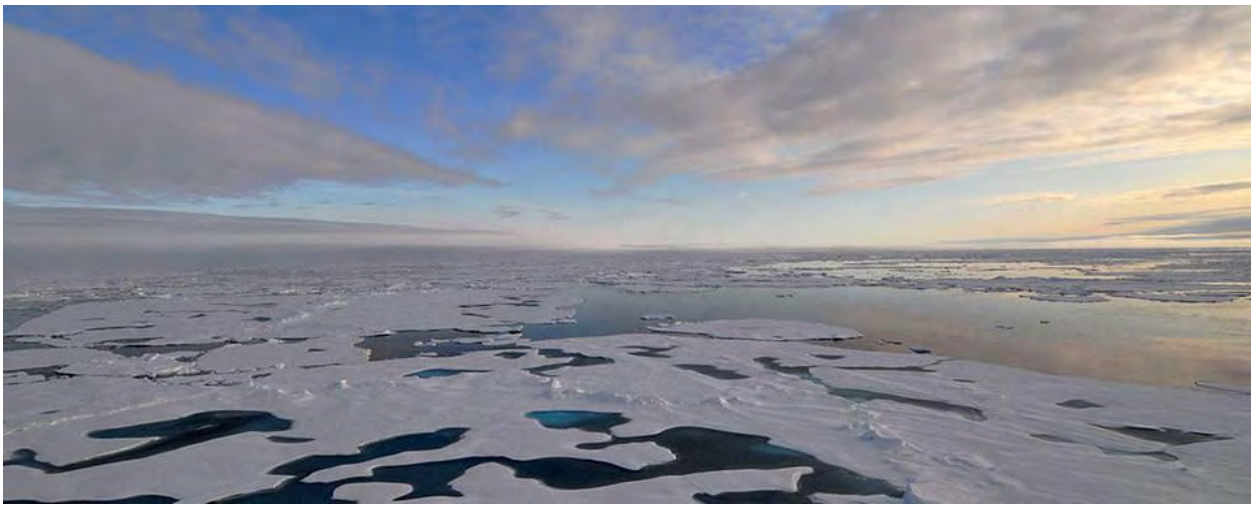
Himalayas From Space



Himalayas From the Surface

Ice Caps From Space

Ice Caps From the Surface



River Flow From Space - Connecticut River

River Flow From the Surface

Image Dataset Observation Sheet

What is the value of collecting data from space?

Background

Imagine looking out into the arctic ice sheets. What do you see? If you wanted to research how fast sea ice in the arctic was decreasing, what data could you collect from the surface to study this question? What benefit would looking *from space* provide you when studying this question?

Collecting data from space provides scientists information and services that they may not be able to collect from near the surface of the Earth.

In this activity, you will compare images from the Earth's surface as well as from above Earth's surface. You will work with your team to determine what data you could collect from your location from each perspective, and what benefits collecting data from space may provide.

Task

1. Gather your image set from your teacher.

2. Record where on the planet you are observing.

3. Discuss questions you could investigate using data from each perspective.

4. Draw a conclusion about the value of collecting data from space for your location.

Observations

Description of location being studied	Possible questions to research at this location	Possible data collection from Earth's surface	Possible data collection from space

Conclusion

Based on your comparison of data collection on Earth's surface to data collection from above, what value does collecting data from space provide us? Refer to your observations above in your conclusion.

CubeSat Template Instructions

1. Take the CubeSat Template and paste it onto a foam board (or corrugated cardboard).
2. Carefully use scissors or a scoring knife to cut the black solid lines to make puzzle pieces.
3. Put the CubeSat together like a puzzle (Fig. 1).
4. Tape can be used to hold it if it doesn't stay together, but it will need to be able to be opened (Fig. 2).
5. The final dimension should be approximately 10x10x10 cubic cm.

Figure 1: Completed CubeSat Template Opened

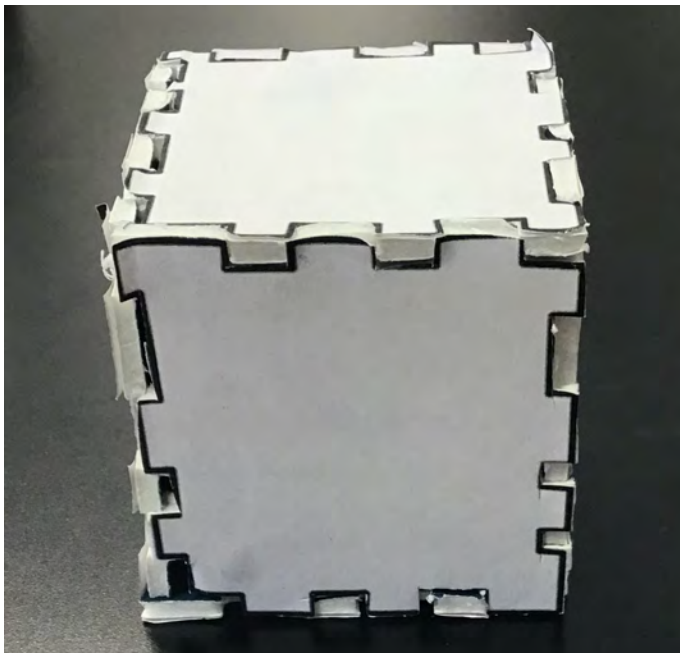
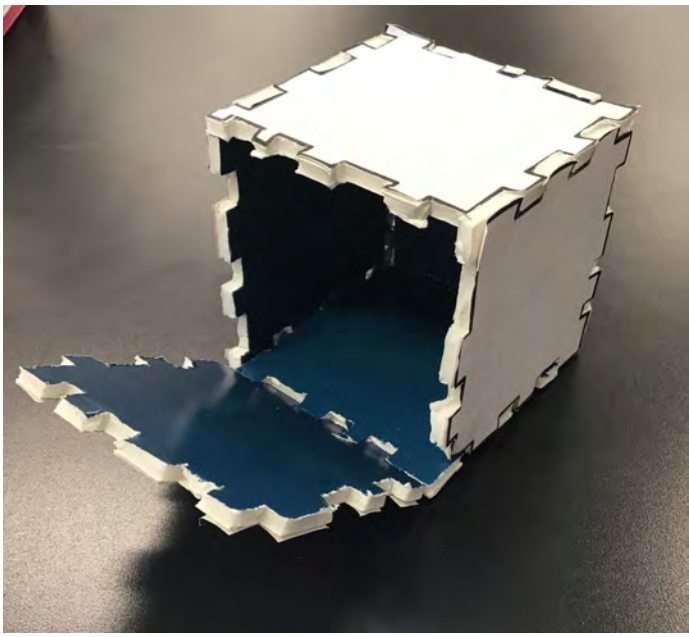
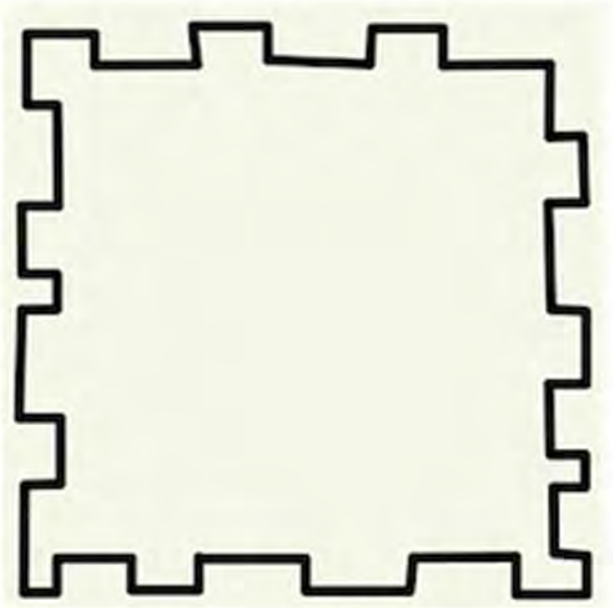
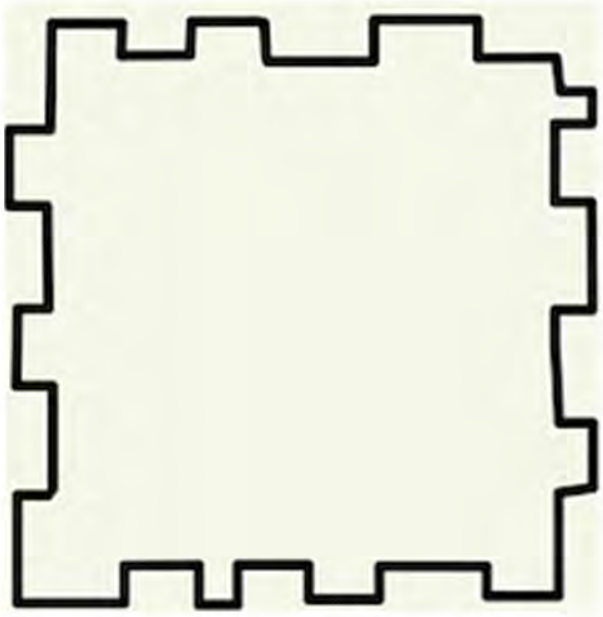


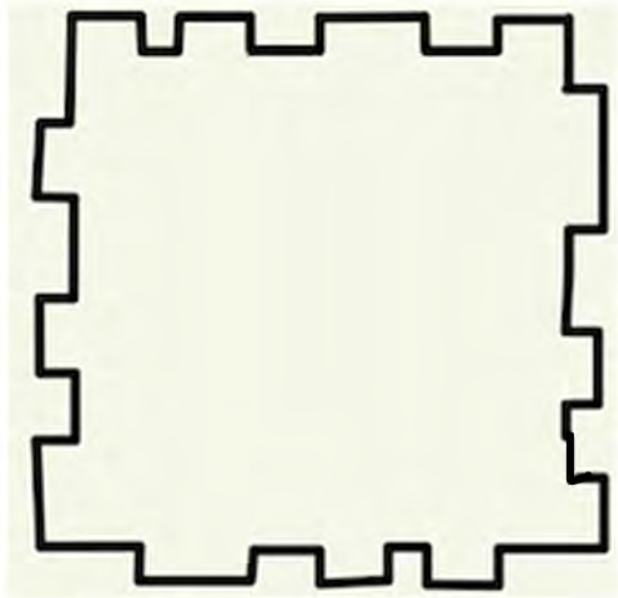
Figure 2: CubeSat Template

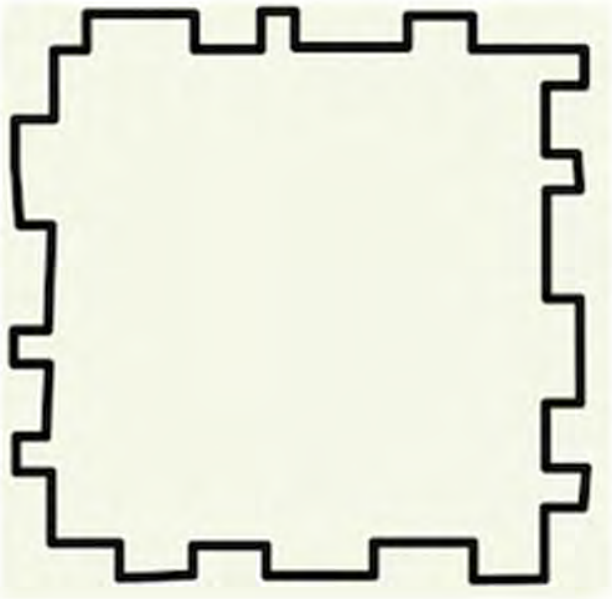


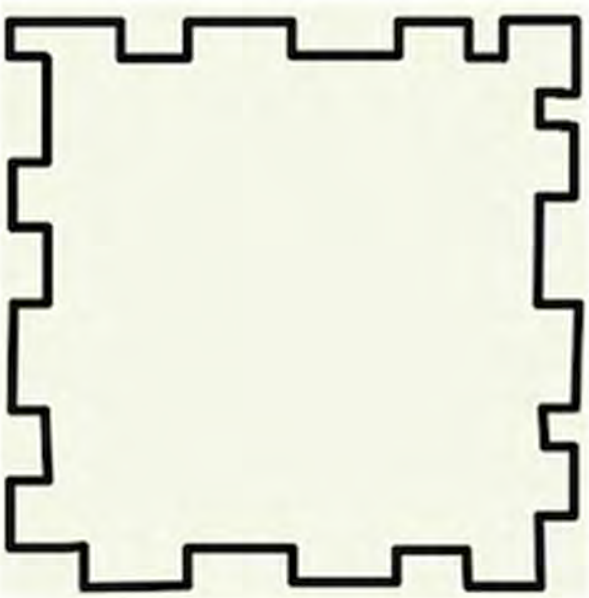
CubeSat Template

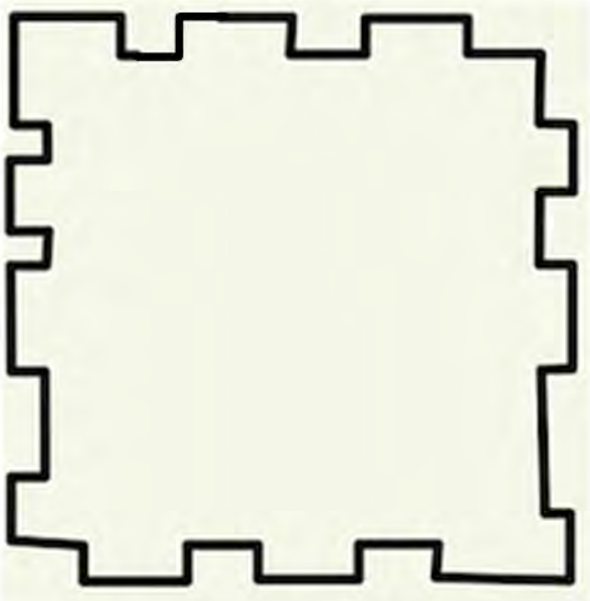






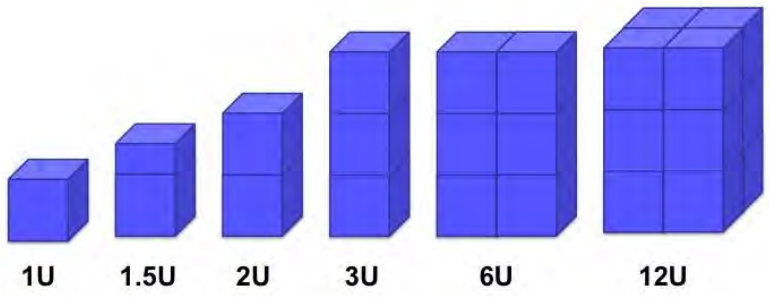






What Goes Into Designing a CubeSat?

CubeSats are designed with a set of standard criteria. The standard size is a 10×10×10 cm cubic unit. This single unit is called a U, which is the unit of measurement for CubeSats. CubeSats can be combined together to be 2U, 3U, even 12U in size. For this project, you are limited to a 1U cubesat.



CubeSats also have a weight parameter. Each CubeSat unit can be no more than 1.33 kilograms.

These size and weight constraints limit the payload you can include.

Design Question: What components should be included in a standard CubeSat platform so that it can be sent to space to collect data?

1. Brainstorm the tasks that a CubeSat must perform to complete its data collection mission in the space below.

2. Complete the first column with the list of components from the class consensus. Use the provided components to predict which would fulfill each task. Verify your ideas with your teacher before recording them in the second column.

Task a CubeSat must perform	**Component in the CubeSat platform to fulfill this task**

Build your prototype!

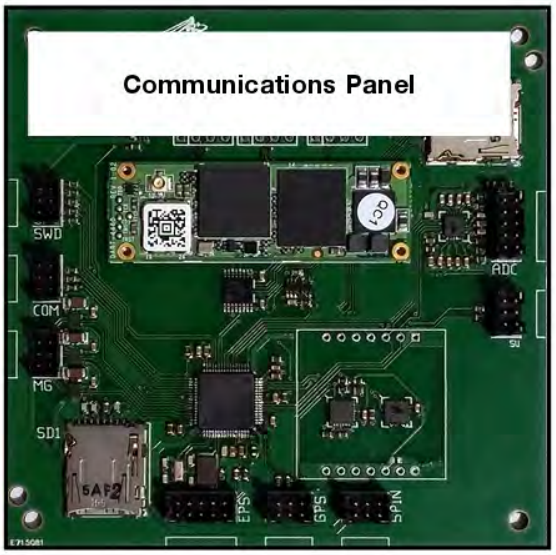
Once your information in the table above has been verified, take your CubeSat components provided to you and add them to the base of the CubeSat you assembled the previous day.

1. Attach a solar panel to the exterior of your CubeSat box.

2. Attach your antenna to the exterior of your CubeSat box.

3. Stack the remaining components inside of your CubeSat box.

CubeSat Standard Components


Communications Panel
SWD
COM
MG
SD1
ADC
EPS
GPS
SPIN


ADCS - Attitude Determination and Control Subsystem
SWD
COM
MG
SD1
ADC
EPS
GPS
SPIN


OBC - On Board Computer


Battery Pack