Authors: Victoria Trang, Alicia Young, Brittany Hornal

(1) Title of Lesson:MEASURING SOIL MOISTURE FROM SPACE

(2) Grade Level and Subject Area: 6th Grade Earth Science

(3) Standards:

- **NGSS: MS-ESS2-4.** Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. [Clarification Statement: Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.] [*Assessment Boundary: A quantitative understanding of the latent heats of vaporization and fusion is not assessed.*]

- **CCSS: Mathematics: CCSS.Math.Content.6.SP.A.3** Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.
- **CCSS: Writing Standards:** Sentence Types P.1 Is the sentence declarative, interrogative, imperative or exclamatory.
- **CCSS: Speaking and Listening Standards:** my text
- **CCSS: LA-Literacy:** my text

(4) Justification Statement: This topic is an important part of the sixth grade, and the lesson provided below is a creative way that ties together the water cycle process and the ideas of recent NASA/JPL projects that are going on to evaluate the soil moisture which shows how the water cycle is important and where and why there is a problem with the soil in certain areas.

(5) Measurable Objectives: *At the conclusion of this lesson, students will be able to understand the water cycle, and the effects of water on soil by drawing and labeling, and written descriptions in their science notebook.*

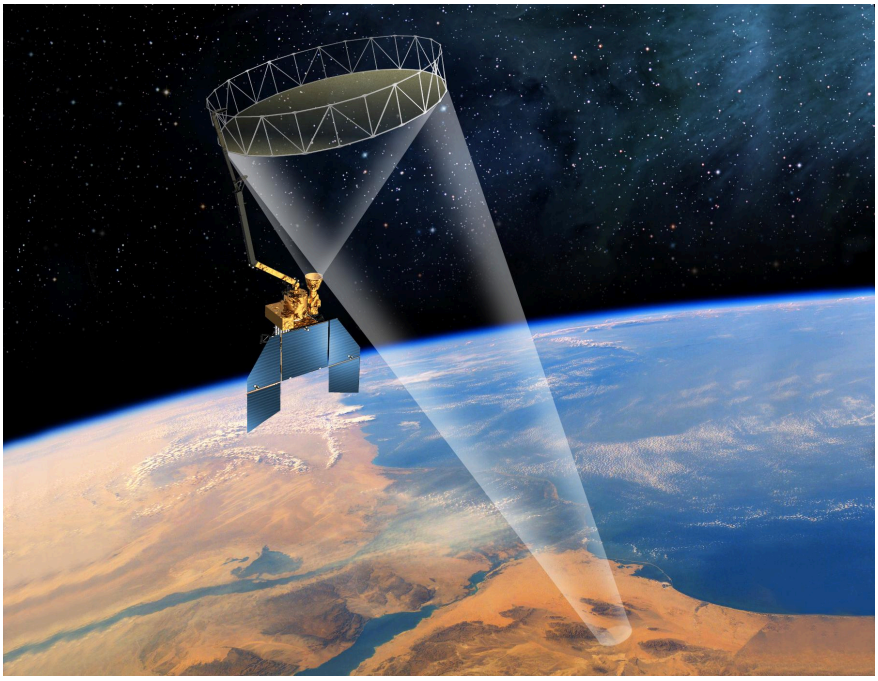
(6) Total Time: 60 minutes per day for 2 days.

(7) Social Skills and or Habits of Mind to Engage/Asses: Children will need to active listeners, that are ready ti learn new thing

(8) Level of Voice Appropriate for Activity: Low Discussion Voice

(9) NASA 5E Framework: (Student Behavior)

- **Engage:**
  - Students, where does our water come from? How often does Southern California rain? *Show students drought map found on the following link. http://www.drought.gov/*
  - Show a video or create a poster with the class to give visual aid on the water cycle. http://www.jpl.nasa.gov/video/index.php?id=558
  - NASA/JPL Experience (SMAP), Pictures, Video.



- **Explain:**
  - KWL Chart; This chart will allow the students really have a say of what they know about the cycle. This chart will have a section that will allow the children to come to the board and write what they may have learned or already knew about the topic.

- **Explore:**
  - Students will work collaboratively in groups. Each group will measure the soil temperatures of various soil pots. There will be 6 pots of soil each group will measure.
    There will be three soil pots indoor and three outdoor.
    Indoors will have a pot of rich soil, dry polluted soil, and sand. The pots outdoor will contain the same.
    Students will measure water each pot of soil with one approximately ¼ to ½ cup of water per pot. After watering, students will find and record the temperature. All data will be recorded in data sheet.

Students will continue this over the course of approximately one week.

- **Formation of Groups:** Each group will have 4 students. The children will count off from one to four and sit in groups based on the number they receive.
- **Role Assignments:**
  - Time Monitor
  - Supply Manager
  - Data Collector
  - Water and Temperature Monitor
  - Traveler (for the uneven group)

- **Extend:**
  - Ask the students how this study of soil temperature can help understand the water cycle trends. For example, have the groups split up and discuss this what the connection between soil, and water cycle is, then how one may help the water cycle.
- **Evaluate:**
  - **Content Formative Assessment:** Data Sheets, Science Journals
  - **Content Summative Assessment:** Have students write a proposal to community that uses the information they have learned to show the importance of water usage and ideas of how to help the water cycle.
  - **Formative Assessment of Non-Cognitive Factors:** Test the children of overall knowledge learned.

Materials List

- Paper, pencils, soil samples, water bottle with water, small plastic bins or cups, labels, thermometer (or temperature measuring device from Home Depot), computer, internet.