Eyes on Earth - Current Events Paper

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SCED 547

If you are out at a party and you mention that you teach Earth Science, you often get mixed reactions. If I tried to discuss the lessons from this course with my friends, family and acquaintances, it would not be an ongoing topic of conversation. They might listen a bit, but they will definitely mention how poorly they did in the course and how boring their teachers were. I know - that is my life. The harsh reality is that for the non-science person, Geology, Meteorology and Oceanography are not topics they often engage in. Based on our conversations, this may be due to negative experiences in their classrooms. This is unfortunate, as the spheres play an intricate role in many aspects of our lives. For example, climates play a role in factoring in where people live and what their lifestyle will be like in a region or country. Weather plays a huge role in our daily interactions and many of our parks are focused on some body of water that people use recreationally. Basic geology dictates what kinds of structures can be built for homes and other buildings and the natural resources in a region. The Manhattan skyline is even related to the bedrock geology. Something has to be used to connect the people who are science-wary (including students) and these important concepts that influence their everyday lives.

Current events offer such an avenue. It seems that not a day goes by without some disaster or weather events making national news and spiking across social media. I will often share these, and those same people who did not like Earth Science as a kid will comment or sometimes tell me in person how much they learned. This means that there is a chance to educate people about something current and relevant if you are able to diffuse the sensationalism and get to the root cause and the immediate effects. Last week I went to San Francisco, in the wake of the Ridgecrest Earthquake and the ensuing aftershocks. This provided me a chance to talk with my own children (ages 7 and 11) about the size of the state of California, what generates earthquakes, and the likelihood that I would be in danger. We also talked about how few earthquakes we have on the East Coast. This event allowed me to pull the curtain back on the mechanisms at work to produce these phenomena. If we are savvy enough, we can do this in our classes as well.

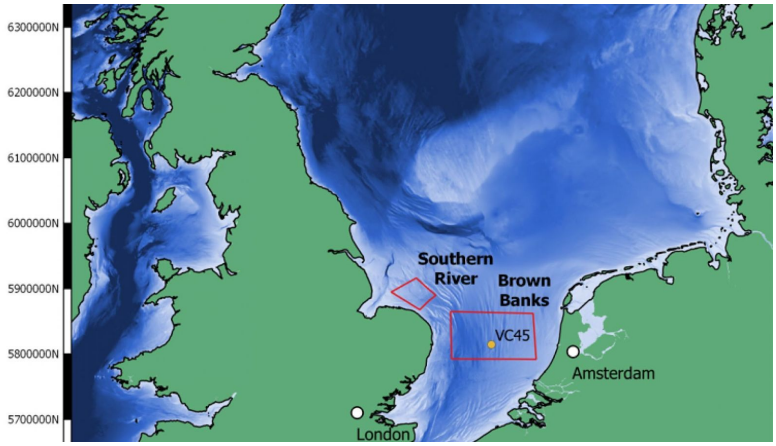
I chose three very different current events for this assignment. I wanted to avoid the “Natural Disaster” focus, as I think those are very obvious. Instead I tried to find articles related to something more than just an outbreak of tornadoes and, importantly, from popular news sources. I wanted to use simple articles that focus on something out of the ordinary and show how the spheres we discussed, the Atmosphere, Hydrosphere, Lithosphere and Biosphere, are

connected and interrelated. All of these make you think, and I have included related visuals from each of the articles as well.

One current event I would explore further in my class comes from Fox News from May 29, 2019: **Scientists search for 'lost' Stone Age settlement in 'Doggerland' at the bottom of the North Sea By James Rogers | Fox News**

https://www.foxnews.com/science/lost-stone-age-settlement-doggerland

This article describes, in brief, an expedition to the North Sea in search of evidence of ancient landscapes under the ocean. This area is roughly between England and The Netherlands (see image)



2019 exploration areas on the Brown Banks and the Southern River.
(© Lost Frontiers/VLIZ/UGenT)

This region of the North Sea now covers an area that has been named Doggerland. During the last Ice Age, this region was above water and home to the full extent of land-dwelling ecosystems and species, including people. The research vessel RV Belgica battled harsh weather to dredge samples up from the Brown Bank in search of a 10,000 year old settlement. Fisherman have brought up archeological evidence from this region in the past, but they did not collect any evidence of humans during this trip. However, they did find evidence of a forest floor, including peat moss. This is evidence that the area was indeed above water in the not so distant past.

This article combines a few of the spheres, but is directly associated with the Hydrosphere, all the Earth's waters including the Cryosphere or the ice. Actually, it represents how the fluctuations in the Cryosphere have direct impacts on the Biosphere. During the last Ice Age 10,000 years ago, the ice caps grew and stored vast amounts of the world's water in mile-high glaciers covering the polar regions. Regions of today's ocean floor hundreds of feet under water were exposed on the land's surface, indirectly connecting with the Lithosphere, the rocks of the Earth's surface. This article would open up any number of discussion topics, including a major misconception I have heard in the past. First, many students are surprised to learn that the ocean floor is indeed solid, so we could discuss that. I could get a map of how the

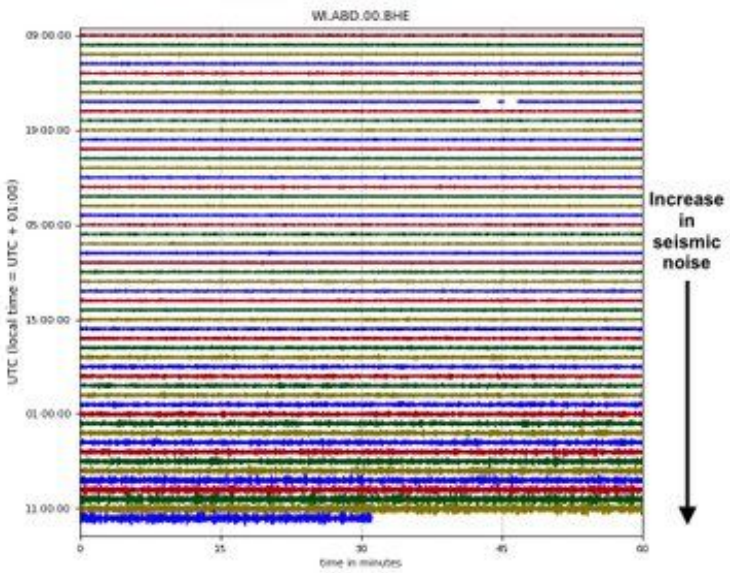
Earth's surface looked with the Ice Age coastlines and we could discuss how this would impact the fossils and archeological evidence we may find. Finally, we could discuss the Milankovich Cycles as they were the driving force for the shifting climates that produced the cycle of Ice Ages.

In terms of the lessons, I could not connect this with a specific space mission or set of satellite imagery. This does connect with the idea of using satellite images to find archeological sites (https://www.nationalgeographic.org/projects/space-archaeology/), but I do not think we have a satellite that can peer through the rough seas to map the ocean floor. Yet. So I looked back at the original reading (Quinlan, 2016) and thought about just exploring data sets. I would start the class by using bathymetric sets to create a contour map of the now ocean-covered Doggerland. From there, I would have students create hypothetical food webs for the region based on researching animals that would have been present at that time. Finally, I would have the students predict likely locations on their maps where scientists should search for human settlements based on the terrain, available water and food.

The next article that I would discuss is from USA Today from Sept. 5, 2017.

Hurricane Irma is so strong it's registering on devices designed to detect earthquakes

Doyle Rice, USA TODAY Published 4:06 p.m. ET Sept. 5, 2017 | Updated 2:11 p.m. ET Sept. 6, 2017



https://www.usatoday.com/story/weather/ 2017/09/05/hurricane-irma-so-strong-its-registering- devices- designed-detect-earthquakes/634419001/

This article describes how researchers were examining their seismographs on the Island of Guadeloupe as Hurricane Irma was bearing down on the Caribbean Islands. A pattern became noticeable as the hurricane approached. (see image). The moving air is a force that drives a number of actions that transfer energy to the ground, therefore seismographs will record the motions. These include swaying trees, crashing waves and simply large gusts of

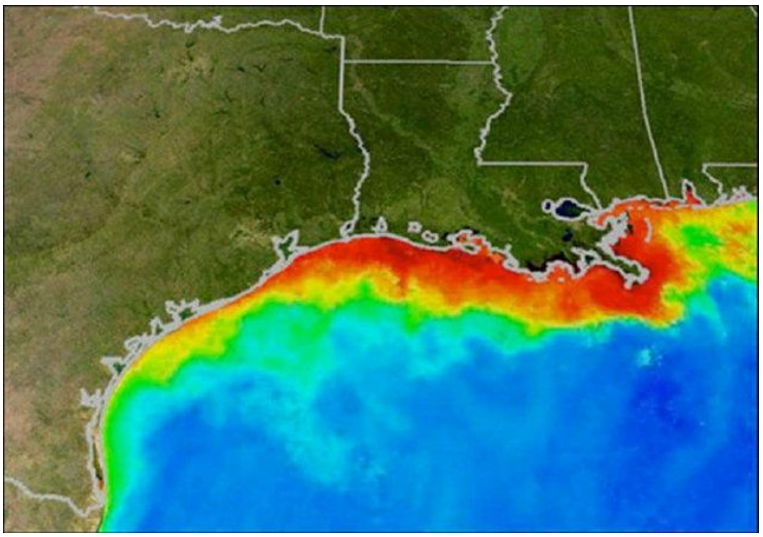
wind. The article discusses how many large storms, and not just earthquakes, create phenomena that the seismographs will pick up. This ties the Atmosphere and the Lithosphere together very nicely, and connects to the Hydrosphere if the development of hurricanes is included.

I see this revelation sparking a number of questions and conversations. The article quotes Stephen Hicks from the University of Southampton as saying that "there is no evidence to suggest that hurricanes and storms directly cause earthquakes." This would be a fantastic claim to support by overlaying the tracks of major hurricanes and storms with earthquake data. In the class, I also see this steering directly to the work NASA JPL and the Scripps Institution of Oceanography has done with GPS measurements related to measuring earthquake intensity. (Garner, 2016). It might be possible for students to analyze seismographs (through IRIS https://www.iris.edu/app/station_monitor/) to see if they can determine the strength of hurricanes from that data as well. Another possibility would be to examine resources like The Weather Channel (weather.com) or Google Crisis (http://google.org/crisismap/weather_and_events) to then connect with live feeds of seismographs close to a storm's path and look for these readings to develop in real-time. Another resource that could be connected is the NASA Hurricane Center (https://www.nasa.gov/mission_pages/hurricanes/main/index.html), which has incredible data sets available that could also be cross analyzed with the seismic data.

The final article is **The 'dead zone' in the Gulf of Mexico may grow to the size of Massachusetts this summer. That could make seafood more expensive.**

Aylin Woodward Jun. 11, 2019, 8:20 AM

https://www.businessinsider.com/dead-zone-gulf-of-mexico-low-oxygen-water-2019-6



The Gulf of Mexico "dead zone," an area of low-oxygen water that makes it impossible for marine life to survive, starts at the mouth of the Mississippi River.NOAA

This phenomenon shows how all of the spheres interact at times to create massive problems, for people and the environment. As the Mississippi River dumps into the Gulf of Mexico, it brings with it the runoff from almost half of the United States. In that mix is fertilizer runoff, industrial pollution, and municipal pollution such as untreated sewage. This creates a massive nutrient overload and once the flow slows down in the Gulf waters, an algal bloom erupts. Algae is a simple photosynthetic organism, so most students think that this is not a bad thing. Unfortunately, if a lot blooms at once, then a lot will die at the same time and start to decompose. The bacteria breaking down the algae uses all the oxygen in the water, creating a "dead zone" in any body of water that this occurs in, from a small farm pond to the Great Lakes. This is a place that fish and other organisms can not live in. Last summer the dead zone in the Gulf of Mexico was about as large as the state of Delaware. This year, the Midwest experienced massive rainfall and floods. More water, and therefore more nutrients flowed into the Gulf and the article quotes a NOAA prediction that this year's zone will be about the same area as Massachusetts. Massive amounts of wildlife will be impacted, as well as a major source of our nation's seafood.

This article easily connects with our Biosphere lesson, as the MODIS satellite can record algal blooms by measuring the chlorophyll-a levels from a body of water. Various visuals are available through the NASA Eyes on the Earth app, My NASA Data, ResourceWatch.org and others. Algal concentrations can also be tracked over time. An example can be found here: Gulf of Mexico Deadzone https://www.arcgis.com/home/webmap/viewer.html?webmap=22efcbb232be4e4a9c71524d37be4a30.

To connect the Lithosphere with the Hydrosphere, I would like to have the students create a landscape out of a large piece of plastic to model a watershed and have them create a simulation that demonstrates how runoff fertilizer can create algal blooms. I am visualizing fake grass carpet sections with green-dyed baking soda sprinkled over it to represent fertilizer, then the river would flow into a container spiked with vinegar to represent the existing phytoplankton. It would also be interesting to track various data sets and see what correlates strongest with a larger dead zone - rainfall or snowfall in various cities in the watershed, flow rates at the various large tributaries, etc. I would have the students collect this data in a class-wide spreadsheet and have each student prepare a CER statement to explain which event links strongest with algal blooms in the Gulf. Finally, to connect the Atmosphere, we could analyze the weather patterns that produced the heavy rainfall in the Midwest. I would have the students organize a class set of questions that could be answered, such as:

Did other regions experience weather patterns that were somewhat extreme?

Is this a sign of Climate Change?

Was this weather pattern linked to El Niño?

I would have partner groups then research and prepare a CER statement to answer one of the questions the class generates. They would present their findings as a newscast or special weather report.

RESOURCES:

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