Ocean Sediments in Google Earth: Distribution of Surficial Marine Sediments & Virtual Visits to "Type Localities" on the Seafloor

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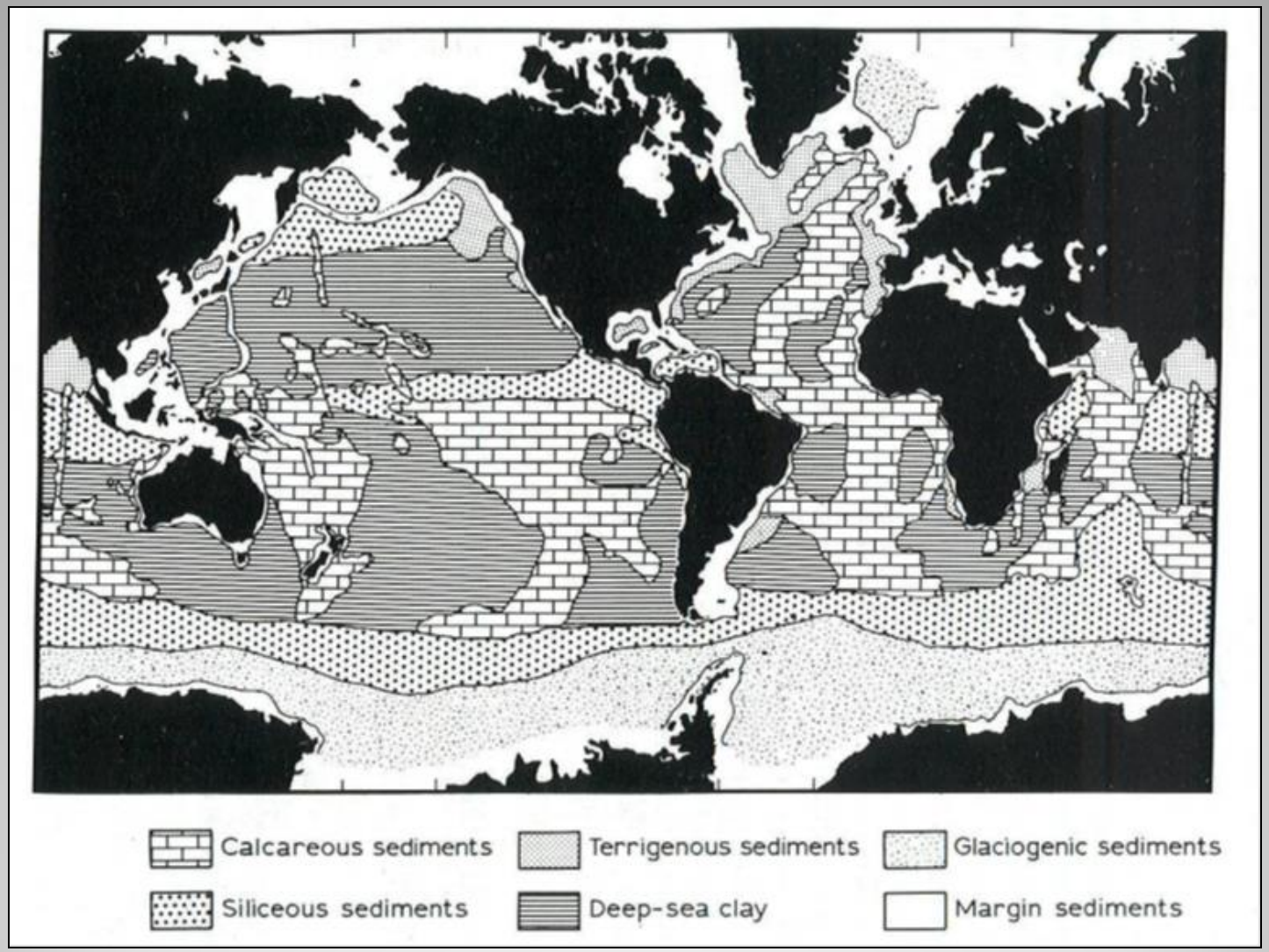
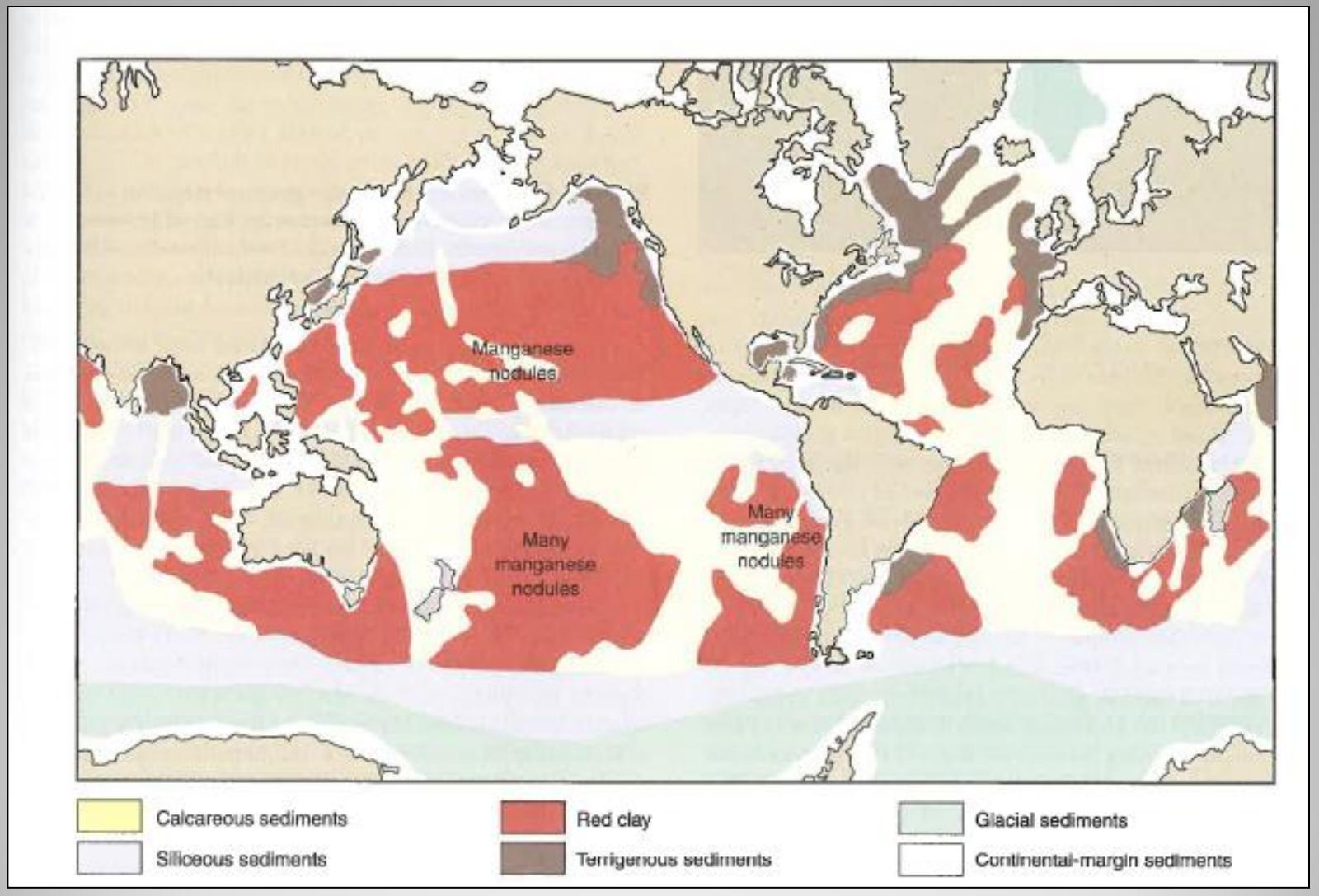
Importance of Marine Sediments in Geoscience

- Marine sediment types and their distribution are essential topics in **oceanography** and **marine geology courses**.
- The geographic distribution of marine sediments in the global ocean depends on factors such as:
  - water depth
  - distance from land
  - biological productivity
  - surface currents
  - Climate
  - ocean chemistry.
- Illustrate complex interactions in the Earth system.
- An archive for paleoceanographic and paleoclimatic reconstructions.



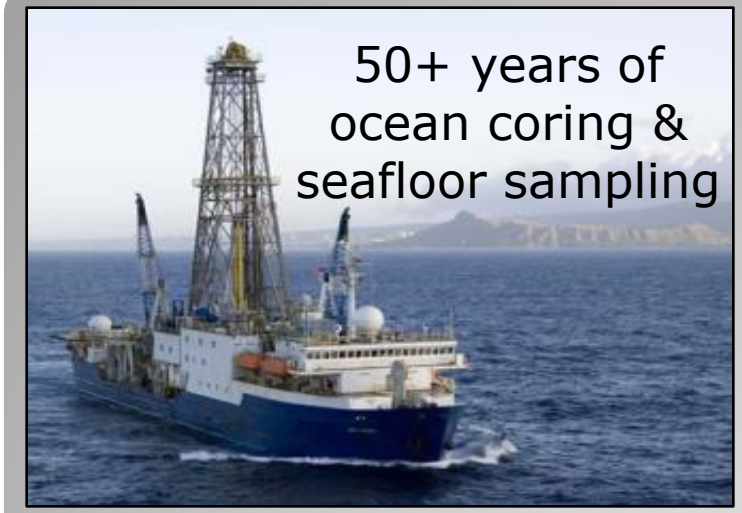
From Rothwell, 1989, after Davies and Gorsline, 1976.

Distribution of Surficial Marine Sediments



From Sverdrup and Armbrust, *Introduction to the World's Oceans* 9th ed, 2008

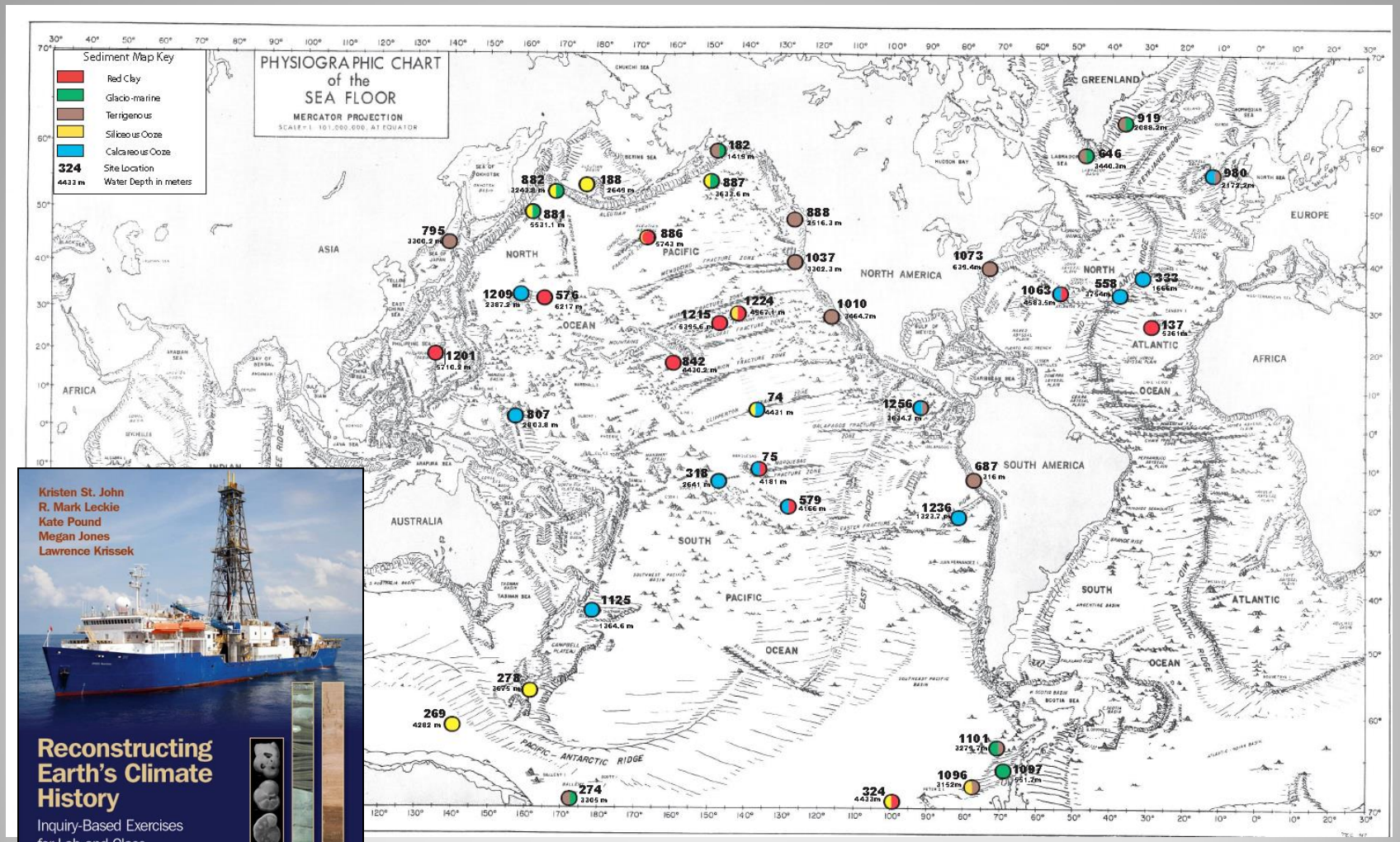
Adaptation of the 1976 map still used today



Open Access to Big GeoData

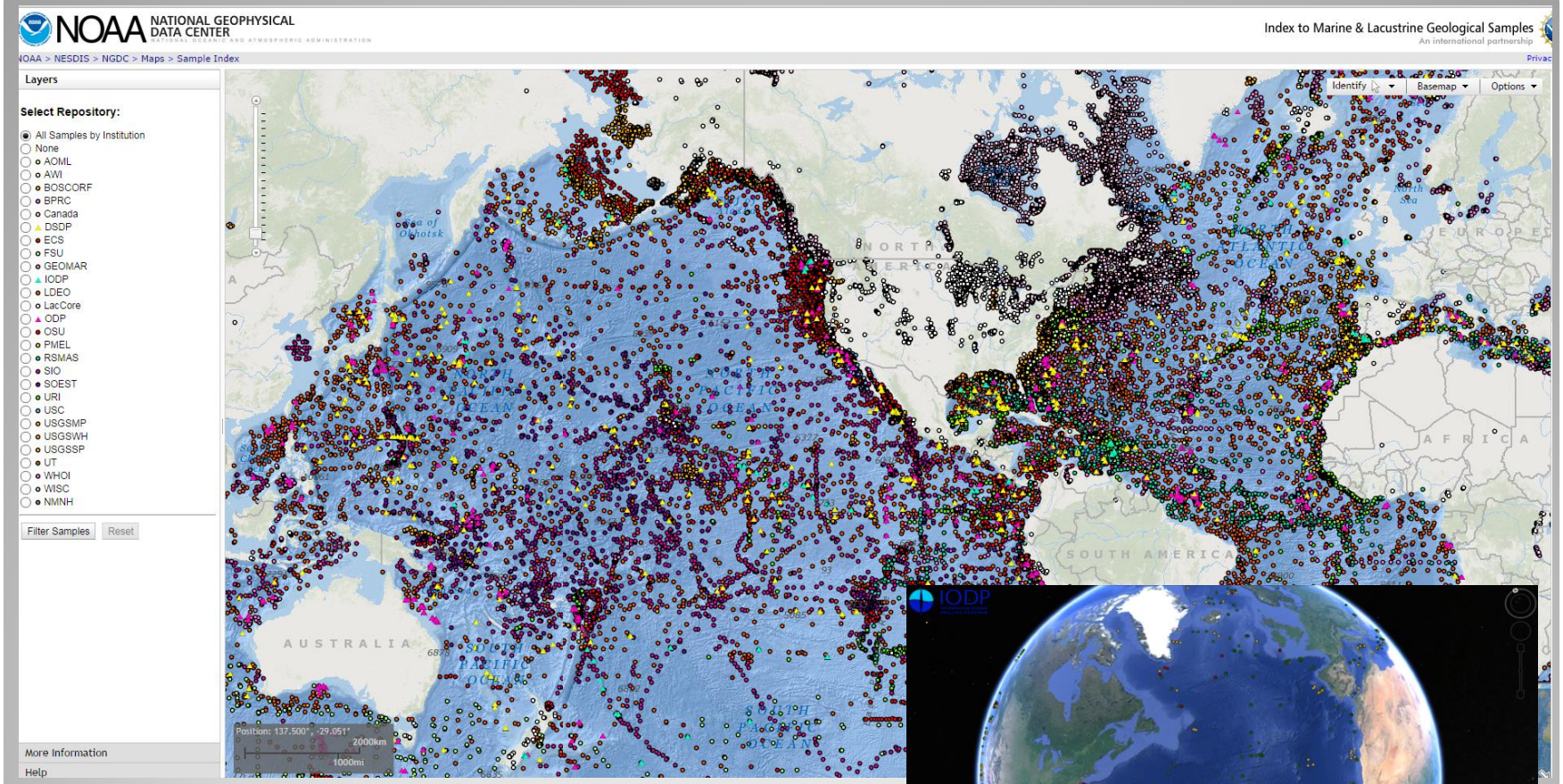
Project Goal: Use empirical data to map the global distribution of surficial sea floor sediment types in Google Earth and develop related learning materials.

An opportunity to display data from the global ocean in a volume and format not previously possible.



From St. John et al 2012, instructor guide

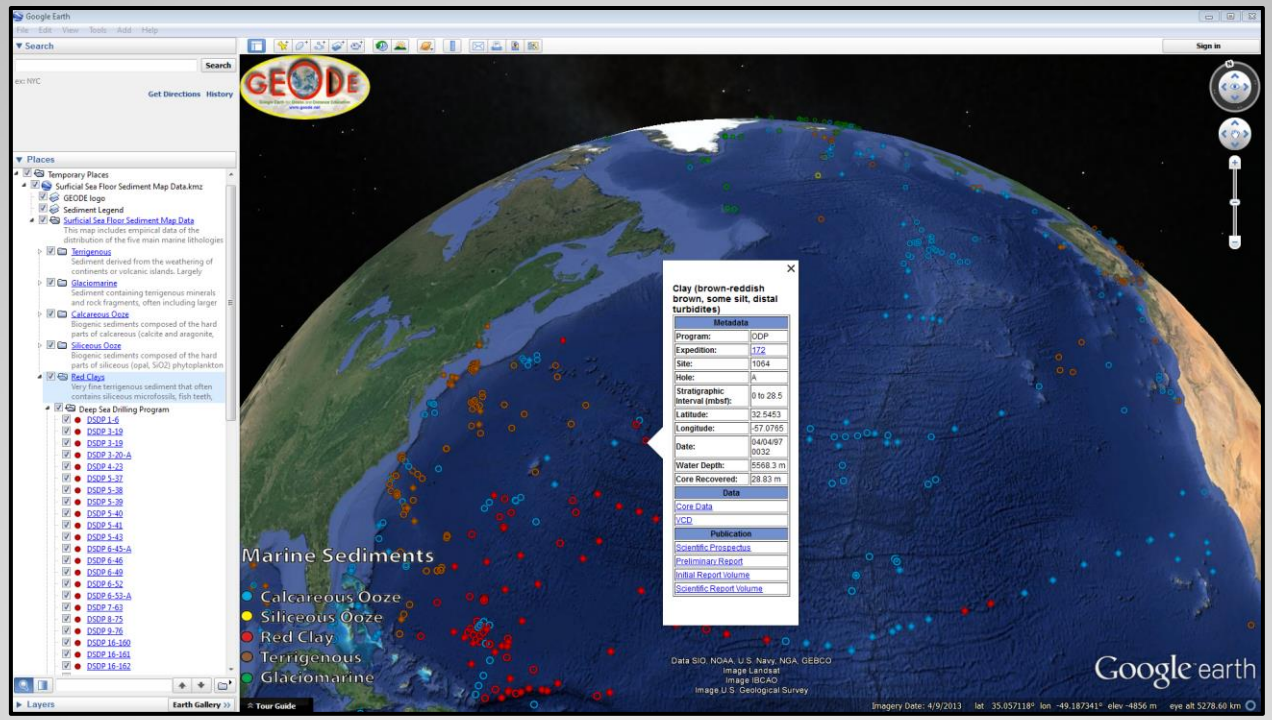
Building on Existing Curriculum



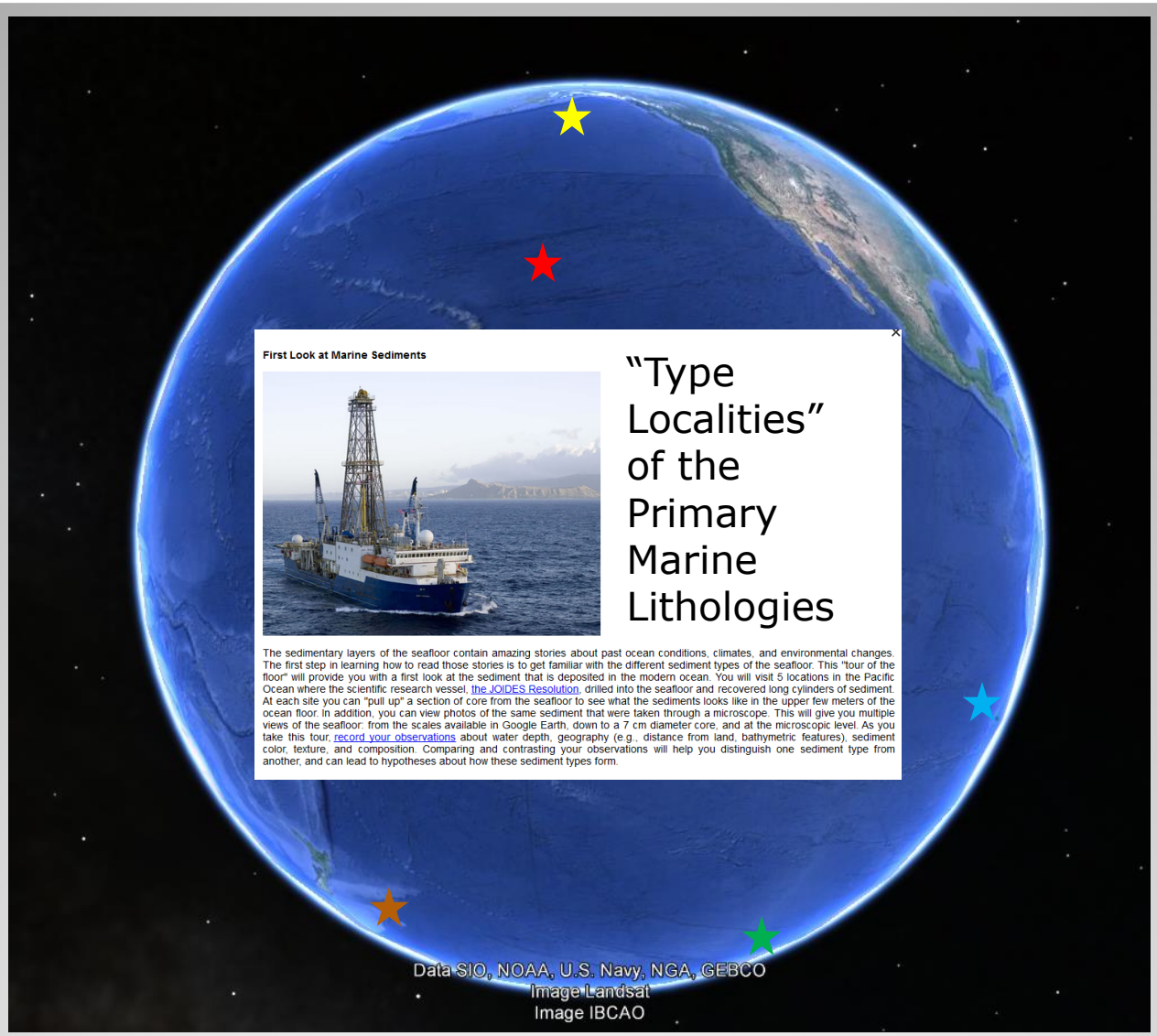
- National Geophysical Data Center Index to Marine and Lacustrine Geologic Samples
- IODP-ODP-DSDP borehole map

Drawing from Big GeoData

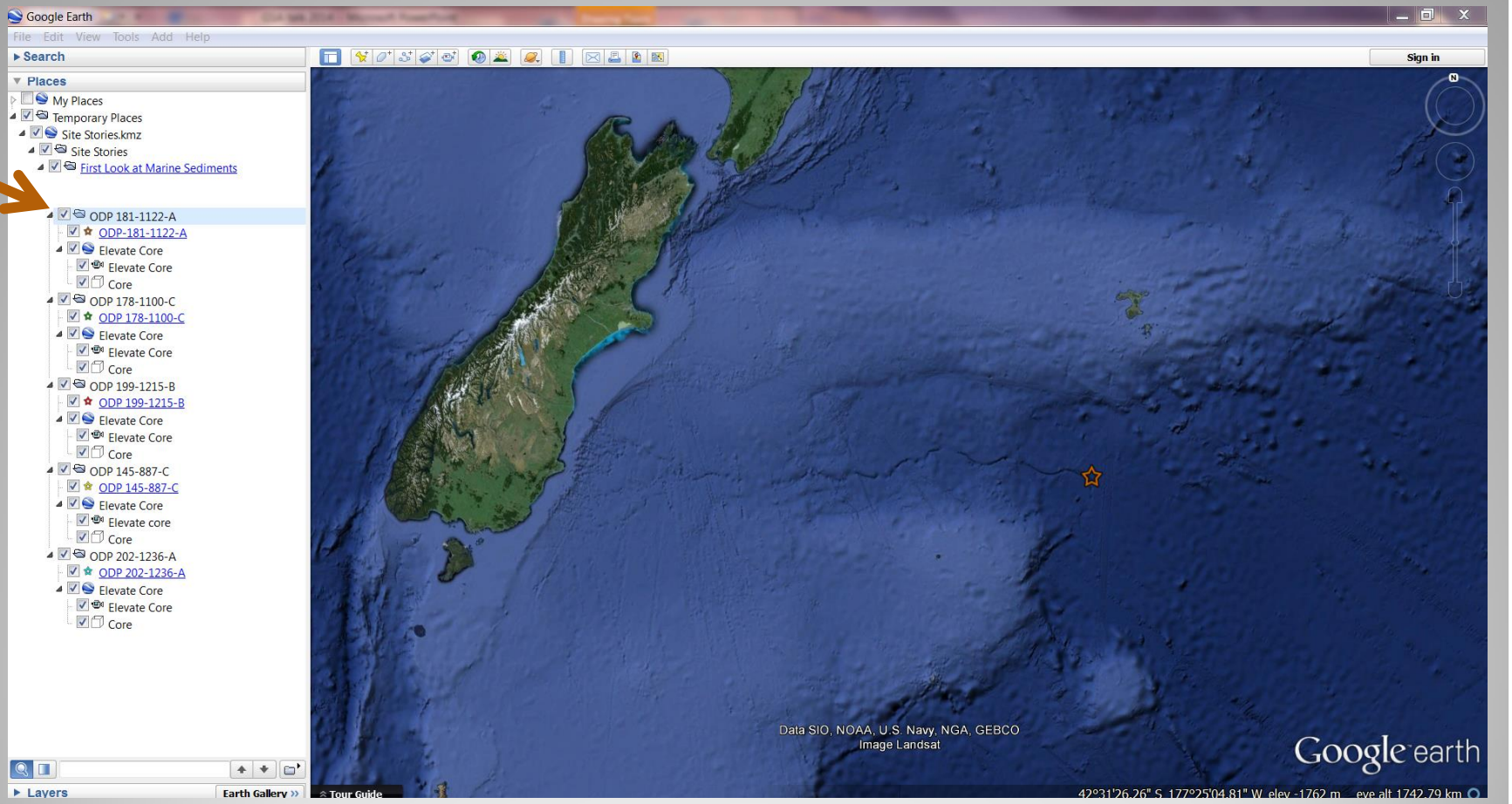
- 2000 sites have been plotted in Google Earth from DSDP, ODP, IODP, and WHOI research programs, with links to the original data.
- Draft Student Exercise: *Exploring Marine Sediments Using Google Earth*.
  - *Part 1. A First Look at Marine Sediments*
  - *Part 2. Exploring the Distribution of Marine Sediment Types on the Sea Floor*
  - *Part 3. Refining Your Hypotheses on Biogenic Marine Sediment Distributions*



Project Status



Part 1: First Look at Marine Sediments



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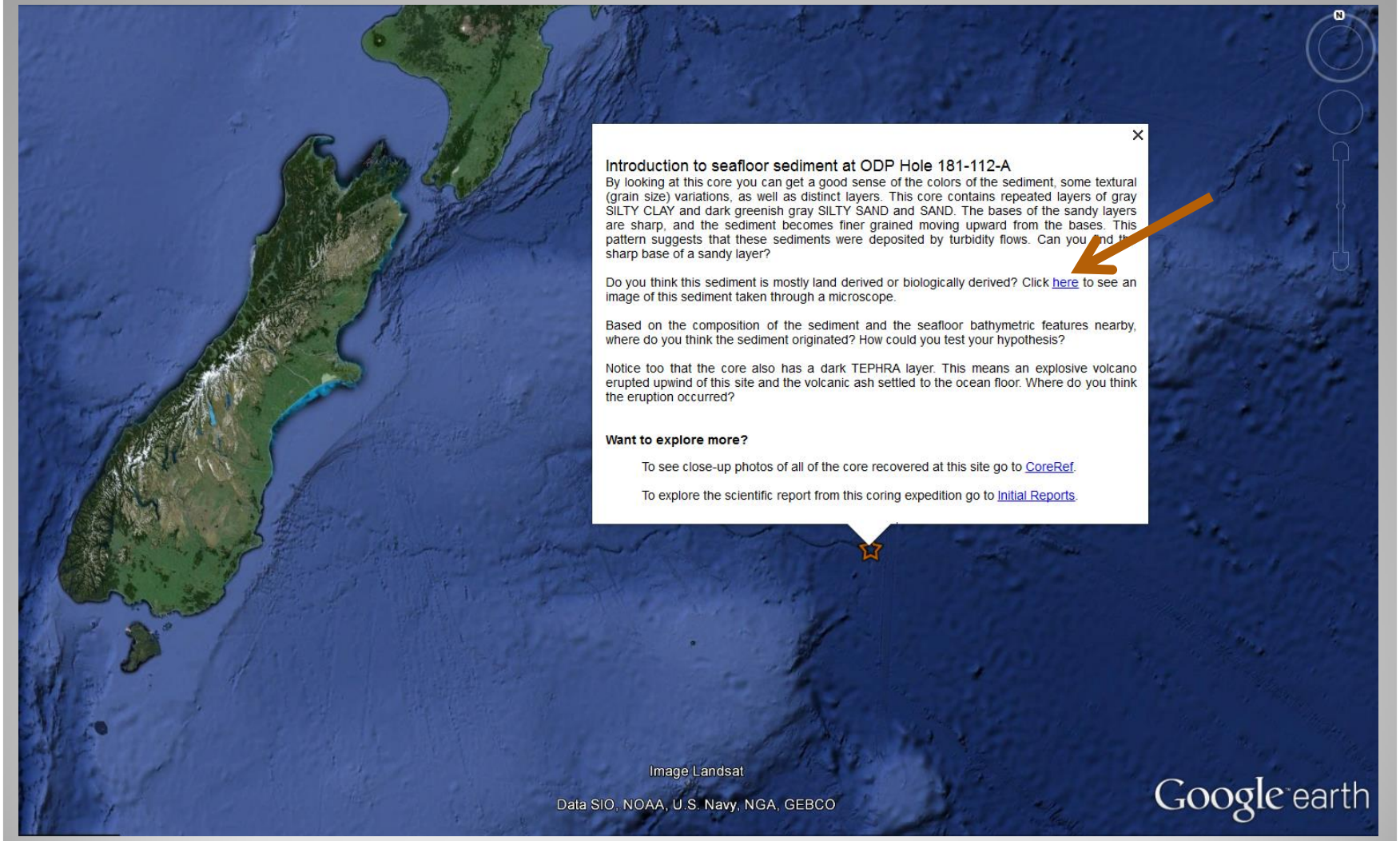

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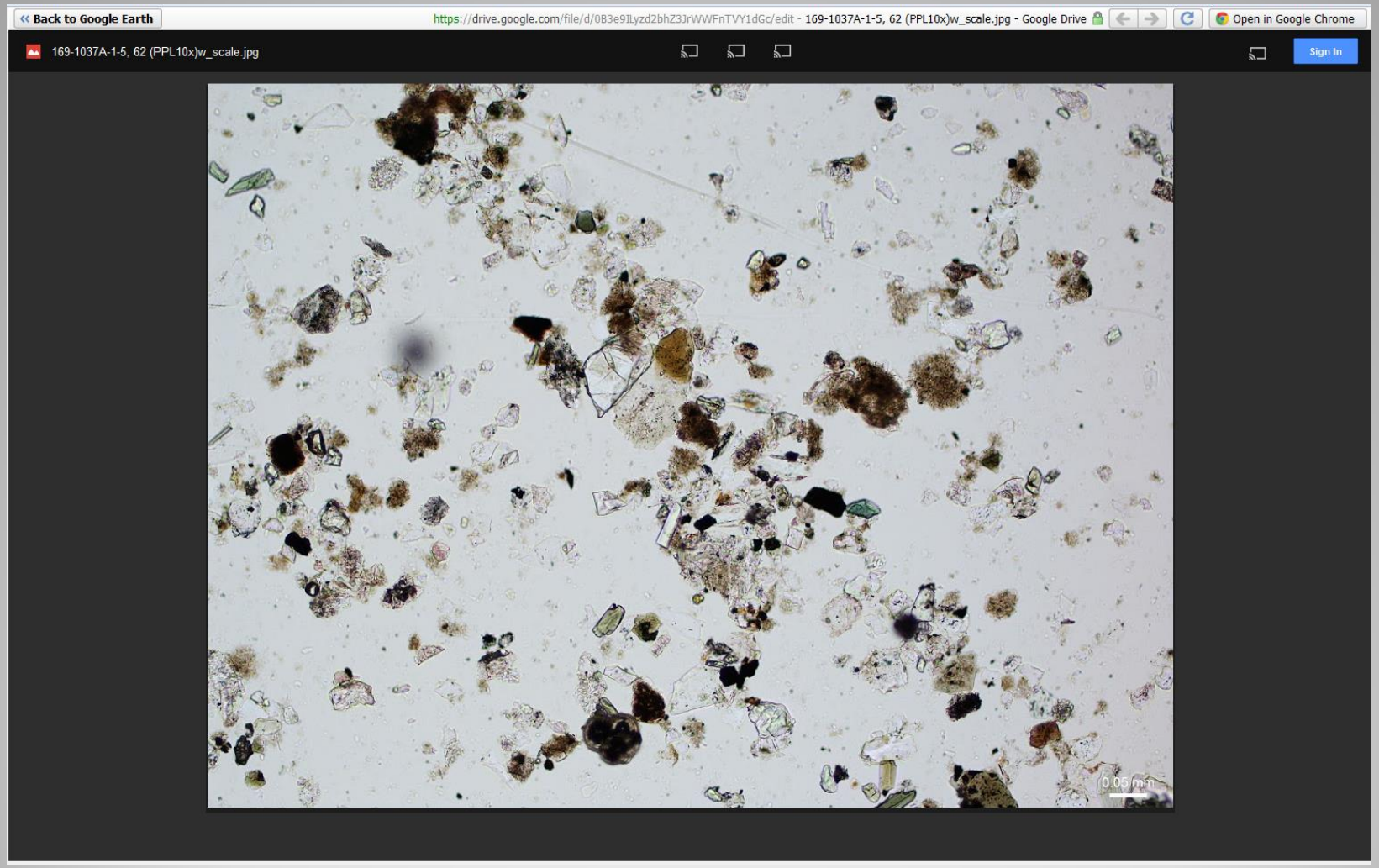

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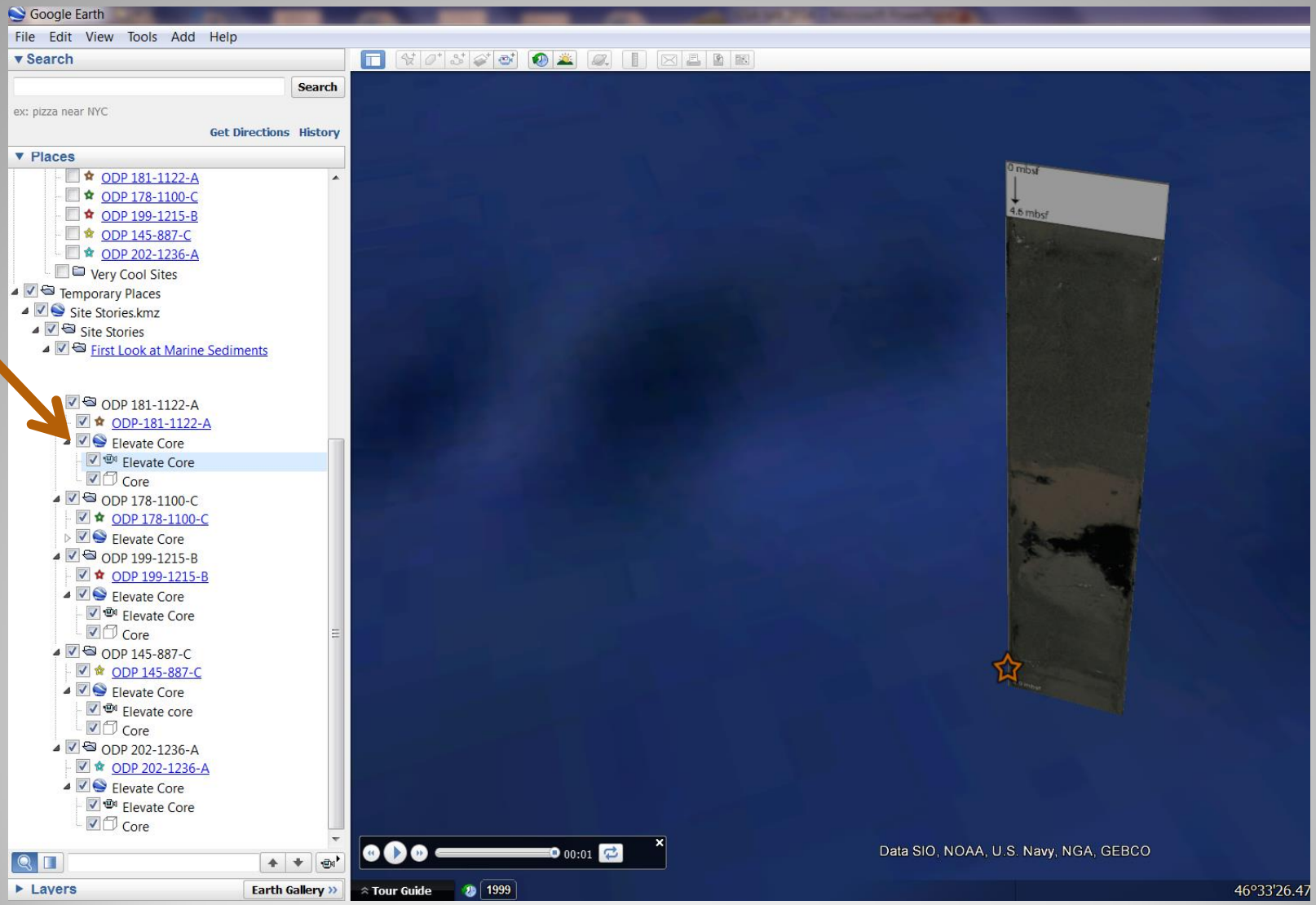

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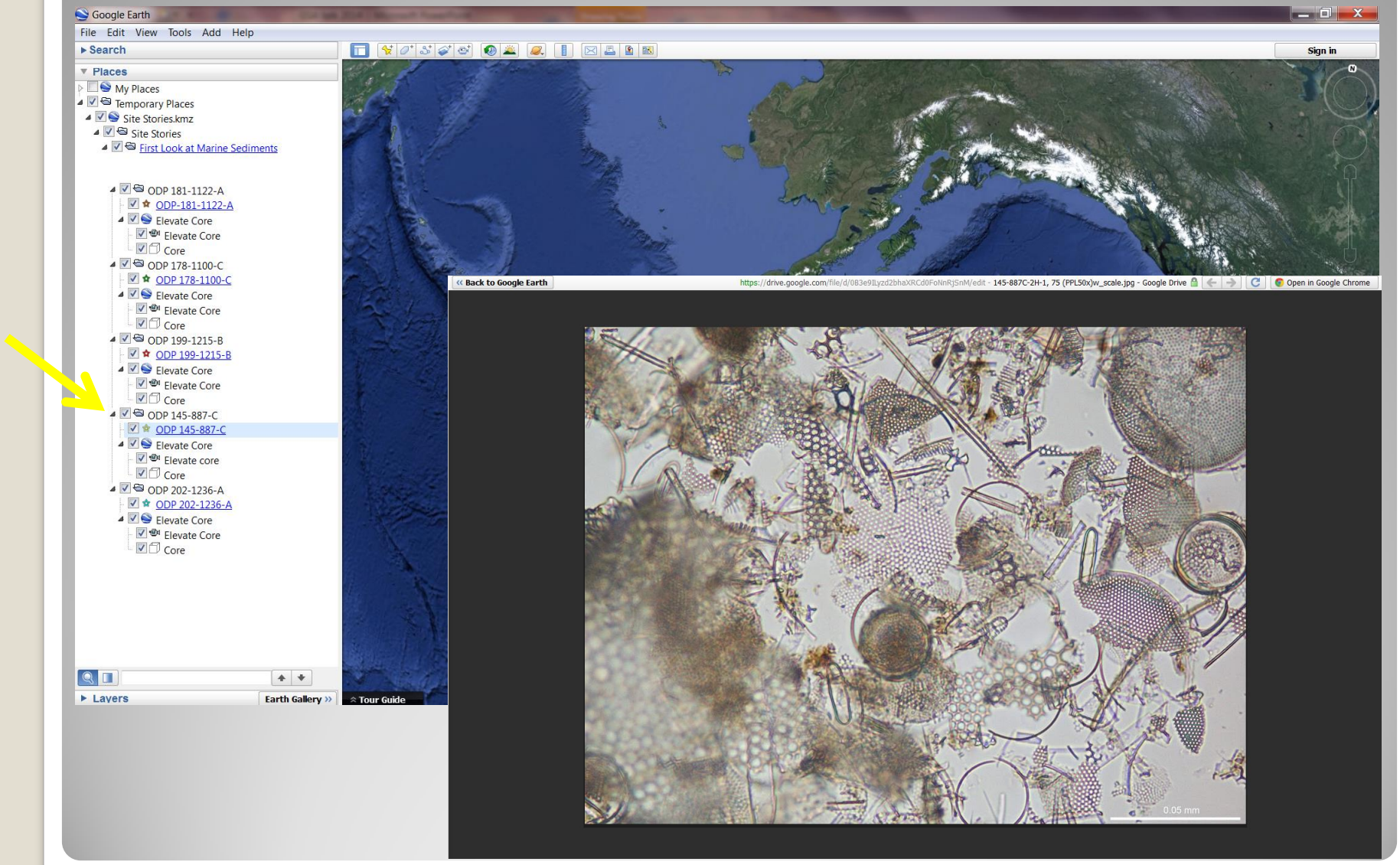


Part 1: First Look at Marine Sediments

Table 1. First Look at Marine Sediments - Summary Observations

	Site Locations				
	ODP 181-112-A	ODP 145-887C	ODP 199-1215B	ODP 202-1236A	ODP 178-110C
How deep (meters) is the water at this site?					
How far (km) is this site from land?					
What is the shape of the seafloor here? (e.g., flat, submarine plateau, continental slope…)					
What does the se co					
Wh se of					
Wh ob do					
Wh qu ab loc ha					

Table 2. First Look at Marine Sediments - Responses to Site-Specific Questions

ODP 181-112-A

Can you find the sharp base of a sandy layer?

Do you think this sediment is mostly land derived or biologically derived?

Based on the composition of the sediment and the seafloor bathymetric features nearby, where do you think the sediment originated?

How could you test your hypothesis regarding the sediment origin?

Notice the dark tephra (ash) layer in core. Where do you think the eruption occurred?

Part 1: First Look at Marine Sediments

Table 3. Description of the Principle Marine Sediment Types

Marine Lithologic Name	Description

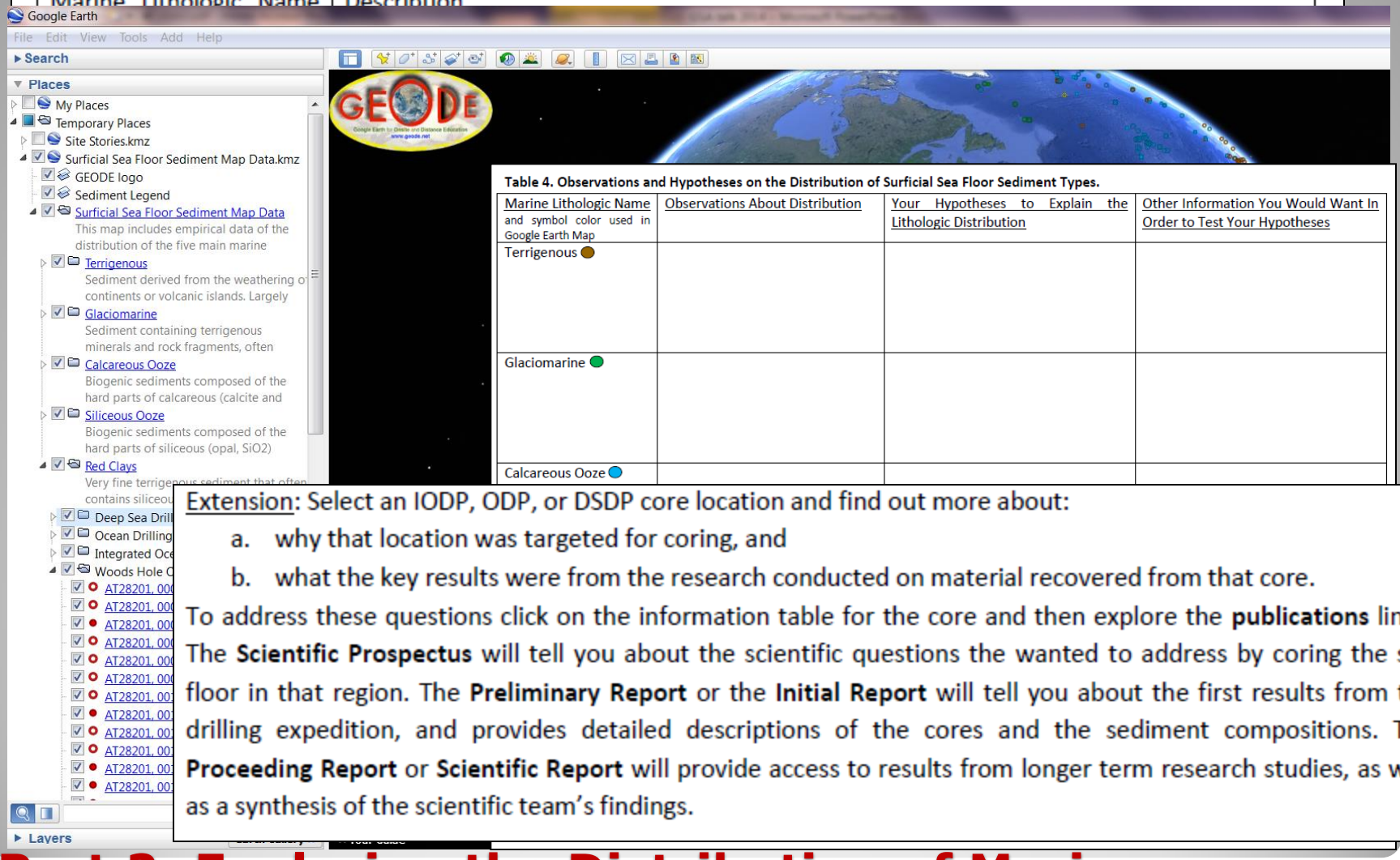


Table 4. Observations and Hypotheses on the Distribution of Surficial Sea Floor Sediment Types.

Marine Lithologic Name and symbol color used in Google Earth Map	Observations About Distribution	Your Hypotheses to Explain the Lithologic Distribution	Other Information You Would Want In Order to Test Your Hypotheses
Terrigenous			
Glaciomarine			
Calcareous Ooze			

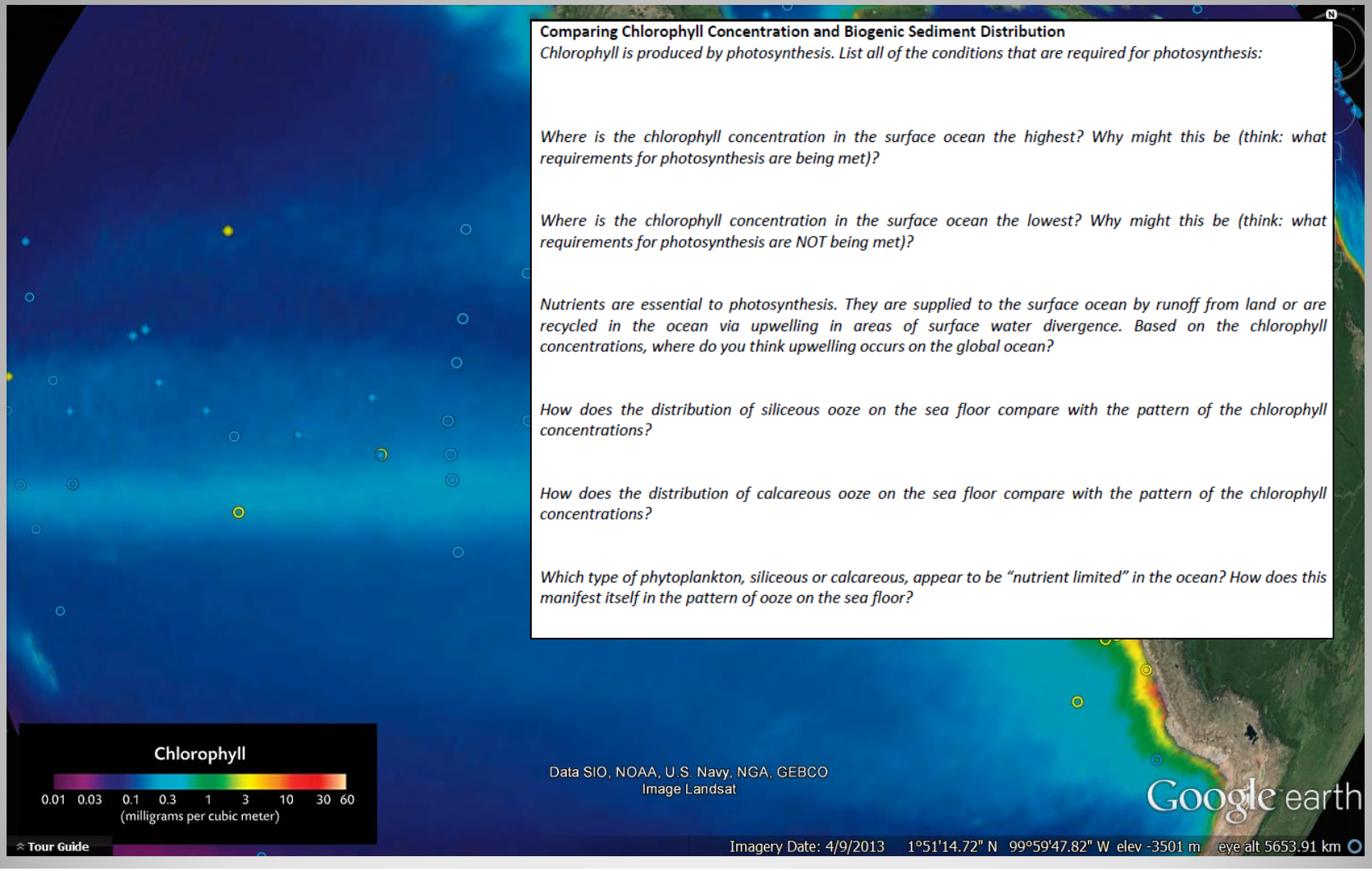
Extension: Select an IODP, ODP, or DSDP core location and find out more about:

a. why that location was targeted for coring, and

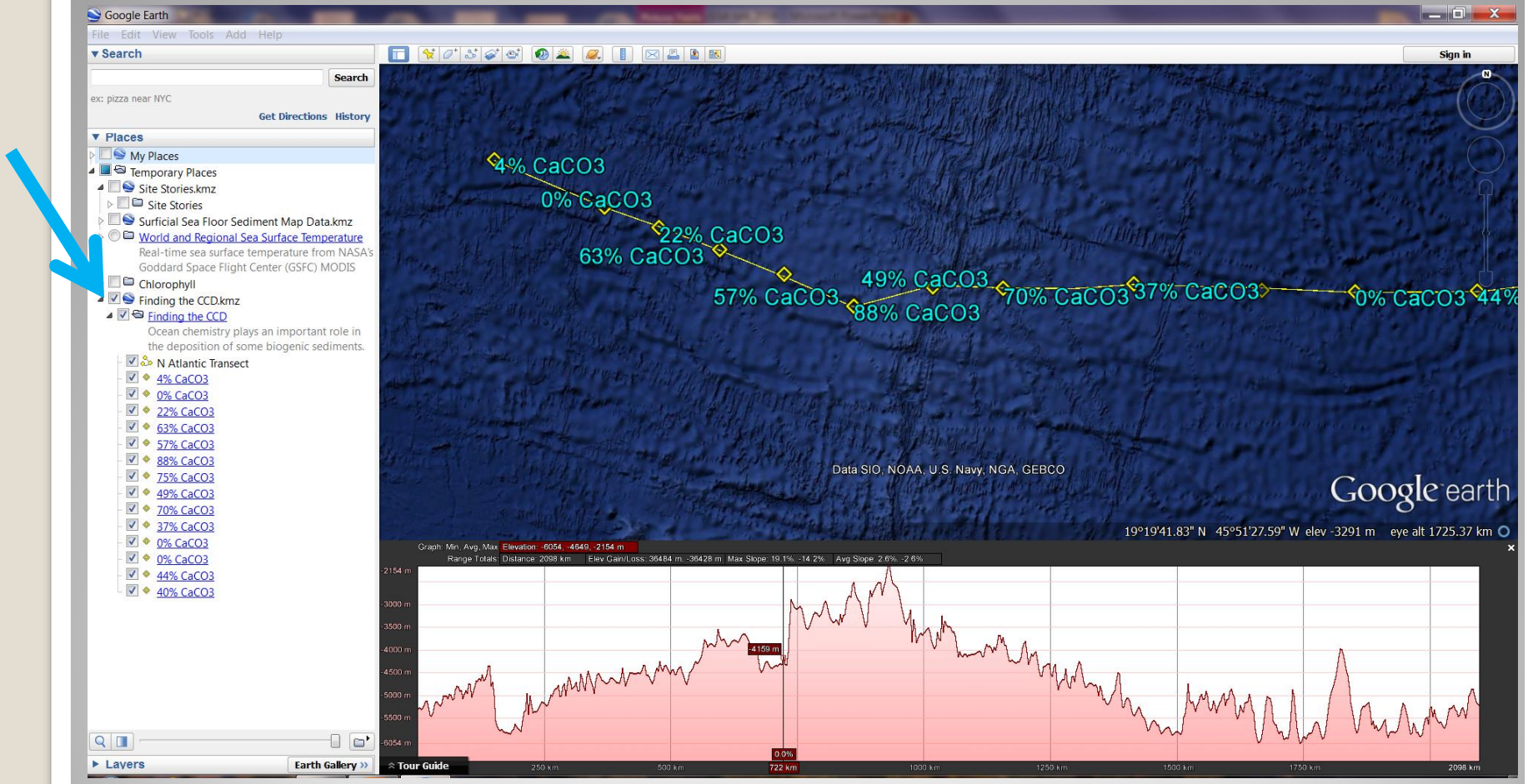
b. what the key results were from the research conducted on material recovered from that core.

To address these questions click on the information table for the core and then explore the **publications** links. The **Scientific Prospectus** will tell you about the scientific questions the wanted to address by coring the sea floor in that region. The **Preliminary Report** or the **Initial Report** will tell you about the first results from the drilling expedition, and provides detailed descriptions of the cores and the sediment compositions. The **Proceeding Report** or **Scientific Report** will provide access to results from longer term research studies, as well as a synthesis of the scientific team's findings.

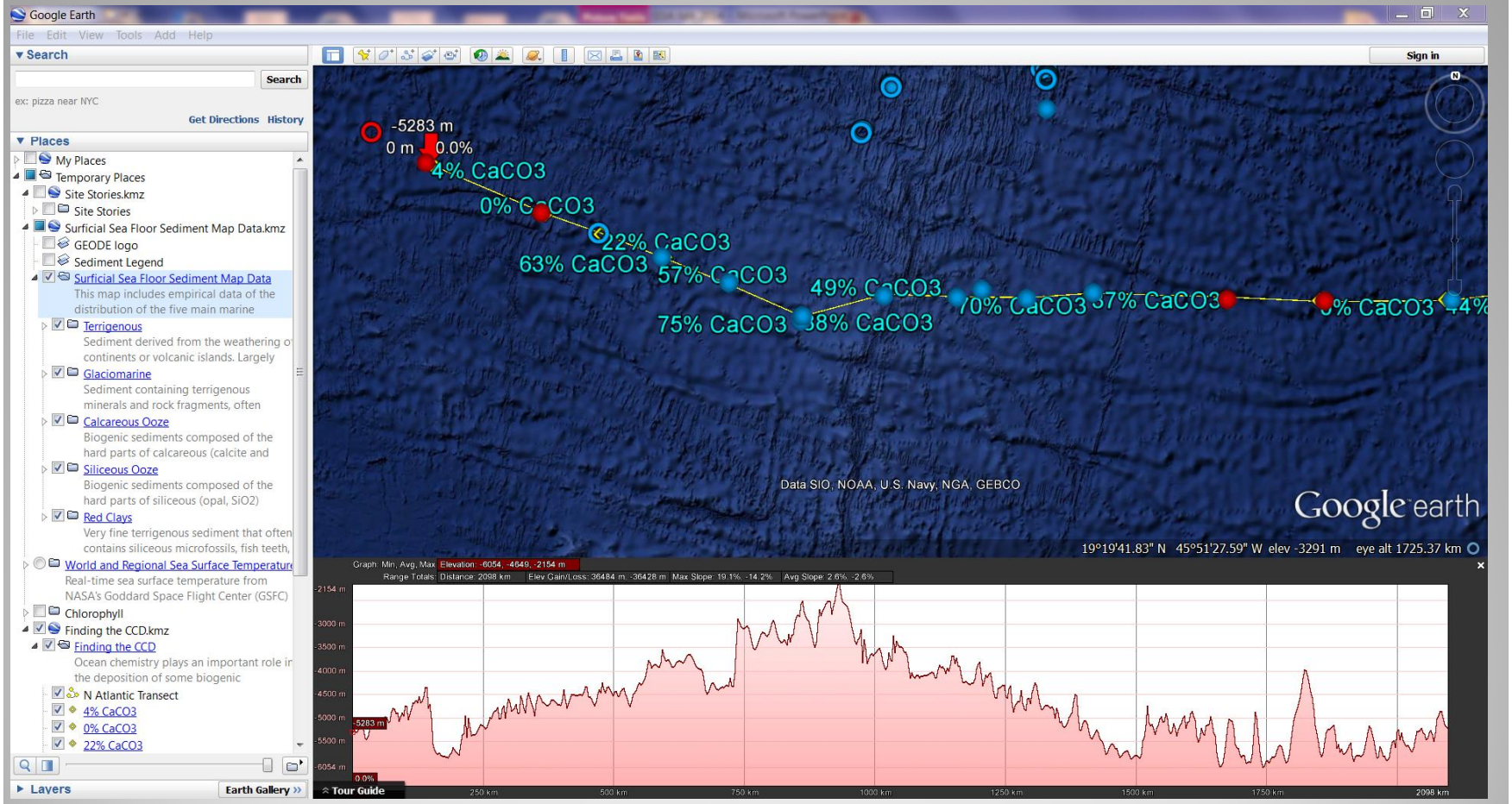
Part 2: Exploring the Distribution of Marine Sediment Types on the Sea Floor



Part 3: *Refining Your Hypotheses on Biogenic Marine Sediment Distributions – comparing to other "Big Data"*

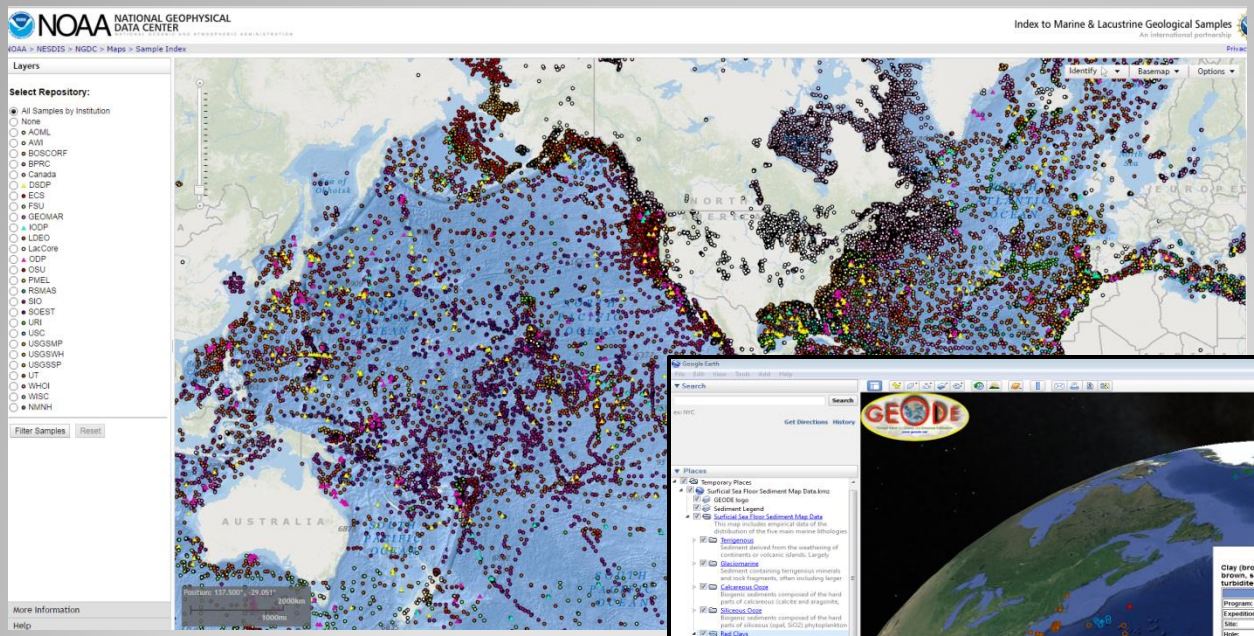


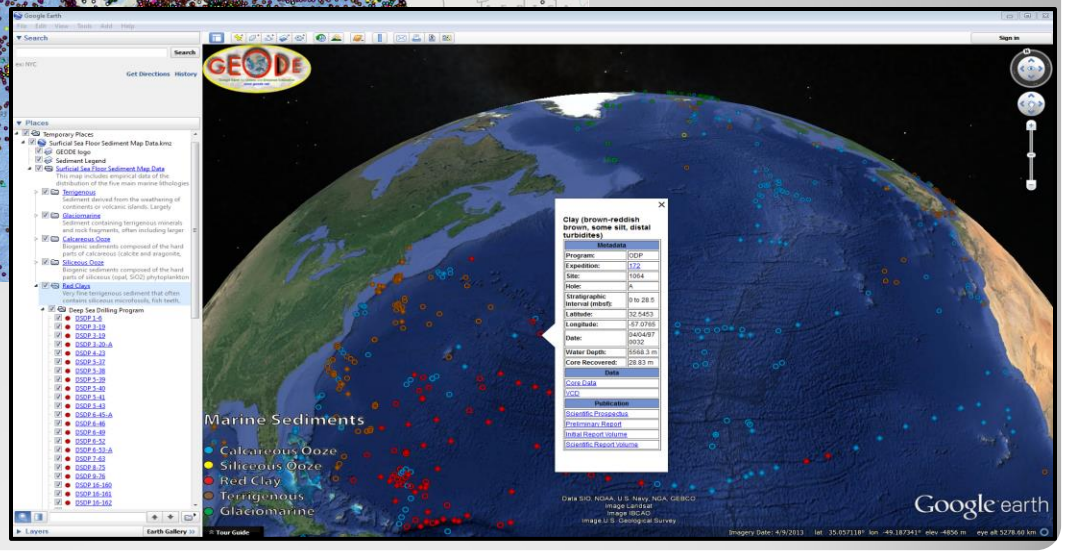
Part 3: *Refining Your Hypotheses on Biogenic Marine Sediment Distributions – Connecting Observation to Theory on the CCD*



Part 3: *Refining Your Hypotheses on Biogenic Marine Sediment Distributions – Connecting Observation to Theory on the CCD*

- Add ~10,000 more sites to Google Earth map by “mining” the National Geophysical Data Center Index to Marine and Lacustrine Geologic Samples.
- Test student exercise in classrooms/online.





Next Steps