

The Swim

Lesson Packet: Water Data

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Introduction

The most dynamic scientific data collection in The Swim is tackling is the crew keeping track of water data as Ben and the Seeker crew crosses the Pacific Ocean. The Water Data Lesson Pack for The Swim provides recommended materials for teachers interested in creating a lesson around the high definition water data being collected as the expedition crosses the ocean.

The following lesson pack provides recommended materials for teachers interested in creating a lesson around the event. This pack contains multimedia resources, worksheets, and a standard lesson plan targeting students ages 12-17. While the target age is middle school levels, ***this lesson pack also highlights some more advanced lesson suggestions and has a more advanced focus of class discussion and student engagement.***

This pack is designed to be as flexible as possible with various levels of vocabulary, scientific information, and student discussion topics to be added to and changed as befitting the class.

Teachers are encouraged to use the suggested materials at will depending on their class size, background, and curriculum requirements. Discussion topics and student conversation questions are highlighted in **ORANGE**.

We hope your students have as much fun with The Swim as we do!

Lesson Plan

SUBJECT:	Ben Lecomte's The Swim		
LESSON	Water Data		
TITLE:	Water Data in the Swim		
LESSON LEVEL:	Beginner/Intermediate	DURATION:	20-30 mins
OBJECTIVE:	<ul style="list-style-type: none"> • Students will understand the many ways water can be analyzed and how these results can be interpreted when thinking about scientific and environmental protocols. • The students will be familiar with the breadth of the technology being used in the Longest Swim and how Ben and the Crew are using them to analyze the water. • Students will be familiar with which protocols need specific water data and why. 		
SUMMARY OF TASKS/ACTIONS:	<p>(5min) Introduction of teacher, lesson, and watch Ben's introduction of the roll of water data in The Swim.</p> <p>(10min) Students will watch a video of technologies showing water data in the swim. In addition they will look at the different filters on the Live Tracker and discuss how this is important to science and Ben's performance.</p> <p>(10min) Students will receive a handout from the teacher on the types of water data collected. They will create a scientific protocol of their own using this data.</p> <p>(5min) The students will debrief about the activity with the teacher.</p>		

Vocabulary

Data	facts collected for analysis
(Experimental) Control	a sample that remains the same throughout an experiment to make sure the data is valid.
Hypothesis	a first guess about what you think the results of your experiment will be
Nautical Mile	1.15 Miles or 1.85 Kilometers A nautical mile is based on the circumference of the earth.
Knot (kt)	the measurement of one nautical mile per hour 18 knots = 18 nautical miles per hour
(Water) Current	Water moving continuously in a certain direction
Beaufort Scale (bft)	the standard way to measure wind
pH scale	the scale used to specify the acidity of the water

Water Data in the Swim

Many of the science projects Ben and the crew will be collecting data for rely on knowing details about the water he is swimming in.

Each day the crew takes a sample the water from the Pacific Ocean.

The crew will need to know which protocols their daily water sample is associated with.

For Example:

The Toxicity protocol requires a daily water sample,

The Radiation protocol only asks for a water sample every four days

The Microplastics protocol needs water samples every other day.

DISCUSSION: What protocols do you think need water samples? Which water samples? And Why?

(List of some experiments of the Swim: Toxicity, Bird Watching, Sounds of the Ocean, phytoplankton, Plastics, Microfibers, Gravity, Nutrition, Heart Rate, Lantern Fish counting)

Knowing which protocols need water analysis and samples on certain days will determine how much water needs to be sampled and even which tests to run that day. The crew gathers a lot of its data with the **iSAMI** a high definition water data collection prototype.

When taking water samples the crew also needs to know how many of the research projects want the water to be analyzed on the boat and discarded, and which projects want the water collected at the end of The Longest Swim.

In many cases of the different protocols the water analysis will function as a type of experimental control.

The water analysis as a control helps research analysis determine if the data of what they are researching is directly relevant to their topic or if the result is skewed from outlying factors.

There are many scientific protocols in the swim that are concerned only with the water, so water data is very important. Things that the crew measure for specific water protocols are:

Toxicity- How toxic is the water?

Radioactivity-Is there radiation?

(Spotlight on the RadBand technology later in the pack)

Salinity- How salty is the water? Does this affect life in the ocean?

Acidity- what is the pH balance in the water and how does this affect the ecosystem?

The Tracker (That cool looking map)

The website tracker not only follows Ben and the crews distance from Japan, but also catalogues a lot of the water data taken every day. There are four main filters that track:

1. **Temperature**- Is the water cold? Is it too cold?
2. **Wave Height**- it is not safe to swim if the waves are too high. Ben can get separated.
3. **Wind speed**- this is based on the Beaufort scale. (Attached in the pack)
4. **Currents**- which direction and how fast is the water flowing?

Tracker Filters

The real-time Live Tracker can be found at benlecomte.com/live-tracker/

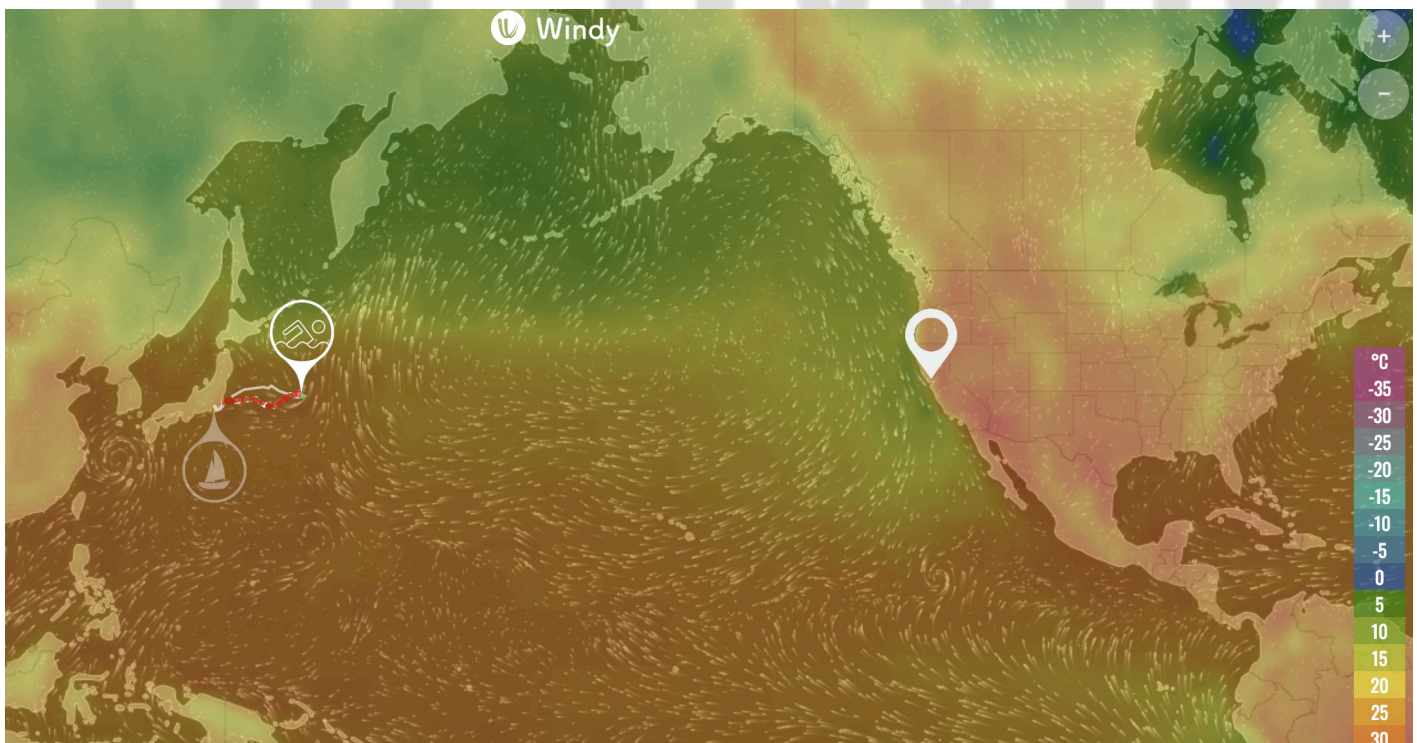
DISCUSSION- Questions to accompany photos:

Which filter is this? How can you tell?

What do the scales in the bottom right measure?

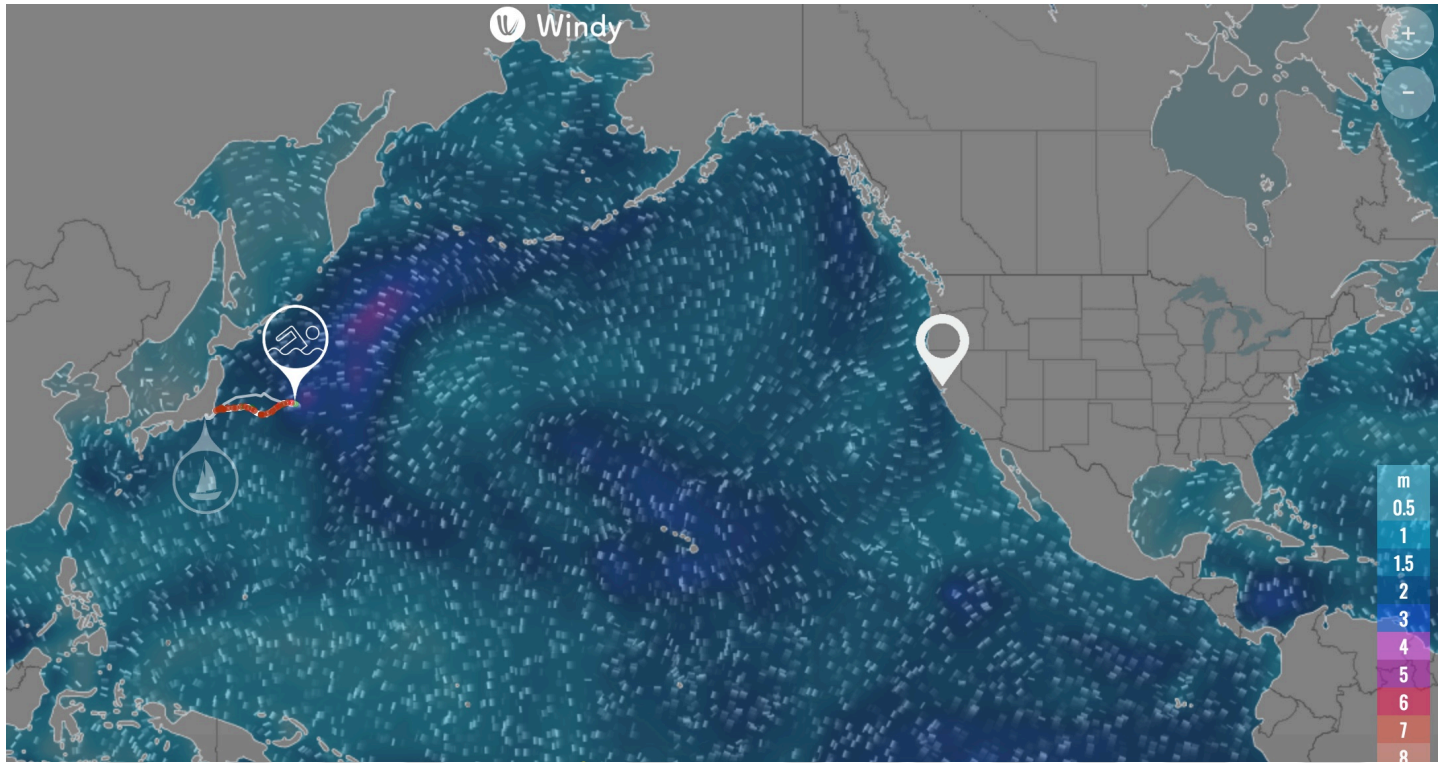
Compare these still photos to the real time live tracker. What is similar? What is different?

How do things like temperature or wave height affect science collection and data gathering in other scientific protocols?



Temperature

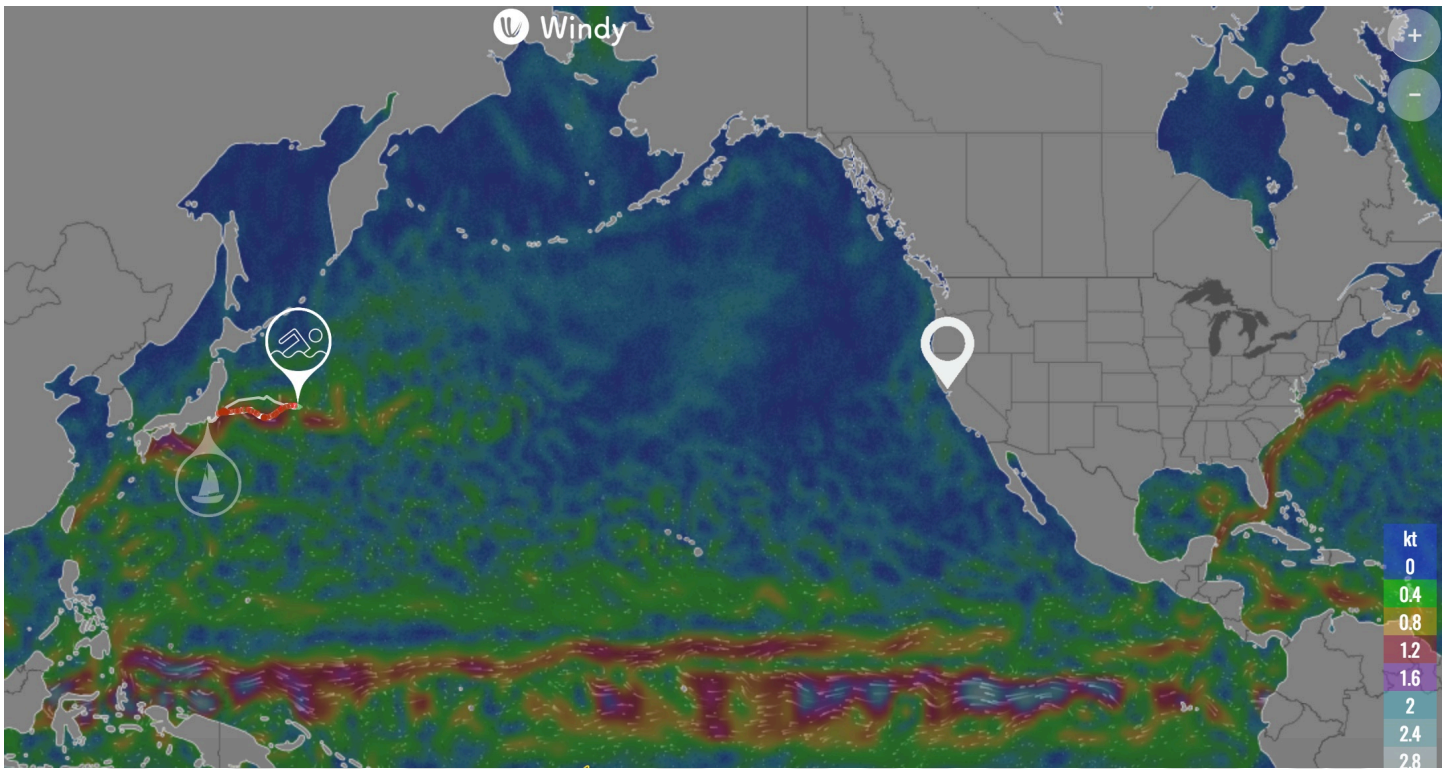
<http://benlecomte.com/education>



Waves



Wind



Currents

THE SWIM
Seeker + Discovery

Student Activity Pages

Design Your Own Experiment

Have students think about a question they have about how the temperature, currents, acidity, or wave height affects the ocean ecosystem. Have them create a **hypothesis** about the question they have.

For a further interactive element of this activity, have the class choose one question and send it in to The Swim to get an answer from one of the people working hard on the project!

Advanced Page: The Beaufort Scale

Go through the beaufort scale as a class and discuss the why this is an important data point. Use the live tracker filter to have students guess at the wind speed in various areas of the map.

Advanced Page: The Radband

This is a technology spotlight on one of the prototypes being used in the swim, use the hand out to discuss the invention in class and have students discuss and present about one aspect of the radband and how it relates to the tracker filters and other types of water data. Three recommended group topics are:

- The device as an invention for the swim
- The state of radiation in the Pacific
- The importance of radiation monitoring

Name:

The Swim- Water Data

Propose an experiment where at least one of the water data sets is important to the hypothesis.

What question does your experiment answer?

Which of the water data sets will your experiment use? (More than one allowed)

- Temperature Wave Height Current Speed
 Acidity Wind Speed

Why is this important to your experiment?

A **hypothesis** is a first guess about what you think the results of your experiments will be. What is your hypothesis for your experiment?

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The Beaufort Scale

Discuss: Why is wind so important to the swim? Why is it important for other boats?
How can this be important for people on land?

	Feels Like	Wind Speed
0	Calm	<1 mph or, <0.3 m/s
1	Light Air	1-3 mph or, 0.3-1.5 m/s
2	Light Breeze	4-7 mph 1.6-3.3 m/s
3	Gentle Breeze	8-12 mph 3.4-5.5 m/s
4	Moderate Breeze	13-18 mph 5.5-7.9 m/s
5	Fresh Breeze	18-24 mph 8.0-10.7 m/s
6*	Strong Breeze <i>Advisory Warning!</i>	25-31 mph 10.8-13.8 m/s
7	Near Gale <i>Advisory Warning!</i>	31-38 mph 13.9-17.1 m/s
8	Gale <i>Advisory Warning!</i>	39-46 mph 17.2-20.7 m/s
9	Strong Gale <i>Advisory Warning!</i>	47-54 mph 20.8-24.4 m/s
10	Storm <i>Advisory Warning!</i>	55-63 mph 24.5-28.4 m/s
11	Violent Storm <i>Advisory Warning!</i>	64-72 mph 28.5-32.6 m/s
12	Hurricane Force <i>Advisory Warning!</i>	≥73 mph ≥32.7 m/s

The Radband Seawater Monitoring Bracelet

What is it?

- Small, portable, anklet prototype invented by *Dr. Ken Buesseler*.
- The anklet holds disposable filter, which is coated in a special resin.
- Tracks levels of *Cesium 137*.

Why was the Radband created?

- It measures levels of radioactive Cesium in seawater.
- Dr. Buesseler of Woods Hole Oceanographic Institute, is interested in tracking the spread of radioactivity in our oceans.

Why measure Cesium?

- Dr. Buesseler developed the radband specifically to answer *environmental and safety* questions about cesium in our oceans emanating from the plant in Japan.
- Cs 137 will have had the time to disperse throughout the Pacific Ocean.
- The Radband tracks GPS location so samples will show the geographic effect of the nuclear meltdown.

What is Cesium?

- Element 55 is most known for its radioactive isotope: Cs 137
- Responsible for radioactivity of *spent nuclear fuel*.

How did it end up in the ocean?

- The *Fukushima Dai'ichi Power Plant* meltdown in 2011 leaked record levels of Cs 137 into the Pacific.
- Radioactive waste often ends up in our oceans.

Fun Facts!

- The radband is currently 1000 Nautical Miles moving east away from Japan. (And getting further!)
- Dr Buesseler developed the radband prototype specifically for The Swim.
- Radband filters use a special resin that reacts to Cs 137, turning the filter a different color. The stronger the color, the more cesium in the water.

Miscellaneous Tid-bits!

- Other *prototypes* used in The Swim:
 - The i-SAMI Ocean PH sensor- High Definition water data
 - Shark repellent bracelet- Electrical currents for swimming safety

Radband Photos





Further Resources

<http://benlecomte.com/live-tracker/>

<http://benlecomte.com/science/>

<https://waterdata.usgs.gov/nwis>

<http://www.oceanweather.com/data/>

<https://www.spc.noaa.gov/faq/tornado/beaufort.html>

