


EPSS 15: Blue Planet Introduction to Oceanography

Santa Monica Bay Observatory mooring station. UCLA Image

Jose and Maria storms in the Atlantic, Sept. 19 2017.
<https://earthobservatory.nasa.gov/IOTD/view.php?id=90998>

GOES-13 Satellite, Public Domain



The Big Picture

Why does the Earth have oceans?
What happens in and around them?



How do the oceans affect our lives?
How do we affect the oceans?

Photo from Int'l Space Station, Jan. 17 2014
http://www.nasa.gov/images/content/133350main_earth_011714_33350.jpg?724x83350 Public Domain

The Big Picture



Sea turtle entangled in a discarded net. NOAA image. Public Domain



Monterey sardine processing, 1908. US Office of the Commissioner of Fish and Fisheries. Public Domain



Tsunami damage, 2015 Illapel Earthquake, Chile. Photo by Sjs90, https://commons.wikimedia.org/wiki/File:Barcos_varados_en_Coquimbo.JPG Creative Commons Attribution-Share Alike 4.0 International

Introduction to Oceanography

- Earth, Planetary & Space Sciences 15 (EPSS15)

Webpages:
<https://ccle.ucla.edu/course/view/17F-EPSSCI15-1>
http://www2.ess.ucla.edu/~schauble/EPSS15_Oceanography

– This is the primary resource for course info!

Instructor: Professor Edwin Schauble
 3642 Geology Building
 schauble@ucla.edu
 Office phone: 206-9292
 Office Hours: Mon./Tues. 3-4pm (or appt.)

Teaching Assistants

- Alex Sedlak asedlak@ucla.edu
1D, 1H, 1L 3685 Geology
- Ashna Aggarwal aaggarwal01@ucla.edu
1E, 1F, 1G 5652 Geology
- Michelle Jordan mkjordan@ucla.edu
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Lecture Format

- Lectures: MWF 1:00pm-1:50pm
- Location: Dodd 147
- Information
 - Lecture exams cover lectures AND textbook.
 - Some material will be covered only in the textbook or lab.
 - You are responsible for all material from lectures, labs & assigned reading.

Lecture Format

- Lecture slides will be on put on the course webpage before class (usually)

Webcasts

BruinCast audio and video have been requested. Stay tuned for more information.

Group Work

- **Group Work Policy:**
- You are encouraged to work and study together on reading and lab exercises
- ***Collaboration and copying are prohibited on all exams and lab quizzes. You must do your own work.***
- Using a cell phone as a calculator is OK for lab exercises, but not for quizzes or exams.

Background knowledge

- High school science & math
 - **Math:** algebra & geometry, powers of 10, *graphs*
 - **Metric units** (today's lecture)
 - **Geography:** *maps*, Earth's major features, longitude & latitude
 - **Chemistry:** elements, atoms, molecules, chemical equations
 - **Physics:** matter, density, waves, velocity, energy, gravity
 - **Biology:** classification, metabolism, evolution

Textbook

- *Invitation to Oceanography*, (Pinet)
7th Edition (2014) – 6th Ed. is good, too

Image by Downtowngal -- Wikimedia, Creative Commons Share-Alike 3.0



QUESTIONS?



Laboratories

- Room 3820 Geology Bldg.
- All students must enroll in a lab section
- Lab attendance is required:
You must attend SIX (6) or more labs to complete the course.
All Lab quizzes count towards final grade.
- Reading for labs available on class website. Download, print and read before your section.

Laboratories

- Check completion of lab exercise with TA each week.
 - “check” grade given for successful completion
- After first week, labs will begin with a short quiz
 - based primarily on the previous week’s lab and reading material.
 - chief grade for lab.
- Lab checks & quizzes: 30% of your total grade
- Each lab is worth about 4% of your final grade
- Working through the in-lab exercise each week is key to getting the best possible grade the next week’s quiz!

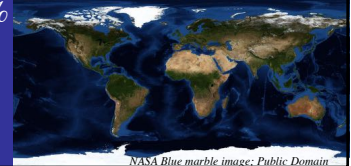
*Attend a laboratory session next week!
TA’s can issue PTE #'s.*

Permission to add or switch will be granted if lab section enrollments permit.

Make sure your TA knows your status!

Grading Policy

- Weekly Lab Quiz: 8 checks & quizzes, worth 30%
- Lab Section Final Exam: 10%
- Two in-class exams: 35% total (First exam: 15%, 2nd: 20%)
- Final Exam: 25%



NASA Blue marble image: Public Domain

Grading Policy

- Curving: grades on exams are assigned relative to the class average.
 - Mean for each exam is adjusted to 77.5 (B–)
 - Standard deviation adjusted to 10%.
 - The curve will never lower your grade.
 - *My.ucla.edu* will report curved exam scores.

Grade Scale:

A+ > 96; A > 92; A– > 88
B+ > 85; B > 81; B– > 77
C+ > 75; C > 72; C– > 69
D+ > 66; D > 62; D– > 59
F ≤ 59

Grading Policy

Lab scores usually are not curved (class average ≈ B). Every quiz counts!

Pass / No Pass:

Pass = C and above
No Pass = C– and below



Photo by E. Schauble

Extra Credit

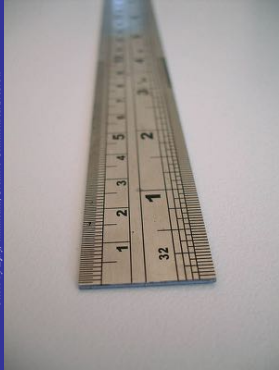
- Three movies (more or less) shown during term.
- Oceanography-related seminars are listed on class webpage.
 - Please note guidelines for being a good seminar audience member!
- Write a brief (1-2 page) summary of either, get 0.5%.
- Email to instructor (schauble@ucla.edu)
- Maximum: 2% total from Seminar/Movie extra credits.
- Bigger projects/honors papers -- see instructor for approval.



E. Schauble photo

QUESTIONS?

UNITS!



UNITS!

- *What are units?*
Units define the meaning of a quantity
 - Example: Money.
 - No Units: “I made 340 this week.”
 - Dollars? Yen? Peanuts?
 - With Units: “I made \$340 this week.”
- Always understand the units.
- Always include units with a quantity.

UNITS!



- A common system of units is necessary for further discussion
- Scientists use METRIC (S.I.) units

Scientific Units: The S.I. System

- SI units:
 - Length: meters, m
 - Time: seconds, s
 - Mass: kilogram, kg
 - Temperature: °C (°K)



SI Units

LENGTH, meters

- 1 meter = 100 centimeters (cm) = 1000 millimeters (mm)
- 1000 m = 1 kilometer (km)



SI Units

Compared to US customary (i.e., ‘English’) units:

- 2.54 cm = 1 inch



- 1 meter = 39.4” = 3.3 feet (= 1.1 yards)

SI Units

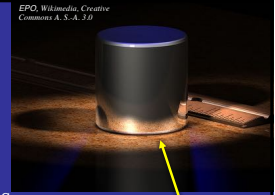
Compared to British Units:

- 1 km = 3281 feet
- 1 km = 0.62 miles (about 2/3 of a mile!)
 - 10 km = 6.2 miles
 - Mean Ocean Depth: ~ 3.7 km

SI Units

MASS, Kilograms (kg):

- 1 kg = 1000 grams
- Kilograms are a unit of mass
 - Not quite the same as weight
weight = (mass x gravity)
 - 1 kg of mass weighs 2.2 pounds on Earth's surface
 - Same 1 kg weighs only 0.4 pounds on the Moon's surface



Masses of standard kilograms are drifting! Will change in 2019 to a fundamental standard based on Planck's constant, the speed of light, and a microwave emission frequency in atomic Cesium vapor

SI Units

TIME, Seconds (s):

- 60 seconds = 1 minute
- 60 minutes = 1 hour
 - 3600 seconds = hour
- 24 hours = 1 day
 - 86400 seconds = 1 day
- 365 days = 1 year
 - 31,536,000 seconds = 1 year

Harrison H4 Sea Watch (1759)
for determining longitude at sea



Top Photo: Phantom Photographer, Wikimedia, CC BY-SA 3.0 Unported.
https://commons.wikimedia.org/wiki/File:H4_low_250.jpg
Bottom Photo: Mike Peel (www.mikepeel.net), Wikimedia, CC BY-SA 4.0.
https://en.wikipedia.org/wiki/John_Harrison#/media/File:Harrison_H4_clockwork_1.jpg

Temperature: Celsius

- °C are an international unit of temperature (technically a derived SI Unit)

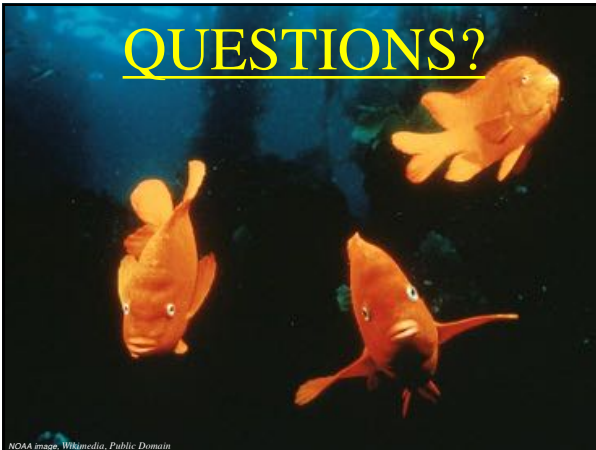
Water	Melts	Boils
°F	32	212
°C	0	100

Celsius -> Fahrenheit: $T_F = 9/5 T_C + 32^\circ F$

Fahrenheit -> Celsius: $T_C = 5/9 (T_F - 32^\circ F)$

The base SI unit of Temp is °K, $T_K = T_C + 273.15^\circ$

QUESTIONS?



NOAA image, Wikimedia, Public Domain

Unit Conversions

- Mathematical rules for working with quantities with units
 - Can only add or subtract quantities with the same units
 - Must convert to same units when necessary
 - Units are carried along in multiplication and division

Unit Conversions

- Examples:

- Simple Case:

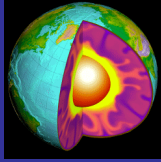
- The Earth's core is ~3500 km thick.
The Earth's mantle is ~2900 km thick.

- Together the Earth's core and mantle are:
 $3500 \text{ km} + 2900 \text{ km} = 6400 \text{ km thick. (same units)}$

- More difficult:

- The average ocean depth is 3.8 km.
- Sunlight penetrates about 200 m into the ocean.
- How much of the ocean is dark?
-- need to convert so that units are the same:
 $3.8 \text{ km} = 3800 \text{ m.}$
 $3800 \text{ m} - 200 \text{ m} = 3600 \text{ m.}$

USGS, presumed Public Domain



Units

- Division/Multiplication of units:

Salinity of 1 liter of seawater containing 35 grams of dissolved salt: $\frac{35 \text{ gm}}{1 \text{ liter}} = 35 \text{ gm/liter}$

- Speed of a tsunami wave that crosses 1000 km of ocean in 1.5 hours:

$$(1000 \text{ km}) / (1.5 \text{ hours}) = 667 \text{ km/hour}$$

FAST!

QUESTIONS?



Tom Murphy, Wikimedia, Creative Commons A.S.A.3.0

Assignments

- Check class website:
http://www2.ess.ucla.edu/~schauble/ESS15_Oceanography
- Download & study Lab 1 reading.
- Read Chapter 1 and Appendices 1-4 in Pinet textbook
- Enroll in & attend a lab section next week.

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