

## 2020 Oceanography Resource Links

The topic for the 2020 Dynamic Planet Event is Oceanography. The resource links provided below are categorized by the key event topics listed in the 2020 Dynamic Planet Event Rules.

### GENERAL OCEANOGRAPHY RESOURCES

'20 YouTube: [Oceanography Playlist](#) with 200 videos

Some of the best of these are Oceanography courses directly linked here:

'20 [Earth Science X](#)

'20 [scienceclassisgreat](#)

'20 [Lecture series on Physical Oceanography](#)

'20 [Lecture on Geological Oceanography](#)

'20 [Link](#): Woods Hole Oceanographic Institute resources for teachers. Click the WHOI Ocean Topics tab on the home page for a catalog of oceanography topics that will surely be covered in the event.

'20 [http://www.education.noaa.gov/Ocean\\_and\\_Coasts/](http://www.education.noaa.gov/Ocean_and_Coasts/) : National Oceanographic and Atmospheric Administration (NOAA) resources for teaching about the oceans. Check out the collection of education resource links at the bottom of the page.

'20 <http://www.education.noaa.gov/> : NOAA teacher resource homepage that includes lots of great data resources.

'20 [Link](#): PennState's online e-educational course Essentials of Oceanography

'20 <http://www.nsf.gov/geo/oce/ocekids.jsp> : National Science Foundation's Ocean Sciences Links for Kids homepage. This site is more appropriate for Division B students.

'20 [http://msi.ttu.ee/~elken/IntroOcean\\_Tomczak.pdf](http://msi.ttu.ee/~elken/IntroOcean_Tomczak.pdf) : Australian lecture notes providing a great introduction to the study of oceanography.

'20 [Link](#): Textbook introduction to the study of oceanography by the American Meteorological Society. Very well written with lots of illustrations.

'20 [Link](#): Fundamentals of Physical Geography, Ch. 8: sections o. to r, Ch.10: sections p. and ac..

'20 [UN Atlas to the Oceans](#): Click on FACTS to begin.

'20 <https://mrvanarsdale.com/marine-science/semester-1/>: A high school teacher's online website.

'20 <https://mrvanarsdale.com/marine-science/online-textbook/>: his online textbook.

### SEAWATER

'20 <http://www.marinebio.net/marinescience/02ocean/swcomposition.htm>

Marine Science website providing a good introductory description of the properties of seawater including salinity, temperature, density and dissolved gases.

'20 <http://www.slideshare.net/mswilliams/composition-of-seawater-27316061>

Great Slideshare presentation of sea water composition packed with great information.

'20 <https://www.youtube.com/watch?v=l55s9Zn2tFg>

You Tube presentation which emphasizes the role of dissolved gases in ocean chemistry.

'20 [https://www.youtube.com/watch?v=Qu2tc-ed\\_JU](https://www.youtube.com/watch?v=Qu2tc-ed_JU)

Similar to the above presentation with an emphasis on dissolved solids in ocean water.

'20 <http://www.physicalgeography.net/fundamentals/8p.html>

I have always been fond of the Physical Geography webpage series. This page will provide a solid description of seawater composition.

### **ENERGY INPUTS AND OUTPUTS**

'20 <http://www.indiana.edu/~geol105/1425chap4.htm>

Indiana University website that provides a very broad and easy to read explanation of Earth's energy budget.

'20 <http://mocomi.com/input-output-tables/>

A very fundamental introduction of the mathematical concept of inputs and outputs. More appropriate for Division B.

'20 [https://www.teachengineering.org/view\\_lesson.php?url=collection/cla\\_/lessons/cla\\_lesson6\\_efficiency/cla\\_lesson6\\_efficiency.xml](https://www.teachengineering.org/view_lesson.php?url=collection/cla_/lessons/cla_lesson6_efficiency/cla_lesson6_efficiency.xml)

An excellent energy efficiency lesson from the K-12 Teach Engineering curriculum. It includes lessons on work and heating of the oceans.

## **WATER METRICS**

'20 <https://www.nodc.noaa.gov/dsdt/cwtg/>

NOAA's coastal water temperature guide that displays water temperatures and data tables for any region of the United States.

'20 <http://science.nasa.gov/earth-science/oceanography/physical-ocean/salinity/>

NASA Mission Earth webpage that provides a thorough explanation of salinity with some outstanding satellite images.

'20 <http://water.usgs.gov/edu/whyoceansalty.html>

USGS webpage answering the question why the ocean is salty.

'20 <http://www.csgnetwork.com/h2odenscalc.html>

Water density calculator provided by NOAA and the University of Michigan.

'20 [http://er.jsc.nasa.gov/seh/Ocean\\_Planet/activities/ts2ssac4.pdf](http://er.jsc.nasa.gov/seh/Ocean_Planet/activities/ts2ssac4.pdf)

NASA PDF explaining the three-level structure of ocean water.

'20 [http://wps.prenhall.com/esm\\_tarbuck\\_escience\\_11/32/8324/2131063.cw/content/index.html](http://wps.prenhall.com/esm_tarbuck_escience_11/32/8324/2131063.cw/content/index.html)

Pearson summary of factors affecting ocean water metrics.

## **TOPOGRAPHIC FEATURES OF OCEANS**

'20 <http://www.physicalgeography.net/fundamentals/10p.html>

Physical Geography webpage describing the topography of ocean basins.

'20 [https://www.youtube.com/watch?v=qbBbS\\_JL1qw](https://www.youtube.com/watch?v=qbBbS_JL1qw)

A more visual description of ocean floor features.

'20 <http://geology.com/articles/arctic-ocean-features/>

Geology.com webpage describing and illustrating Arctic seafloor features.

'20 [http://www.education.noaa.gov/Ocean\\_and\\_Coasts/Ocean\\_Floor\\_Features.html](http://www.education.noaa.gov/Ocean_and_Coasts/Ocean_Floor_Features.html)

NOAA webpage of ocean floor topographic features.

'20 <http://www.indiana.edu/~g131/set1tofQ.html>

Indiana University website for topographic features of oceans. Lots of links to great images and other resources.

'20 <http://www.ucmp.berkeley.edu/fosrec/Metzger3.html>

University of California PDF describing sea floor spreading and effect of Earth's magnetic field.

'20 [http://www.wou.edu/las/physci/taylor/gs106/Lab4\\_Key\\_Seafloor.pdf](http://www.wou.edu/las/physci/taylor/gs106/Lab4_Key_Seafloor.pdf)

Western Oregon University lab activities related to sea floor topography.

'20 <http://www.uh.edu/~jbutler/physical/chap20mult.html>

Multiple choice questions related to ocean floor topographic map features and plate tectonics.

'20 <http://geologycafe.com/class/chapter12.html>

Geology Café website that provides a great description of ocean basin topography.

'20 [Powershow](#) PPT on Geological Oceanography

## **TECTONIC PLATE MOVEMENTS**

<http://www.reefimages.com/oceans/SegarOcean3Chap04.pdf>

An excellent description of plate tectonics as they are related to oceans. The PDF file is well illustrated, but the reading level may be more appropriate for Division C.

<http://earthednet.org/Support/ODP/UsingODPMan/Ch6.Investigations.pdf> Earthnet.org PDF with sample investigative activities related to plate tectonics.

'20 <http://earth.usc.edu/~slund/systems/topic6/topic6.html>

University of Southern California Plate Tectonics webpage, with excellent introductory discussions and simple illustrations of all aspects of plate tectonic movement.

'20 <http://www.indiana.edu/~g105lab/1425chap13.htm>

Indiana University webpage discussing the evolution of continents and oceans.

'20 <https://www.youtube.com/watch?v=JmC-vjQGSNM>

Great description of tectonic plate movement with some outstanding illustrations.

'20 <https://www.youtube.com/watch?v=ELd3ebldSTs>

Cartoon description of tectonic plate movement. More appropriate for Division B.

## **REEF FORMATION**

'20 [http://oceanservice.noaa.gov/education/kits/corals/coral04\\_reefs.html](http://oceanservice.noaa.gov/education/kits/corals/coral04_reefs.html)

NOAA webpage describing the formation of coral reefs.

'20 <https://www.youtube.com/watch?v=btRCAQHqbdY>

Great simply illustrated and taught lesson from Stanford University on the different kinds of reefs.

'20 [http://oceanservice.noaa.gov/education/kits/corals/media/supp\\_coral04a.html](http://oceanservice.noaa.gov/education/kits/corals/media/supp_coral04a.html)

NOAA animation of atoll formation.

'20 [https://www.classzone.com/books/earth\\_science/terc/content/visualizations/es2303/es2303page01.cfm?chapter\\_no=visualization](https://www.classzone.com/books/earth_science/terc/content/visualizations/es2303/es2303page01.cfm?chapter_no=visualization)

Class Zone observations of islands in various stages of atoll formation.

## **WAVES**

<http://www.onr.navy.mil/focus/ocean/motion/waves1.htm>

Office of Naval Research webpage that explains wave motion.

'20 <https://www.youtube.com/watch?v=tutOUwAcYyk>

Discussion of different types of waves.

'20 [https://www.youtube.com/watch?v=zHPUY\\_PB9vs](https://www.youtube.com/watch?v=zHPUY_PB9vs)

Excellent and well-illustrated discussion of wave-related currents including different types of waves.

'20 <http://coastalcare.org/educate/>

Coastal Care website that discusses different types of waves and their formation.

'20 <http://www.utdallas.edu/~mitterer/Oceanography/pdfs/OCEChapt09.pdf>

University of Texas at Dallas PPT notes of wave formation that also provides a mathematical explanation missing from other sites.

## **SURFACE CURRENTS**

<http://www.seos-project.eu/modules/oceancurrents/oceancurrents-c03-p02.html>

Great introductory discussion of ocean currents.

'20 <http://oceanservice.noaa.gov/education/kits/currents/05currents1.html>

NOAA ocean surface currents pages that describes the role of the Coriolis Effect and the Trade Winds in current formation.

'20 <http://www.physicalgeography.net/fundamentals/8q.html>

Physical geography webpage describing surface and sub-surface currents. Minimally illustrated, but well explained.

[http://ic.ucsc.edu/~kudela/ocea1/Lectures/102207/OS01F07\\_surfacecurrents.pdf](http://ic.ucsc.edu/~kudela/ocea1/Lectures/102207/OS01F07_surfacecurrents.pdf)

A nice PDF of a PDF from the University of California Santa Cruz that explains surface and subsurface currents as well as many other fundamental concepts of oceanography.

'20 [http://www.ducksters.com/science/earth\\_science/ocean\\_waves\\_and\\_currents.php](http://www.ducksters.com/science/earth_science/ocean_waves_and_currents.php)

Ducksters Earth Science for Kids website that provides a basic explanation of waves and the energy associated with them. More appropriate for Division B.

## **COASTAL CURRENTS**

'20 <http://fcit.usf.edu/florida/teacher/science/mod2/changing.coastlines.html>

University of Southern Florida webpage that discusses Florida's changing coastline.

<http://www.onr.navy.mil/focus/ocean/motion/currents2.htm>

Office of Naval Research webpage describing coastal currents including rip currents, longshore currents and coastal upwelling.

<http://geology.campus.ad.csulb.edu/people/bperry/geology303/geol303tchapter3.html>

A great introductory level discussion of different types of wave currents. The illustrations are a bit large but the text does include some interesting study questions.

<http://www.shorstmeyer.com/msj/geo130/antarctica/polarinfo.pdf>

Nice PDF describing Antarctic Coastal Currents. The drawings are clear and well designed.

[http://www.ecy.wa.gov/programs/sea/swces/products/publications/glossary/words/a\\_c.htm](http://www.ecy.wa.gov/programs/sea/swces/products/publications/glossary/words/a_c.htm)

Glossary of terms associated with coastal currents and features provided by the State of Washington Coastal Erosion Study.

### **HIGH AND LOW TIDES**

'20 [http://oceanservice.noaa.gov/education/kits/tides/tides05\\_lunarday.html](http://oceanservice.noaa.gov/education/kits/tides/tides05_lunarday.html)

NOAA page describing tide frequencies, water levels and the mechanics of how tides appear.

'20 [http://www.ducksters.com/science/earth\\_science/ocean\\_tides.php](http://www.ducksters.com/science/earth_science/ocean_tides.php)

Another Ducksters webpage, this one explaining high and low tides. Best for Division B.

[http://surfingsantacruz.com/general\\_information\\_about\\_lunar\\_tides](http://surfingsantacruz.com/general_information_about_lunar_tides)

Surfing Santa Cruz website packed with facts about tides. It also includes wind reports and graphs of regional tidal activity.

[http://oceanservice.noaa.gov/education/kits/tides/media/supp\\_tide06a.html](http://oceanservice.noaa.gov/education/kits/tides/media/supp_tide06a.html)

NOAA animation of spring tides.

'20 <http://www.slideshare.net/sciencepowerpointcom/tides-neap-tide-spring-tide-astronomy-lesson-powerpoint>

A well-illustrated 124 slide Slideshare presentation of tides from an astronomical as well as a geological lens. Coaches will especially like the study procedures and added links.

### **COASTAL FEATURES AND PROCESSES**

'20 <https://www.youtube.com/watch?v=EI46Drnw00U>

Depositional features of coastlines.

'20 <http://www.slideshare.net/maliadamit/coastal-processes-and-landforms-presentation>

Excellent Slideshare presentation of coastal processes and landforms. Very well illustrated and thoroughly explained.

'20 <http://www.physicalgeography.net/fundamentals/10ac.html>

I am always appreciative of Physical Geography pages and this one delivers. It also includes a basic discussion of waves and a basic mathematical formula students should be aware of.

<http://www.neckers.siu.edu/pinter/pdf/CoastalExercise.pdf>

Nice lab activity you might want to try with students. It provides a good descriptive background and hands-on activities using a ruler, calculator and graph paper.

'20 <http://water.usgs.gov/edu/earthgwlandsubside.html>

USGS description of subsidence and associated problems.

### **TOOLS OF OCEANOGRAPHY**

'20 <http://www.whoi.edu/main/instruments>

Woods Hole Oceanographic Institute Ships and Technology tab describing many tools used by oceanographer.

## **BOUYANCY**

'20 <http://hyperphysics.phy-astr.gsu.edu/hbase/pbuoy.html>

A simple explanation of the concept of buoyancy that includes the Archimedes Principle.

'20 <https://www.youtube.com/watch?v=ivyKoV7RDwg>

Bill Nye the Science Guy explains buoyancy

'20 [https://www.youtube.com/watch?v=sUjDUW\\_08Ms](https://www.youtube.com/watch?v=sUjDUW_08Ms)

Simple illustrated explanation of the concept of buoyancy

'20 <https://www.youtube.com/watch?v=y0SnFCs9z1g>

Another simple explanation of the concept of buoyancy.

'20 [https://www.grc.nasa.gov/www/k-12/WindTunnel/Activities/buoy\\_Archimedes.html](https://www.grc.nasa.gov/www/k-12/WindTunnel/Activities/buoy_Archimedes.html)

NASA sample buoyancy exercises with answer key.

<http://formulas.tutorvista.com/physics/buoyancy-formula.html>

Includes buoyance calculators and basic mathematical expressions of buoyancy.

## **TEXTBOOK**

*Essentials of Oceanography*

Trujillo and Thurman 12<sup>t</sup> Edition

*Oceanography*

*An Invitation to Marine Science*

Tom Garrison 7<sup>th</sup> Edition (or other editions)

## **SCIENCE PROCESS SKILLS**

'20 <http://www.nsta.org/elementaryschool/connections/200712TorresHandoutParentNSTAConn.pdf>

PDF from the National Science Teacher's Association that can serve as an excellent model for developing science process skills in students.

'20 <http://www.longwood.edu/cleanva/images/sec6.processskills.pdf>

Excellent PDF that discusses many of the science process skills needed by students to succeed in this and other Science Olympiad events.

'20 <http://www.eduplace.com/science/profdev/articles/valentino2.html>

Good strategies for developing science process skills in students by Catherine Valentino.

'20 <http://www.pinterest.com/explore/science-process-skills/>

Pinterest pins for science process skills.