**2015 DYNAMIC PLANET RESOURCE LINKS**

**ALL LINKS ACTIVE AS OF OCTOBER 30, 2014**

The topic for the 2015 Dynamic Planet Event is oceanography. The resource links provided below are categorized by the key event topics listed in the 2015 Dynamic Planet Event Rules.

**GENERAL OCEANOGRAPHY RESOURCES**

<http://www.whoi.edu/main/k-12/teachers>

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.

<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.

<http://www.education.noaa.gov/>

NOAA teacher resource homepage that includes lots of great data resources.

<http://webs.cmich.edu/resgi/links.asp?mc=Earth%20Science&cad=Oceanography&to=49&tod=General%20Oceanography>

A great catalog of oceanography resource links provided by Central Michigan University. It includes a link to the UN’s Atlas of the Oceans.

<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.

<http://msi.ttu.ee/~elken/IntroOcean_Tomczak.pdf>

Australian lecture notes providing a great introduction to the study of oceanography.

<https://www.ametsoc.org/amsedu/online/oceaninfo/samplecourse/Ch01_3rd.pdf>

Textbook introduction to the study of oceanography by the American Meteorological Society. Very well written with lots of illustrations.

**SEAWATER**

<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.

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

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

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

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

<https://www.youtube.com/watch?v=Qu2tc-ed_JU>

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

<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**

<http://www.es.flinders.edu.au/~mattom/IntroOc/lecture04.html>

Australian website that provides a good listing of energy inputs and outputs related to the oceans.

<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.

<http://www.nc-climate.ncsu.edu/edu/k12/.eeb>

A great compilation of climate education activities from North Carolina State University. It includes an explanation of all forms of energy inputs and outputs as well as that of oceans.

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

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

<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**

<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.

<http://www.onr.navy.mil/focus/ocean/water/temp3.htm>

Office of Naval Research’s website that provides an excellent description of ocean water temperature profiles.

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

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

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

USGS webpage answering the question why the ocean is salty.

<http://www.onr.navy.mil/focus/ocean/water/density1.htm>

Office of Naval Research website that provides an excellent description of ocean water density.

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

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

<http://er.jsc.nasa.gov/seh/Ocean_Planet/activities/ts2ssac4.pdf>

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

<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**

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

Physical Geography webpage describing the topography of ocean basins.

<http://www.shorstmeyer.com/msj/geo130/readings/OceanBasinPhysiography.pdf>

A more detailed PDF description of ocean basin topography from UCLA that is probably more appropriate for Division C.

<https://www.youtube.com/watch?v=qbBbS_JL1qw>

A more visual description of ocean floor features.

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

Geology.com webpage describing and illustrating Arctic seafloor features.

<http://www.education.noaa.gov/Ocean_and_Coasts/Ocean_Floor_Features.html>

NOAA webpage of ocean floor topographic features.

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

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

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

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

<http://www.wou.edu/las/physci/taylor/gs106/Lab4_Key_Seafloor.pdf>

Western Oregon University lab activities related to sea floor topography.

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

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

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

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

**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.

<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.

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

Indiana University webpage discussing the evolution of continents and oceans.

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

A great description of tectonic plate movement with some outstanding illustrations.

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

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

**REEF FORMATION**

<http://oceanservice.noaa.gov/education/kits/corals/coral04_reefs.html>

NOAA webpage describing the formation of coral reefs.

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

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

<http://oceanservice.noaa.gov/education/kits/corals/media/supp_coral04a.html>

NOAA animation of atoll formation.

<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.

<http://www.coral-reef-info.com/types-of-coral-reefs.html>

Excellent Division B level introduction to reef formation.

**WAVES**

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

Office of Naval Research webpage that explains wave motion.

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

Discussion of different types of waves.

<https://www.youtube.com/watch?v=zHPUY_PB9vs>

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

<http://coastalcare.org/educate/waves/>

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

<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>

A great introductory discussion of ocean currents.

<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.

<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>

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.

<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**

<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>

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

**HIGH AND LOW TIDES**

<http://oceanservice.noaa.gov/education/kits/tides/tides05_lunarday.html>

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

<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>

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>

NOAA animation of spring tides.

<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**

<https://www.youtube.com/watch?v=EI46Drnw0OU>

Depositional features of coastlines.

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

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

<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>

A 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.

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

USGS description of subsidence and associated problems.

**TOOLS OF OCEANOGRAPHY**

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

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

**BOUYANCY**

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

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

<https://www.youtube.com/watch?v=ZvmChpDExxw>

Bill Nye the Science Guy explains buoyancy

<https://www.youtube.com/watch?v=sUjDUW_08Ms>

Simple illustrated explanation of the concept of buoyancy

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

Another simple explanation of the concept of buoyancy.

<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**

*Oceanography*

*An Invitation to Marine Science*

Tom Garrison 4th Edition 2002 (or other editions)

**SCIENCE** **PROCESS** **SKILLS**

<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.

<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.

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

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

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

Pinterest pins for science process skills.