

Triton Fun Company

Science Newsletter

September 2009

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Rogue Waves: Gigantic and unpredictable

T. Dockweiler

Special points of interest:

Water waves..

Triton Fun stuff

Superfluous questions

We are always looking for **contributors** to the Science Newsletter. If you would like to write an article about a science subject you are excited about, or contribute a superfluous question, or if you would like to be on our **mailing list** for future newsletters, please e-mail us at:

info@tritonfun.com

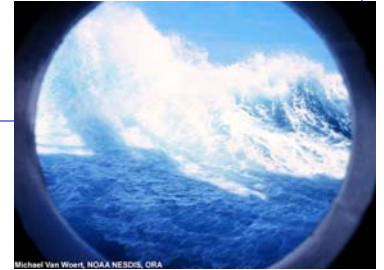
Rogue waves in the sea have been known historically for over a thousand years since at least the Medieval Age. These very large waves are legendary and have assumed a mythical reputation as unbelievable by those hearing about such occurrences because the waves themselves are uncommon. Hardy sea-going peoples (such as the Vikings) through modern sailors could go for a lifetime and not encounter a single one of these gigantic waves which can exceed over 100 feet in height (trough to crest). They have been notorious for making lighthouses disappear off of various coasts both in North America and on islands around the world. They are undoubtedly responsible for many of the disappearing vessels in the ocean areas known as the *Bermuda Triangle* and the lesser known *Dragon's Triangle*. They are possibly responsible for the elimination of low flying aircraft just above sea level usually involved in search and rescue operations.

It is only in very recent history that such waves have been confirmed with scientific instruments on the ocean in two incidents and with Earth satellite technology. The first of those events occurred on the Norwegian oil platform Draupner in the North Sea (upper north-eastern portion of the Atlantic Ocean) on January 01, 1995.

The Draupner platform had scientific measuring instruments on it including a laser beam pointing to the ocean. The wave that hit that platform measured 84 feet (25.6 meters) causing much damage. The second event involved a scientifically instrumented research vessel from the United Kingdom in February 2000. The ship was hit with a wave which measured 95 feet (29.1 meters).

Such a wave can literally come from out of nowhere day or night in the middle of a large ocean with either totally calm or stormy conditions. Rogue waves occur in large bodies of water such as oceans but can occur in large lakes such as the Great Lakes in the United States and inland seas such as both the Caspian Sea and Lake Baikal in Russia. They are usually a single wave, occasionally with a corresponding sea hole [not to be confused with *maelstroms*] where a ship falls into a deep trough before the wave wall of water of the rogue wave towers over and collapses upon the vessel with forces up to 200 pounds per square inch. They can also be in a series of successive large waves.

Rogue waves are not *tsunamis* which are generated by large earthquakes or underwater mountain subsidence slides. They are



Wall of water

Huge rogue wave approaching a ship; they form from positive interference of wave peaks

not *tidal waves* which are gravitationally generated by our Moon and Sun causing bulging of the Earth as the Earth rotates with corresponding high and low tides near coastal shores. They are not *sneaker waves* which are caused by shoaling of waters near coastal zones that are larger than the standard shore waves. They are not *ocean gyres* which are the circular flows around the edges of the boundaries of oceans, although it is possible that the flow in such a gyre cannot be ruled out as an occasional producer for a small number of these monster waves.

There is significant controversy in the scientific community about the cause of these unusual waves. The waves appear to develop, build up, and travel against the direction of the current flow involved.

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Ginormous Water Waves: *continued*
 Photos/Info: NOAA/ U. Texas

They also can develop at the convergence of fluid flows where they propagate in interference patterns, similar to the way light has interference patterns when it goes through a slit. Wind by its normal interaction with the surface water produces waves. Storms both small and large, including hurricanes, can produce these waves. A recent example would be Hurricane Katrina in 2005 which travelled through the Gulf of Mexico near Louisiana toppling sideways an oil platform. The Sun itself is the ultimate energy source that produces such waves for the Earth. The Earth through its airflows dissipates and balances the pressure differences created by the Sun's heat and light received.

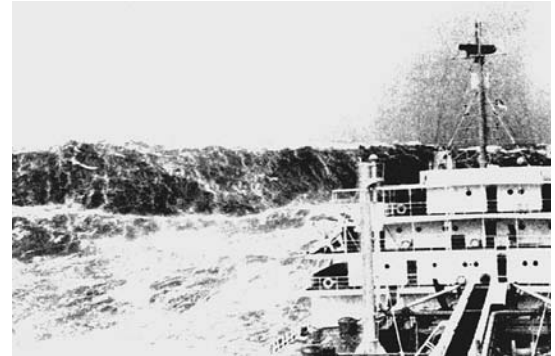
The rogue wave itself is believed to be the superimposed momentary convergence or compression of two waves coming into unison and literally multiplying their height and water volume collectively. Such waves can also be generated by downdraft microbursts in the air which have tornado strength energies which contact the water surface and push the surface into a water surge.

Buoy networks around our planet are still insufficient to fully map the sea waves and heights, but they are improving as to their quantities, locations, and multiple types of data acquisition. Data may also eventually be acquired as more electrical power networks using wave energy are developed beyond those currently in Europe.

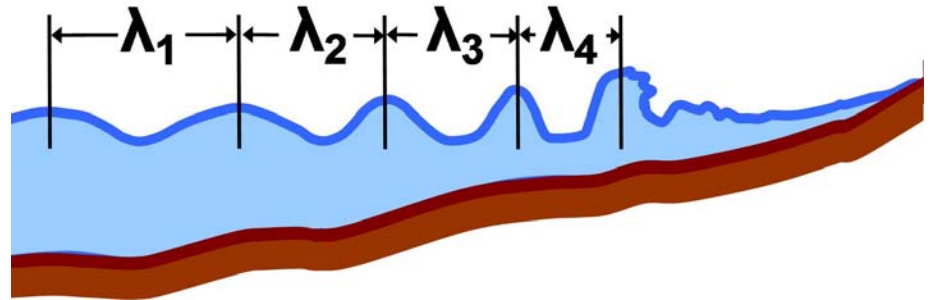
Any large body with current flows of fluid can experience these waves. So it is possible that such waves can be generated on other astronomical bodies if they are sufficiently warm enough; this can include large objects such as planetary atmospheres, and up to and including the surfaces of stars!

 References:

1. Smith, Craig B., *Extreme waves*, National Academies Press, 2006.
 2. Kinsman, Blair, *Wind Waves: Their generation and propagation on the ocean surface*, Dover Publications, 1984.
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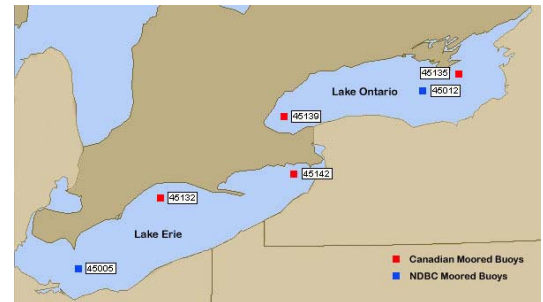
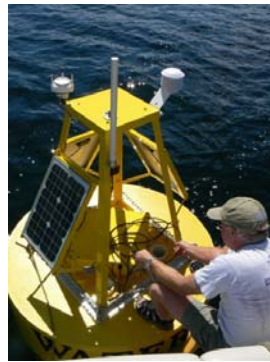


Rogue wave in the Atlantic
 A very large wave approaches a ship in the Bay of Biscay in France; rogue waves are hazardous to sailors and ships of all sizes



Additive waves

All waves and particularly rogue waves add their heights together to make walls of water; as they hit the shoreline, turbulence from surface interactions changes the shape from smooth curves to jagged edges



Buoy Networks

Buoys monitor water conditions in lakes and oceans such as wave heights, wind, weather; different types of buoys

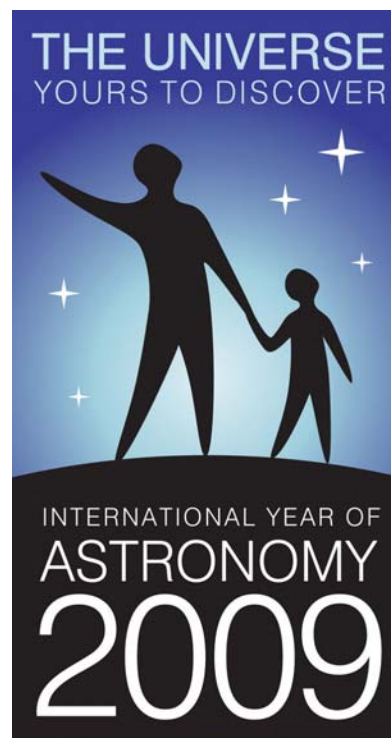
TRITON FUN PRODUCTS

2009 has been declared the "International Year of Astronomy". Events and activities to further the excitement of astronomy are being planned by IYA committees in over 100 countries. The logo for the IYA2009 is shown below. For more info on upcoming IYA2009 events, go to: <http://www.astronomy2009.org>

Triton Fun is an authorized distributor of T-shirts, sweatshirts and long-sleeve tees sporting this new logo. Part of the proceeds from the sale of these shirts will go to support astronomy clubs and astronomy activities connected with IYA2009 in California.

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** Send us your superfluous questions for a future issue ! They can be on any subject. The funnier, the better. M.D., our editor, appreciates the help and will send you a free Triton Fun coffee mug as compensation for your question. Or write an article for us and be read by professional and amateur astronomers and scientists in the U.S. and Canada ! **

Superfluous Questions:

- 1) The *Deep Space Network* antenna array, which tracks spacecraft, has a station near what European city ?
a) Brussels b) Nice c) Rome d) Madrid
- 2) In the British TV show *As Time Goes By*, Jean owns *what* kind of business ?
a) dry cleaning b) clothing shop c) bookstore d) temp agency
- 3) Which land animal has the largest brain size?
a) elephant b) rhino c) giraffe d) buffalo
- 4) "Hoosier" is a colloquial name for people from *what* state ?
a) Indiana b) Tennessee c) South Dakota d) Maine

→ ANSWERS in next months issue of the Science Newsletter ! ←---

** ANSWERS to August's Superfluous Questions: 1. c) Philadelphia 2. c) Cassini 3. b) Bill Dana 4. b) Minnesota