

Explained: The supertide that swallowed a French abbey

By Mark Fischetti, Scientific American on 03.27.15

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An aerial view as a high tide submerges a narrow causeway leading to the Mont Saint-Michel abbey, on France's northern coast, March 21, 2015. A supertide turned France's famed Mont Saint-Michel into an island, delighting thousands of visitors who came to see the rare phenomenon. The so-called "tide of the century" actually happens every 18 years. Photo: Associated Press

A stunning photo went viral over the weekend, revealing a supertide that turned an 11th-century French abbey that is usually surrounded by sheep into an island swallowed by the sea. The image, from The Associated Press, is shown here.

Similar photos from other news agencies also ran rampant on the Web. Thousands of people arrived on the coast of Normandy to watch the spectacular 14-meter-high surge of water envelop Mont Saint-Michel, the enclave around the abbey, usually accessible only by a causeway, which was overtopped by the tide.

The articles that accompanied such photos failed to explain why this supertide happened, or made vague references to the sun, or the moon, or the alignment of the sun and moon, or the eclipse that occurred the same day — and without attribution to any expert or scientific institution. Many also referred to the March 20-21 event as the "tide of the century," even though it arises every 18 years. The previous occurrence was in March 1997, and the next one will be in March 2033.

So what caused the supertide? A strong clue is the repeat of “March” in the dates. Tides are driven by the moon’s gravitational pull. The sun’s gravity has an effect, too, although much smaller. When the sun and moon are aligned with Earth, their combined pull is greatest, creating what are called spring tides. They occur twice every month, but are often greatest in March and September, during the spring and autumn equinoxes.

This year the moon and sun aligned very exactly, causing Saturday’s eclipse. “If we see a solar eclipse there will be a spring tide,” Hal Needham, a climatologist at Louisiana State University, told me. “But if we see a spring tide it doesn’t mean we will see a solar eclipse.”

That explains the recurrence of March for the highest of tides. But why the 18-year cycle? This gets trickier. The best explanation, which Needham emailed to me, comes from Britain’s Met Office, the official meteorological agency. Experts at the Met wrote in a blog that some spring tides are higher than others “because tidal forces are strengthened if the moon is closest to Earth in its elliptical orbit. Tide forces are also enhanced when the sun and the moon are directly over the equator. For the sun this happens on or around March 21 or September. The moon’s orbit also takes it above and below the equator over a period of 27.2 days. Just as with the sun, the tide-generating forces are at their greatest when the moon is directly overhead at the equator.”

The Met also noted: “Very large spring tides occur when these astronomical factors coincide. Approximately every 4.5 years the moon is closest to the Earth, and is also overhead at the equator.” So when the moon and sun align, and they are directly over the equator, and the moon is closest to Earth, we get the so-called supertide.

Needham also noted, however, that the weather can have a greater influence on tides than any of these factors — witness Hurricane Sandy in the New York City area or Hurricane Katrina in New Orleans. One 18-year supertide might be higher than another depending on whether winds are pushing water up against a coastline and whether atmospheric pressure is lower than normal, which can cause a local rise in sea level.

This weekend’s supertide was felt around the world and was most extreme in places that are prone to excessive tides. In North America, the most famous site is the Bay of Fundy in Nova Scotia, where the tide can rise and fall by 10 meters even on a ho-hum day. There is no thousand-year-old abbey in the middle of the bay, however, so I guess people were not posting photos from there on Saturday.

Quiz

- 1 The central idea of the article is developed by:
 - (A) demonstrating the effects of the "supertide" on tides around the world
 - (B) showing that the moon and the sun can contribute to high tides at certain times
 - (C) explaining the variety of occurrences in nature that combine to create a supertide
 - (D) illustrating that news associations often post pictures without an explanation

- 2 Which sentence from the article has information that would be LEAST likely to be included in a summary?
 - (A) Needham also noted, however, that the weather can have a greater influence on tides than any of these factors.
 - (B) Tide forces are also enhanced when the sun and the moon are directly over the equator.
 - (C) This year the moon and the sun aligned very exactly, causing Saturday's eclipse.
 - (D) In North America, the most famous site is the Bay of Fundy in Nova Scotia, where the tide can rise and fall by 10 meters.

- 3 Which paragraph in the beginning of the article noted why the title given to the event by news agencies is incorrect?

- 4 In the paragraph explaining the 18-year cycle, Britain's Met Office describes conditions necessary for the creation of a supertide. What is the MOST important aspect involved in the creation?
 - (A) the prediction of effects of tides
 - (B) the alignment of the celestial bodies over the equator
 - (C) the occurrence of a solar eclipse
 - (D) the spring season of the year

Answer Key

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