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Great Lisbon 1755 Antipodal Impact Quake

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Abstract: The great Lisbon earthquake Nov. 1, 1755 devastated the city and Portuguese coastlines down to Morocco. Many details of the event are typical signs of chaotic terrane caused by an antipodal impact. A faint but fresh-looking antipodal impact structure centered at 35°39′ S, 168°26′ E is found in the Tasman Sea, or about 405 km west-southwest of Cape Reinga, NZ, North Island. By conventional geological methods, the epicenter has been inferred to be on the bottom of the Atlantic Ocean, in an area known as the Horseshoe Plain west-southwest of Cape St. Vincent, Portugal, at a distance of about 200 km from the cape, a round figure estimate. The impact antipode at 35°39′ N, 11°34′ W also is located in the Horseshoe Plain at 277 km west-southwest of Cape St. Vincent, the implied antipodal impact quake epicenter.

Key words: Cosmic object impacts, antipodal chaotic terrane, Lisbon 1755 devastating earthquake, New Madrid 1811, Budapest 1578, Eltanin impact 2.588 Ma, onset of Pleistocene.

1. Introduction: Discerning Antipodal Impact Quakes

Among topics in Earth & Planetary Science that have not received much attention, despite some recently achieved progress in the general area of cosmic object impacts [1-3], here in this paper I emphasize discovery of which known earthquakes were caused by antipodal impacts of a comet or asteroid. The impact quake seismic wave travels around the globe and then is refocused at the antipode, possibly causing tremendous damage of a form that is called a *chaotic terrane.* We might see the ground opening up, emitting vapors & engulfing large structures, sand fountains squirting sand, even granitic plutons erupting, driven up from the “Moho”, the Mohorovicic partially molten zone between crust & mantle. Known examples exist, one on planet Mercury. But so far, geologists largely seem to have overlooked such signs. There are three fairly recent examples, in historical times, where reports clearly convey the diagnostic symptoms of chaotic terrane: New Madrid, Dec. 16, 1811; Lisbon, Nov. 1, 1755; Budapest, May 19, 1578.

Of course, antipodal impact quakes are numerous in prehistory. For just one example, the Eltanin impact 2.588 Ma in the Bellingshausen-Sea (west of Cape Horn) has antipodal granitic plutons near Krasnoyarsk, Siberia, known as the “Stolby Nature Preserve”, popular with local rock climbers. The impact was discovered by Frank Kyte, University of California at Los Angeles, in his 1977 M.Sc. thesis, using piston cores recovered by the research ship “Eltanin” in 1962. The date of 2.588 Ma, or about two and a half million years ago, marks the official onset of the Pleistocene, established by the international geological governing body.

In many cases it is easy to identify the antipodal impact structures on the sea floor, thanks to satellite images (Google Earth). However, these are mostly low-resolution, inferred indirectly from gravity measurements, except along tracks where research vessels have taken high precision soundings. You can see these tracks criss-crossing Google Earth maps in many places. Moreover, there has been no concerted effort to study the formation of ocean bottom craters, which involve mudflows instead of and probably very different from subaerial ejecta.

The city of Lisbon is the capital of Portugal, and it

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was almost totally destroyed by an earthquake and firestorm on Sunday, Nov. 1, 1755. Here, I prove the quake was caused by an antipodal impact of a meteorite, probably a comet fragment or small asteroid. The quake marked the end of Portugal's imperial ambitions & deeply shocked the Christian people of the European continent. Until then, the city of Lisbon had been one of the most splendid capitals in the world. Historians think the psychological disillusionment of the event contributed to the French & American revolutions 20-30 years later. As the Sunday was a special holiday, the inhabitants had lit candles to celebrate. The candles toppled over in the quake, causing the firestorm. The firestorm was so strong that people were sucked into it from a hundred yards away. Sand fountains erupted, and in the port, a brand new pier or quay made of marble with hundreds of people on it disappeared and sank underwater into the ground. Both events are typical symptoms of an antipodal quake.

2. Discovering the Lisbon 1755 Epicenter & Antipodal Impact Signature

For the great Lisbon earthquake Nov. 1, 1755 that devastated the city and Portuguese coastlines down to Morocco, many reported details of the event are typical signs of chaotic terrane caused by an antipodal impact.

It took me 15 years to find the impact, the impression is so subtle, located in the Tasman Sea between Australia & New Zealand, its center 405 km west-southwest (WSW) of Cape-Reinga, which is the extreme northwest corner of NZ, North Island. It may be difficult to perceive the faint outline in Fig. 1. The 120 km yellow line is a diameter of the "crater", a fresh-looking nearly circular rim, presumably left by some kind of mudflow set off by the impact explosion. Cape Reinga is on the right-hand margin of the image.

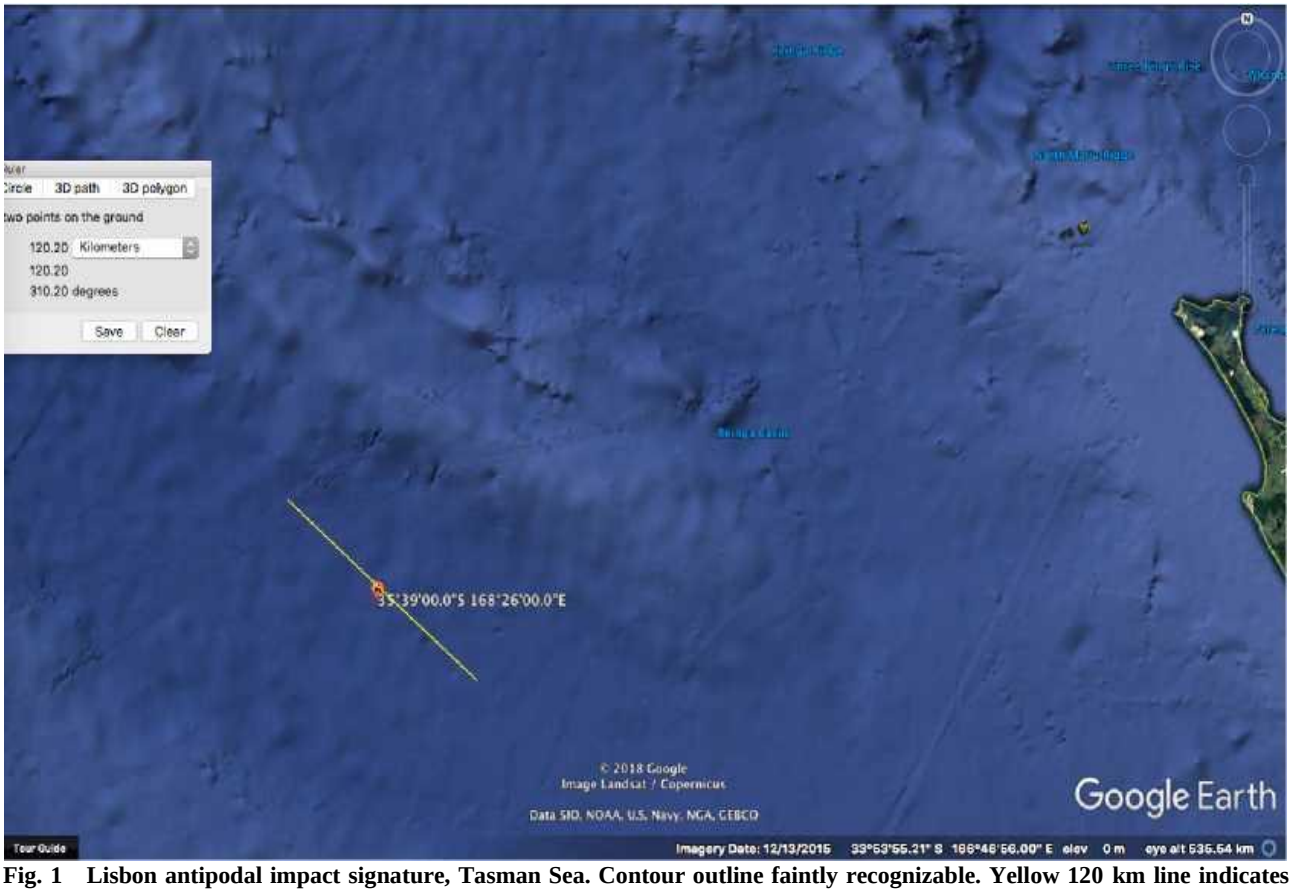

Fig. 1 Lisbon antipodal impact signature, Tasman Sea. Contour outline faintly recognizable. Yellow 120 km line indicates structure diameter. Center map coordinates 35°39′ S, 168°26′ E. Google Earth image—own work.

Captain James Cook learned about the impact with *Feux du Ciel* from the Maori of NZ. He had a Polynesian interpreter from Tahiti on board, **Tupaia**, a navigator who could draw a map of all the Polynesian islands in the Pacific. When Captain Cook arrived in the Tasman Sea in 1769, he mapped the entire coast of NZ for the first time. He landed at Botany Bay, near Sydney, Australia, in 1770, where the Aborigines reported the fiery impact event of only 15 years before.

Here, I am reporting a personal communication that I received in the past, 15 years ago, from Ted Bryant, Wollongong University, a well-known author of his book about impact tsunami, now Dean of Science, but am unable to confirm details about Captain Cook exchanging information with native inhabitants of either continent.

The impact coordinates of 35°39′ S, 168°26′ E give us its antipode at 35°39′ N, 11°34′ W, shown in Fig. 2 below at right, which should be the epicenter of the chaotic terrane.

The impact tsunami is located WSW of **Cape St. Vincent**, the "chin" of Portugal, on the abyssal bottom of the Atlantic Ocean, in a valley known as the **Horseshoe Plain.** The left is a map from Wikipedia, showing the inferred location of the epicenter found by geologists also in the Horseshoe Plain, determined by numerous researchers working over decades, even centuries, using conventional methods of three kinds [4-6]:

1. Historical records of widespread devastation along the coasts of Portugal and Morocco, quake & tsunami arrival times, hours and minutes.

2. Precise measurement of seismic signal velocities by modern methods in the entire region.

3. Ocean bottom disturbances of strata mapped in detail, finding these in the Horseshoe Plain.

The estimate found by this bare-hands approach—ignoring the antipode—was for the epicenter to be WSW of Cape St. Vincent by about 200 km, a round figure estimate. The antipodal impact epicenter in the right hand map, at 35°39′ N, 11°34′ W, is about 277 km from the cape, a little further WSW down the Horseshoe Plain.

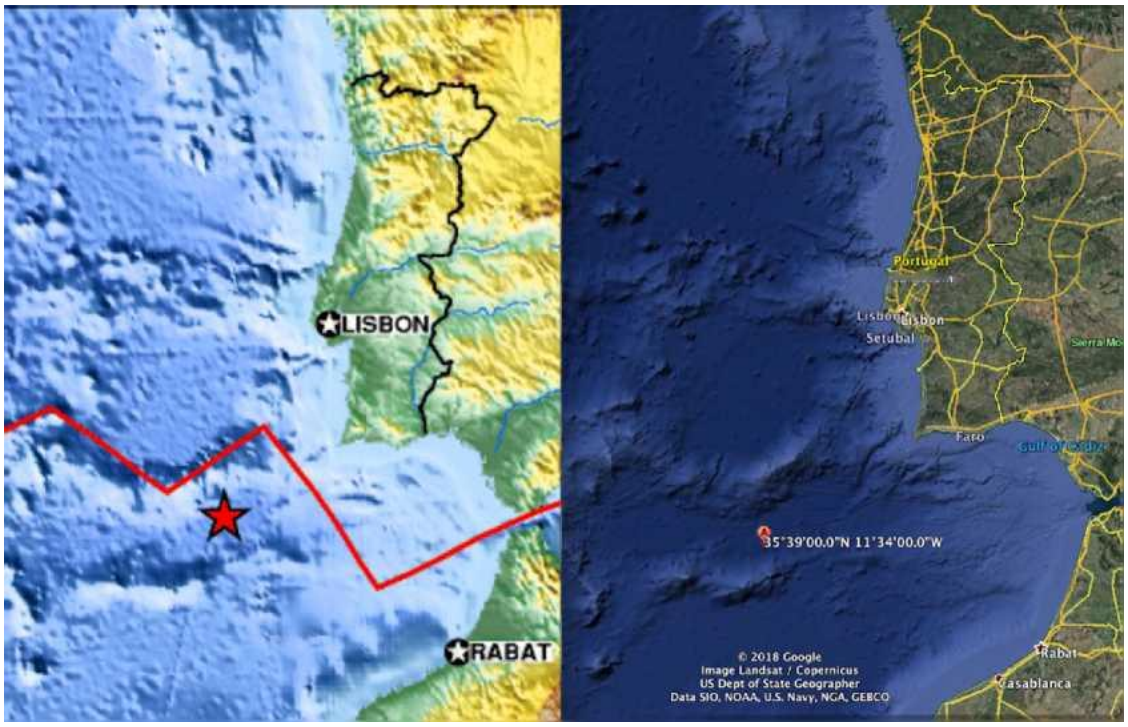

Fig. 2 Left map showing conventionally inferred location of epicenter of Lisbon 1755 in the Horseshoe Plain. Map from Wikipedia. Right part implied epicenter at 35°39′ N, 11°34′ W based on antipodal impact site in the Tasman Sea. Google

Earth image—own work.

3. Summary & Conclusion: Random Cosmic Encounter Determined Fate of a City

Now that the true cause of the horrific Lisbon 1755 quake is known, an antipodal impact in the Tasman Sea, for the Portuguese there remains some kind of absurd consolation, the freak accident of a comet coming down on the other side of the globe, the futility of fate, a random cosmic encounter of the little blue planet with destiny.

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