Hollywood!

By

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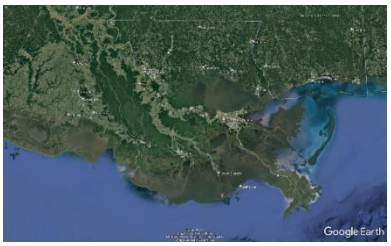
Every child with moderate schooling knows about deltas. In elementary school geography deltas are easily taught, visualised and remembered. An elementary school teacher may spend a lesson on deltas but not much more. After all, there are continents, mountains. rivers, deserts and oceans to name for a child to memorise before the test. A child might see a picture of the Nile or Mississippi delta in a class or in a book. Glance at it, absorb it, and move on.

Nearly every river, large or small, has a delta. The shapes differ depending on local setting, but simply stated deltas form where a river meets a standing body of water – ocean or lake, A D shaped delta or less well organised wetland may form. The term delta comes from the upper-case Greek letter delta (Δ), which is shaped like a triangle. Deltas with this triangular or fan shape are called arcuate (arc-like) deltas. The Nile River forms an arcuate delta as it empties into the Mediterranean Sea.



Mississippi (Bird Foot)

Nile (Classic)

Ganges–Brahmaputra (Bangladesh)

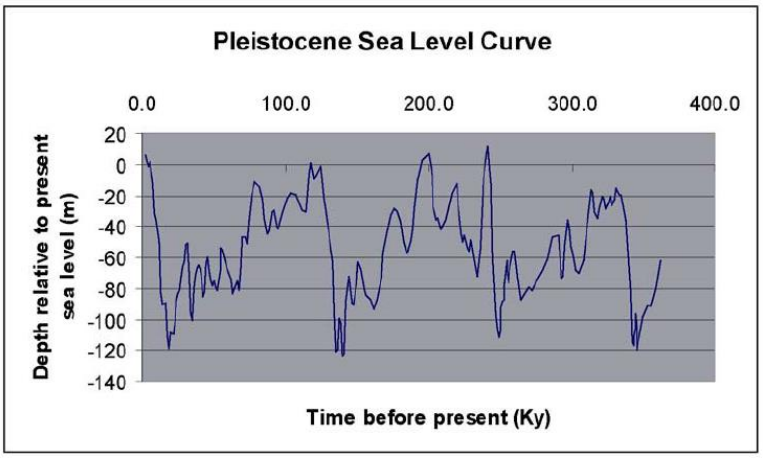
Ebro. Catalonia

These few are noteworthy examples but there are literally thousands of unique deltas in the spectrum that exist and they have been catalogued in spite of their variety into a few types unique to location. That's what geographer's do. There is no strength here in going deeply into the classification of deltas. In this essay I have said enough. I'm interested in the third and fourth dimensions. The third dimension is the depth of sediment in the delta and the fourth dimension is, of course, time.

The Tigris and Euphrates rivers are filling an estuary. Basra, Iraq near the Gulf of Arabia is 2 m above sea level and the gulf is 40-50 m deep.

As different and chaotic as deltas seem, there are common aspects to their formation relevant to this essay and speculations on global warming. Despite their variety, their history is similar and relatively short. All active Deltas are young, having filled basins and grown out to sea in only the last 20,000 to 12,000 years – less than a tic on a geological clock. What happened 12,000 years ago? Glaciers started to melt.

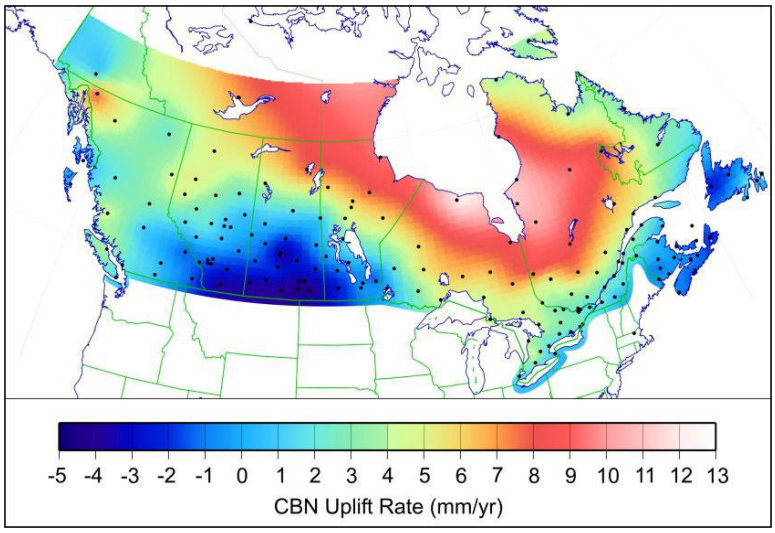
The Mississippi delta is made up of overlapping lobes decreasing in age toward the Gulf of Mexico. From Baton Rouge to the present mouth of the river at Plaquemines is about 250 km. The current delta has been growing for 12,000 years since the end of the Pleistocene glaciation.



Pleistocene sea level curve. Adapted from Lea et al, 2002.

It's an over-simplification to view a delta from above because there are other dimensions that gives a much more complete view in deep time. During the Pleistocene glacial maximum our seas were 120 m lower. The sea level curve shows four low levels over the past 400,000 years corresponding to four glacial episodes on continents.

In places, those ice sheets were up to 3,000 metres thick. After two of these glaciations, sea level rose again; sea level actually rose above the nominal zero shoreline elevation - consistent with oölitic limestone ridge in the central Florida peninsula now 20-40 m above sea level. Similar raised areas are known around the world, but many are the result of uplift of a region once ice has melted to drain into the oceans. The norther tip of the Isle of Man, neighboring Ireland, Scotland and England e.g., have rebounded about 3 metres, and the eastern coast of Hudson's Bay is still rising more than 1 cm a year.



WHAT DO RIVERS DO?

Rivers erode the land. The Mississippi River is known as 'The Big Muddy' in the American vernacular. A river slows as it nears its end and loses energy. Any material rolling on the bed of the river, the bed load, will stop moving. As the river slows, grit, sand and silt grind to a halt. The river will dam itself, build levees during seasonal floods, break through the levees and spread and build up to local lake or sea level creating marshy wetlands that allow vegetation to take hold. The main channel can move laterally over time during floods. If there is level surface space the delta broadens but then will build into deeper water. Storms also may wash sediment to

create beaches backed by lagoons. Lagoons fill with sediment aided by aquatic and land plants that create quiet water and sediment traps (like the dust under my bed.). The loading of sediment, incidentally, is a multiple of the potential load caused by any glacier given the same thickness simply because rocks and dirt are several times denser than ice. Importantly, as sea level rises, rivers reach a base-level and cannot carry as much sediment to the sea.

The Mississippi River Delta can be traced back approximately 100 million years with the creation of a deep fault zone opening the Mississippi embayment. The modern delta is 320 km long and 140 km across at its widest point, covering almost 1.8 million hectares of floodplain. The Mississippi and Yazoo rivers in the embayment focused sediment into the Gulf of Mexico, which created the deltaic land-building processes. The delta advanced over deeper and deeper water. The Geological Survey of Louisiana has shown that the Mississippi delta is more than 10,000 m thick, three times the modern depth of the Gulf of Mexico into which it dumps. The work of Lawson (1942) suggests strongly that it has subsided hand in hand with the deposit of sediment. Sediment from the Mississippi River has been filling the Gulf of Mexico, aided by glacial erosion of the interior of North America.

> "…a delta like that of the Mississippi built out into deep water will subside under sedimentary load and will maintain isostatic balance throughout its growth, up to a limit of thickness which is determined by the initial depth of water (Lawson, 1942).

HOLLYWOOD HAS IT WRONG

New York City will not be flooded if Greenland melts. Not just Hollywood, but all those using the precautionary principle, the UN IPCC, government organs like ***Environment and Climate Change Canada***, the weather channels, mass media, print media and the public mind are all deluded.

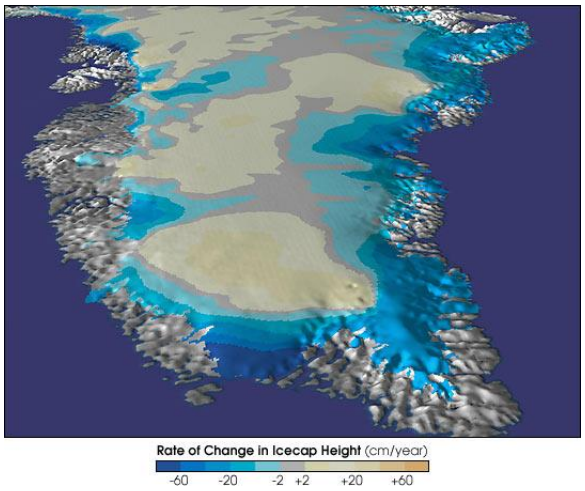
As sea levels rise, rivers lose their energy and build deltas that stay above water. Bangladesh, conservatively, has advanced more than 120 km as sea level has risen 120 metres. The Mississippi Delta has also grown accordingly. All our marine deltas are in the process of advancing out to sea.

Sandy beaches, moreover, are constantly restored by sand in transit along the shore. Strong winter waves erode the beach and gentle summer wave restore sand to build a wide gentle slope. Offshore sand bars in winter become wide beaches in summer.

I would tell my great grandchildren" If sea level rises 1 cm, just move 5 cm toward the higher ground."

WHAT ABOUT THE ICE?

Melting Arctic or Antarctic floating ice has a negligible effect as well. Floating ice is lighter than water and as it melts, it takes up less space. It is impossible for sea ice to add to global sea levels. Antarctica is even colder than Greenland and is in no way a cause for concern.



The Greenland Ice Cap fluctuates annually and Denmark only monitors Greenland in the summer. A recent NOVA presentation on Atlantic icebergs failed on two levels. First, there are as many icebergs now as when the Titanic sank[i1]. There is a dynamic conveyor belt of ice. Ice in the Greenland ice pack is bulging and sliding toward the coasts where it calves off into the ocean. Greenland bulges because it snows in winter on the ice pack and the pack thickens. There are WW2 aircraft buried under the ice since the 1940s[2].

Calving sheets of ice from Antarctica are another source of panic. It will not matter in the slightest if it is already floating in the sea.

Deltas and in truth most shorelines can be incredible dangerous places to live some days. This is particularly apparent because of the unpredictability of weather. It is unfortunate that the elected powers have not enough science to warn the public that floodplains, beaches and other wonderful vistas are not good permanent habitat for man. The rising damage blamed on disasters caused by climate change, however, is not attributable to global warming. These rising costs are best linked to population density, inflation, poor management and the rising cost of insurance.

And so the public mind should **not** think Hollywood has the science to interpret climate change. After all DiCaprio misinterpreted the Chinook. [3]

"New York, New York - it's a hell of a town."

[1] The Titanic hit an iceberg 15 April 1912 during a solar minimum like 2018-2022, but that's for another essay.
[2] Six American fighter planes and two bombers that crash-landed in Greenland in World War II have been found buried under 75 m of ice.
[3] CBC gave him a pass. https://www.cbc.ca/news/canada/calgary/leonardo-dicaprio-chinooks-climate-change-1.3358972

Darwin saw this…

Limestone coral atolls like those of the Maldive Islands south of India, will not be flooded by sea level rise.

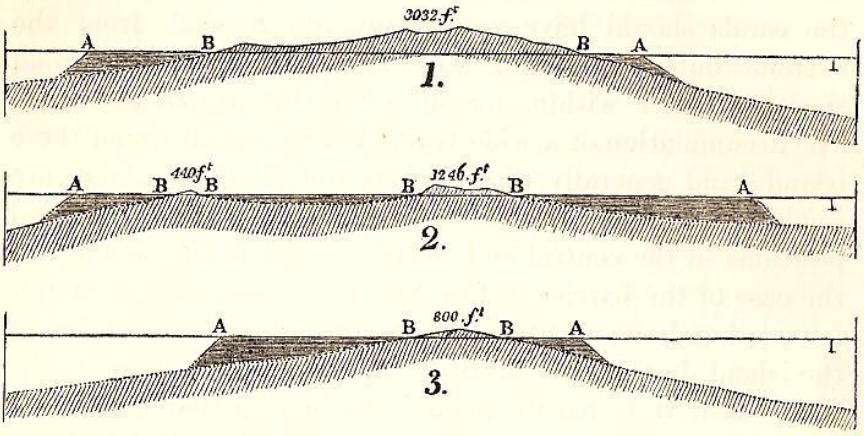
No amount of sea level rise can flood the capital of Malé, the capital of the Maldives as long as coastal development is controlled to keep mud from choking the filter-feeding coral animals of the reef. Judging from the density of development of Malé this caveat may be too late.

The Maldives are largely coral atolls - coral ring reefs wherein coral animals have a symbiotic relationship with blue-green algae that use photosynthesis to survive and live within the coral. The extra energy produced by the algae feeds the coral animal and keeps it healthy and sufficiently robust to keep up with any geological rate of subsidence of the sea floor and obviously the 120 m sea level rise after four major Pleistocene glaciations.

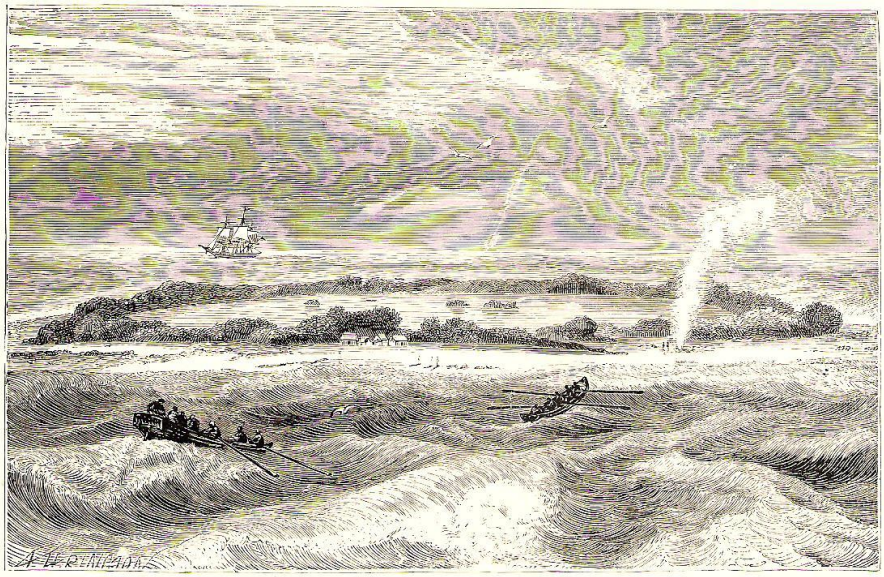
The main site of Pacific atoll formation is a formerly volcanic island or shallow seamount as shown in the outstanding engravings from Darwin's 19th century exploration (Darwin, 1842, 1845). The Maldives have grown on remnants of a drowned mountain range off the coast of India. As the volcanos became inactive the sea floor cooled and subsided. The coral reef maintained position in the sunlit photic zone of the ocean as the sea floor sank. Darwin used the obvious stages of evolution of three Pacific Island atolls to demonstrate the process.

Droxler and Jorry (2020) have not significantly altered Darwin's hypothesis by adding geological history unknown in Darwin's time. The complex stratigraphy was formed by the global Ice age. There is no doubt, however, coral islands respond to sea level rise (and fall). The propagation of new coral reefs whether by storm breakage or from coral plankton allowed continuous colonisation. After each retreat of the sea during glaciation, coral reoccupied their raised margins and grew

vertically, keeping up with sea-level rise and creating the modern atolls (Droxler and Jorry, ***op. cit***.).



1. Vanikoro. 2. Gambier Islands. 3. Maurua.
The horizontal shading shows the barrier-reefs and lagoon-channels. The inclined shading above the level of the sea (AA) shows the actual form of the land; the inclined shading below this line shows its probable prolongation under water.



WHITSUNDAY ISLAND.
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Q.E.D.

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