

Astronomical Society – Astronomy Course

Geology of the Cayman Islands

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Tuesday 22 March 2022**



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Outline

- Relevance
- “He hath founded it upon the Seas”
- Changes in sea levels
- Geological formations
- Earthquakes
- World Water Day
- Concluding remarks



Relevance for the Cayman Islands

Natural Disasters
Earthquakes

Tsunami

Construction

Water

Wastewater

Environment

Climate change



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He hath founded it upon the Seas



**History of the
Cayman Islands is
closely linked to
the sea**

**Geology of the
Cayman Islands is
also closely linked
to the sea**



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Changes in sea level

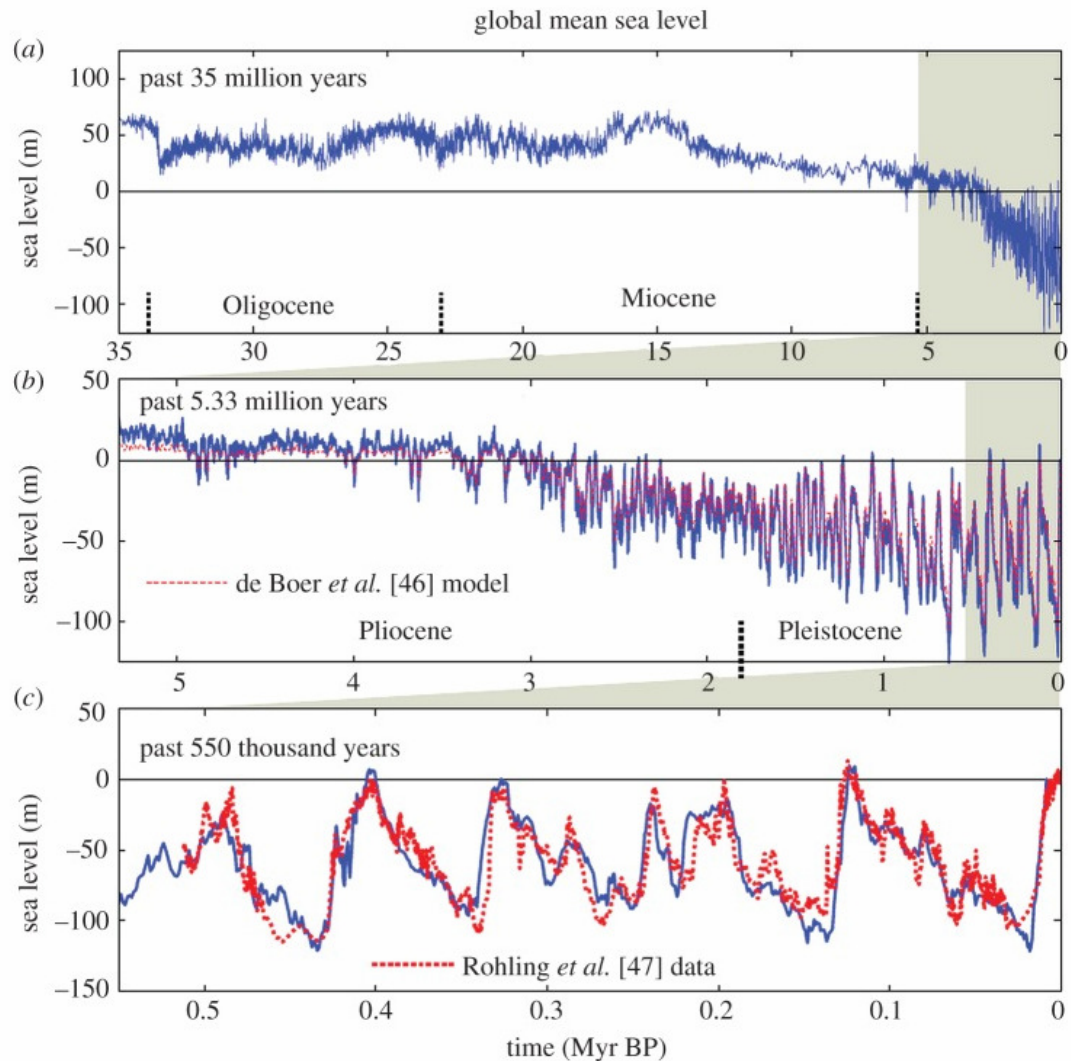
Deposition of sediment
when land mass is
below sea level

Erosion or weathering
of rock when land mass
is above sea level

From: Hansen, James & Sato, Makiko & Russell, Gary & Kharecha, Pushker. (2013). Climate sensitivity, sea level, and atmospheric CO₂. Philosophical transactions. Series A, Mathematical, physical, and engineering sciences. 371. 20120294. 10.1098/rsta.2012.0294.



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Geological Terminology

Formation

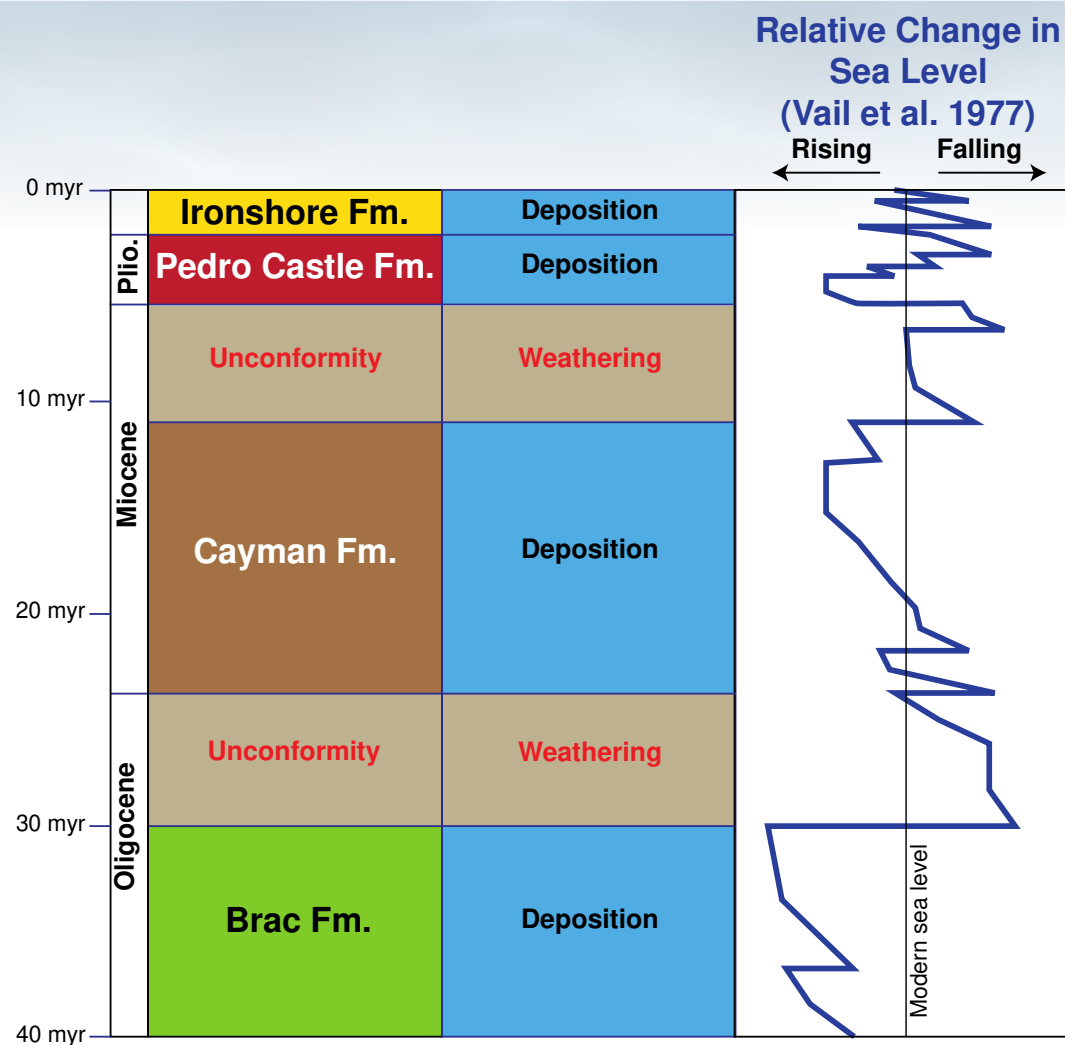
A package of rocks that are all similar to each other, but different from the rocks in the packages above and below

Unconformity


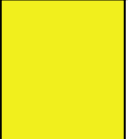

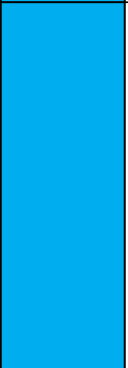

An erosion surface, no deposit takes place. The erosion can take place for extended time



Geological Formations – Cayman Islands

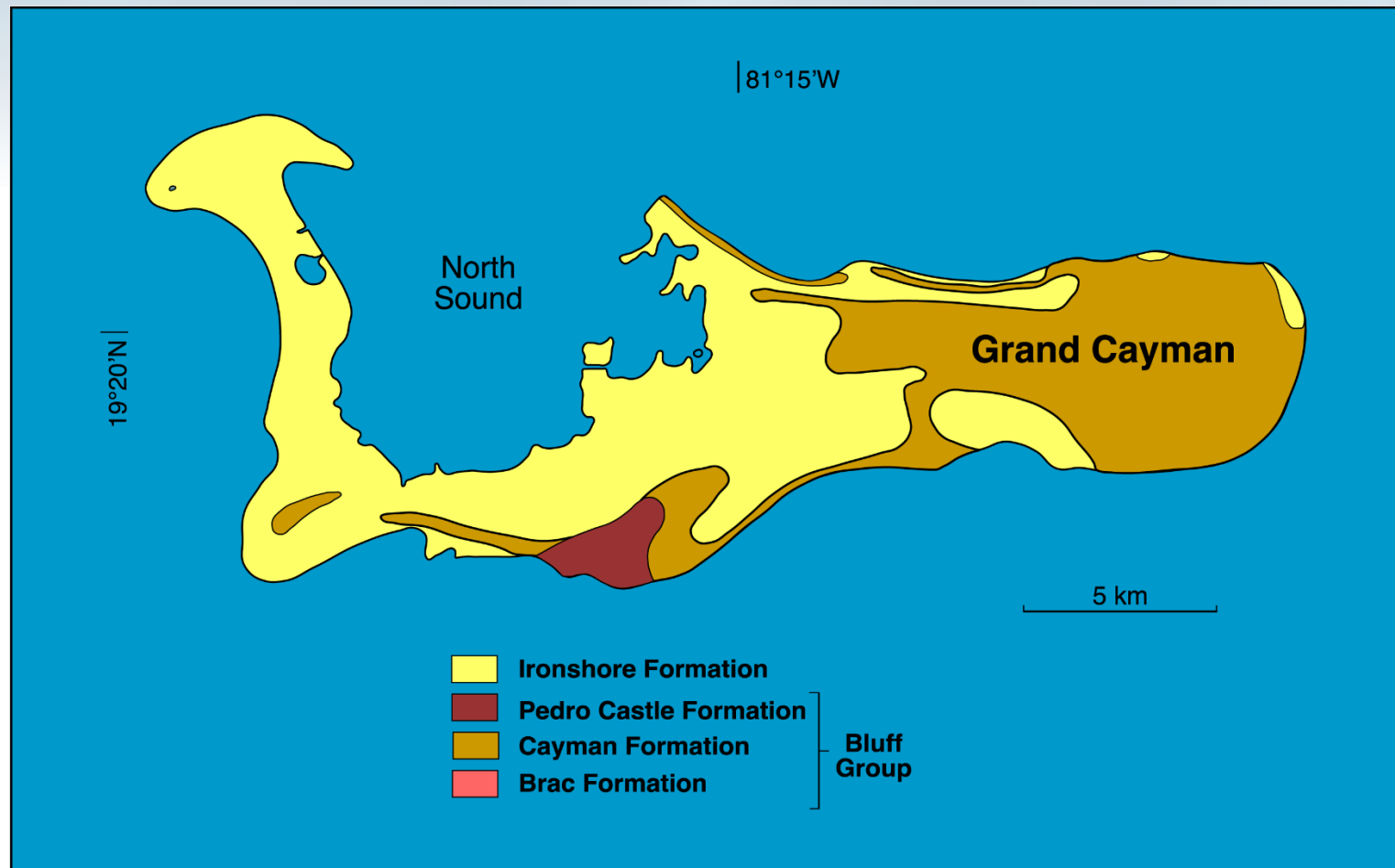


Geological Formations (cont.)

AGE		UNIT	LITHOLOGY	BIOTA
Hol.		<i>Unconformity</i>	Swamp deposits, storm deposits	
Pleist.		IRONSHORE FORMATION <i>Unconformity</i>	Limestone	Corals, bivalves, gastropods
Pliocene		PEDRO CASTLE FORMATION <i>Unconformity</i>	Dolostone (fabric retentive) and limestone	Corals, bivalves, foraminifera, red algae, calcareous algae, gastropods
M. Miocene		CAYMAN FORMATION <i>Unconformity</i>	Dolostone (fabric retentive)	Corals, bivalves, foraminifera, red algae, calcareous algae, gastropods, rhodolites
L. Oligocene		BRAC FORMATION	Limestone and dolostone (fabric destructive)	Bivalves, foraminifera, red algae, gastropods

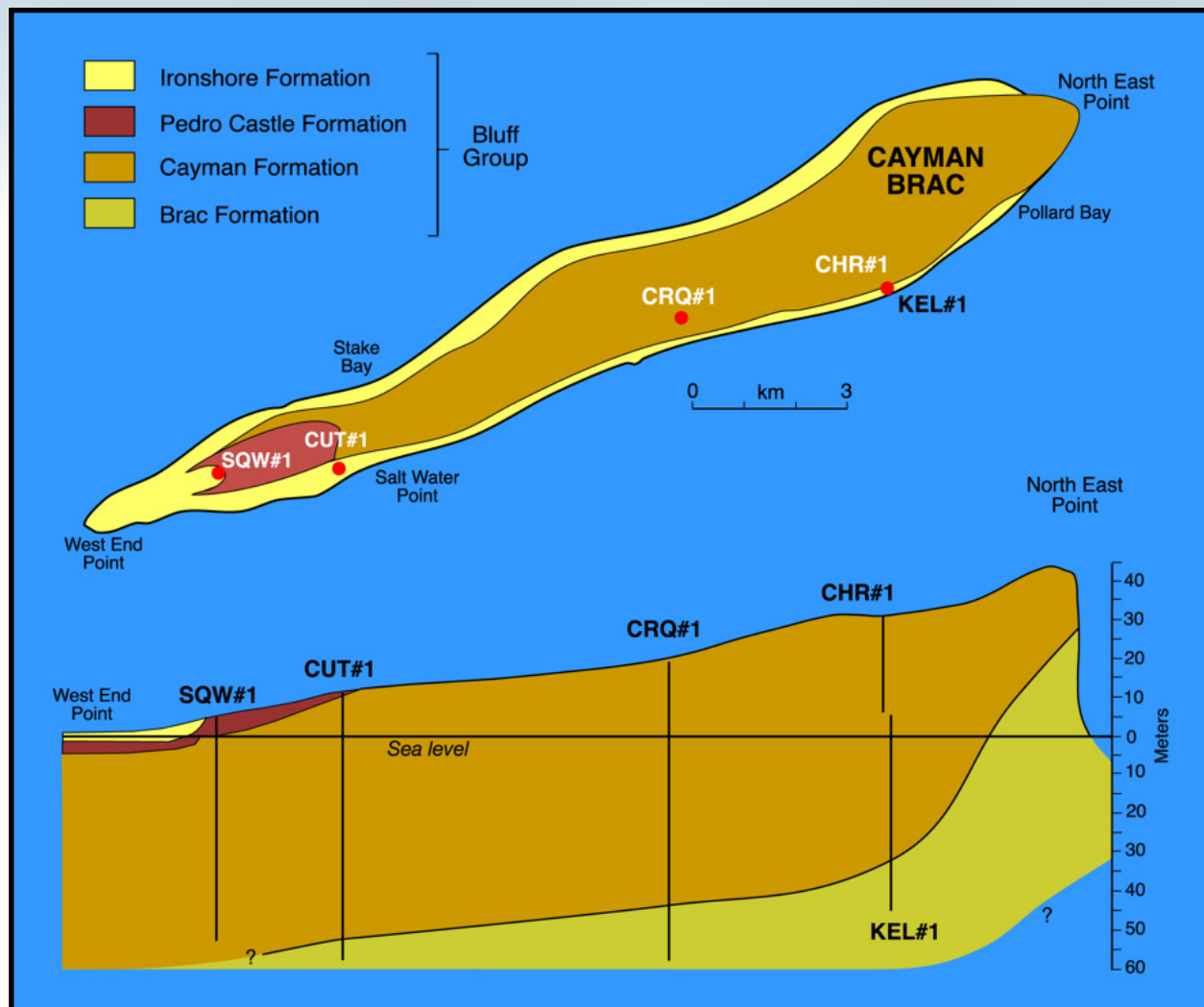


Geology Map Grand Cayman



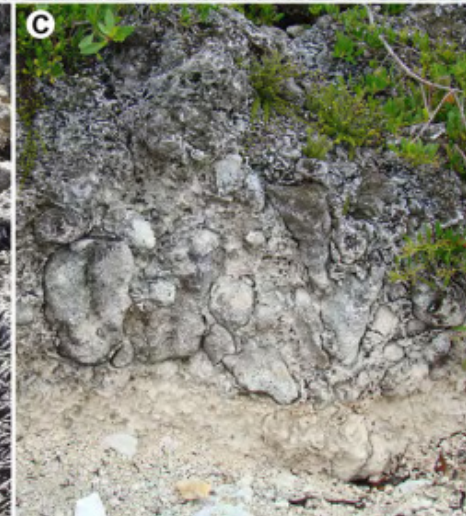
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Geology Map Cayman Brac



Ironshore Formation

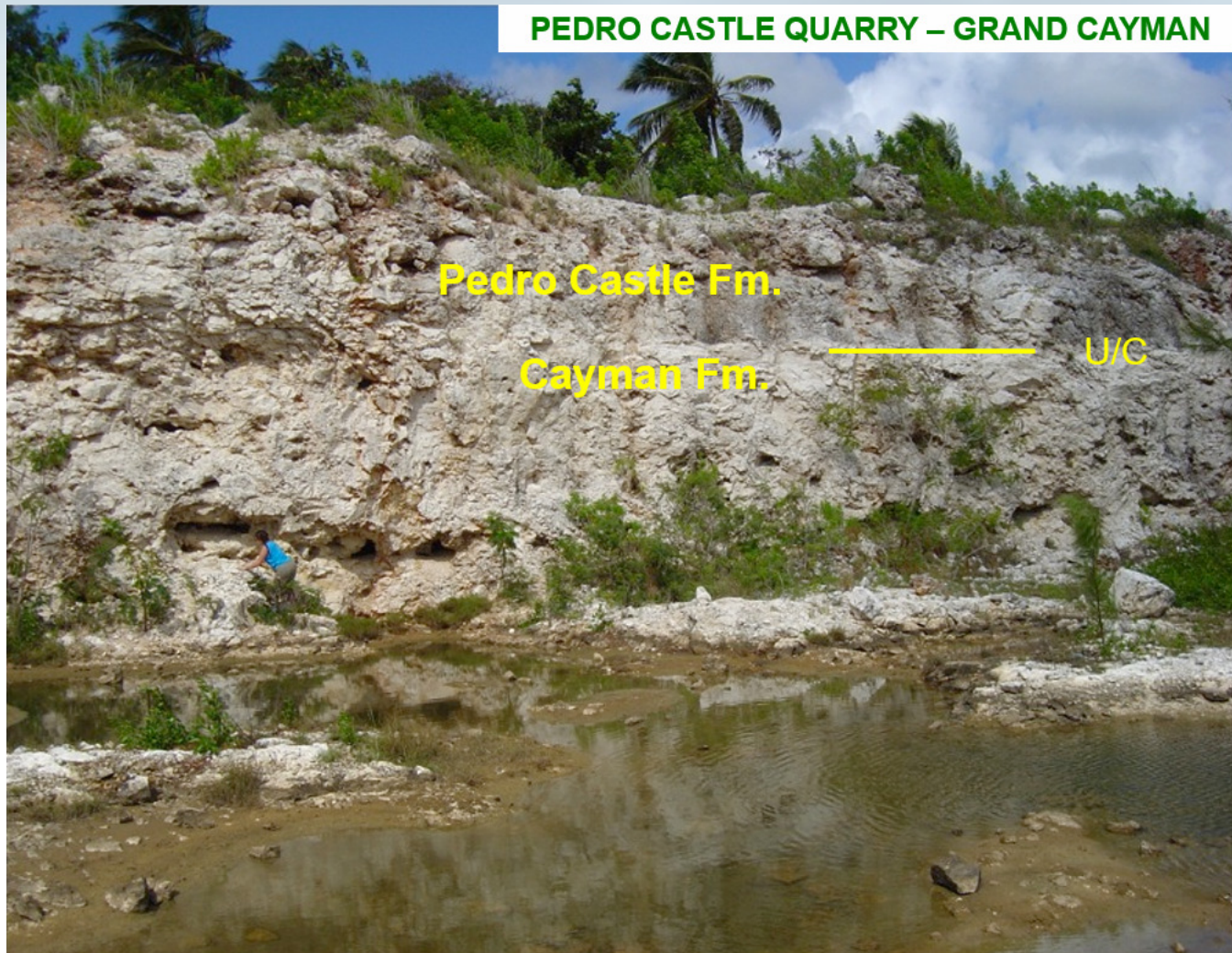
WEST BAY BOAT RAMP



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Pedro Castle and Cayman Formation

PEDRO CASTLE QUARRY – GRAND CAYMAN



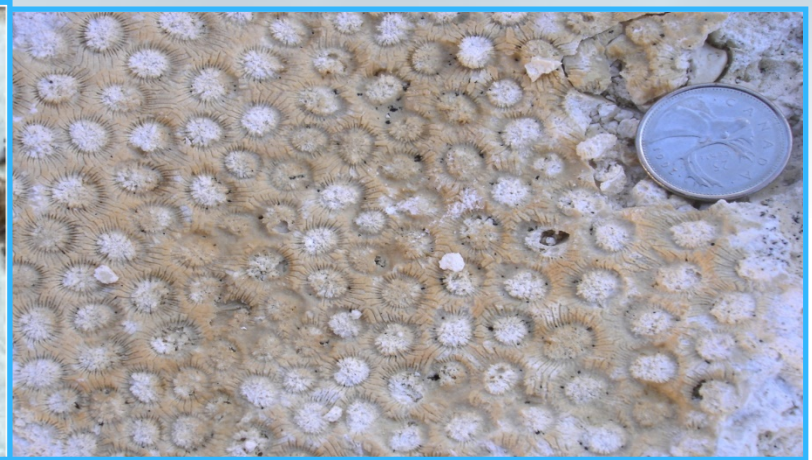
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Fossils in the Pedro Castle Formation



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Fossils in the Cayman Formation



Cayman and Brac Formation

**NE COAST
CAYMAN BRAC**



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Fossils in the Brac Formation



Dolostone and Limestone

CARBONATE SEDIMENTARY ROCKS

LIMESTONE



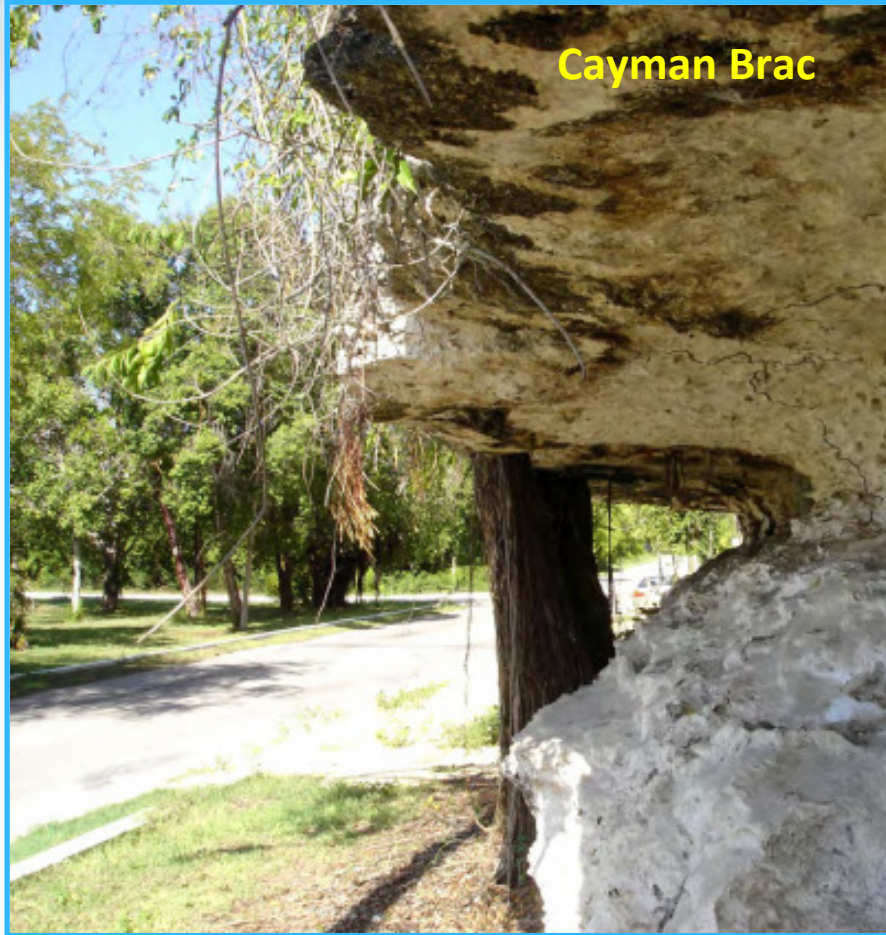
Formed of Calcite/Aragonite
both minerals are CaCO_3

DOLOSTONE



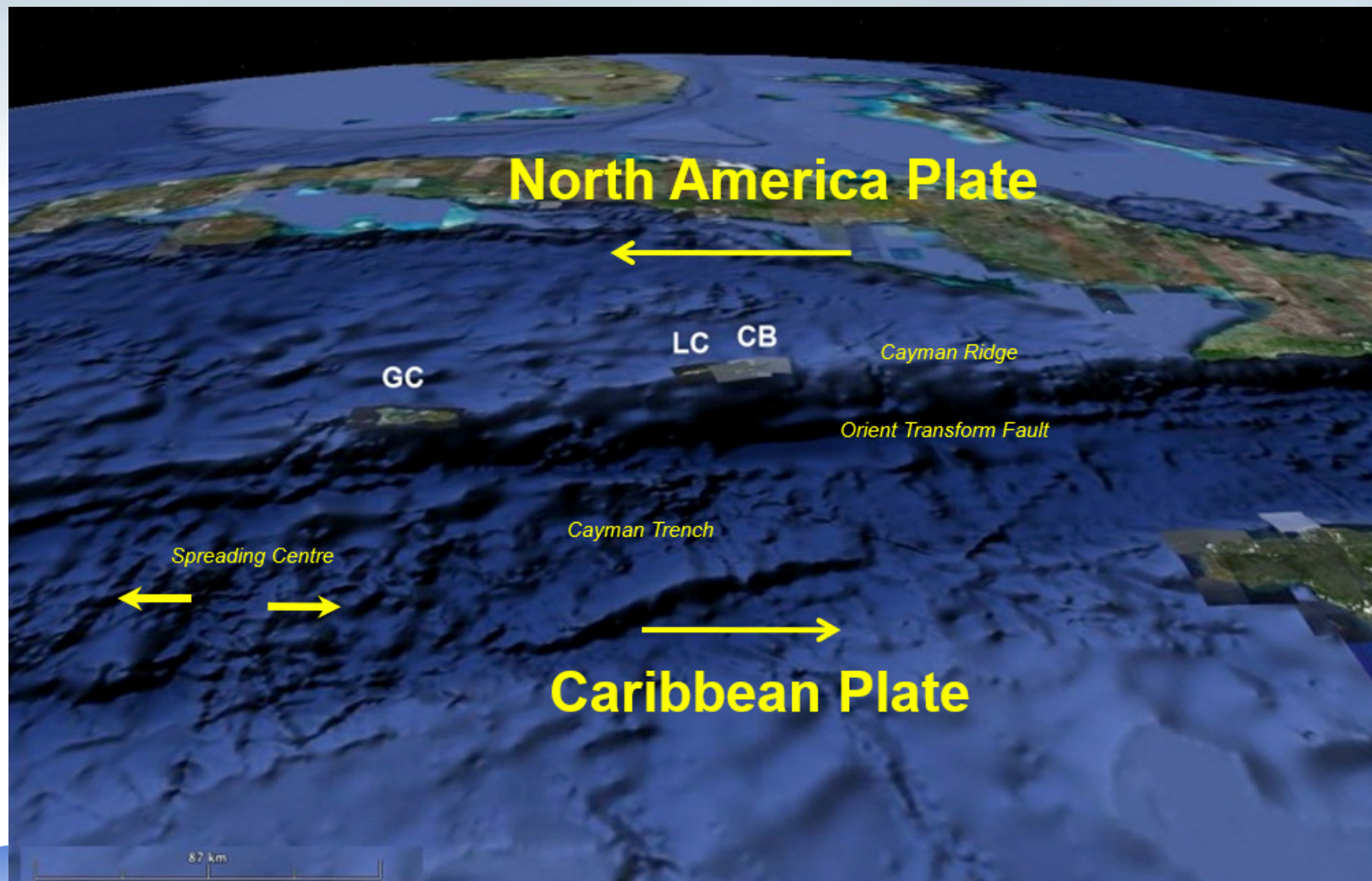
Formed of dolomite
 $\text{MgCa}(\text{CO}_3)_2$

Wave Cut Notch

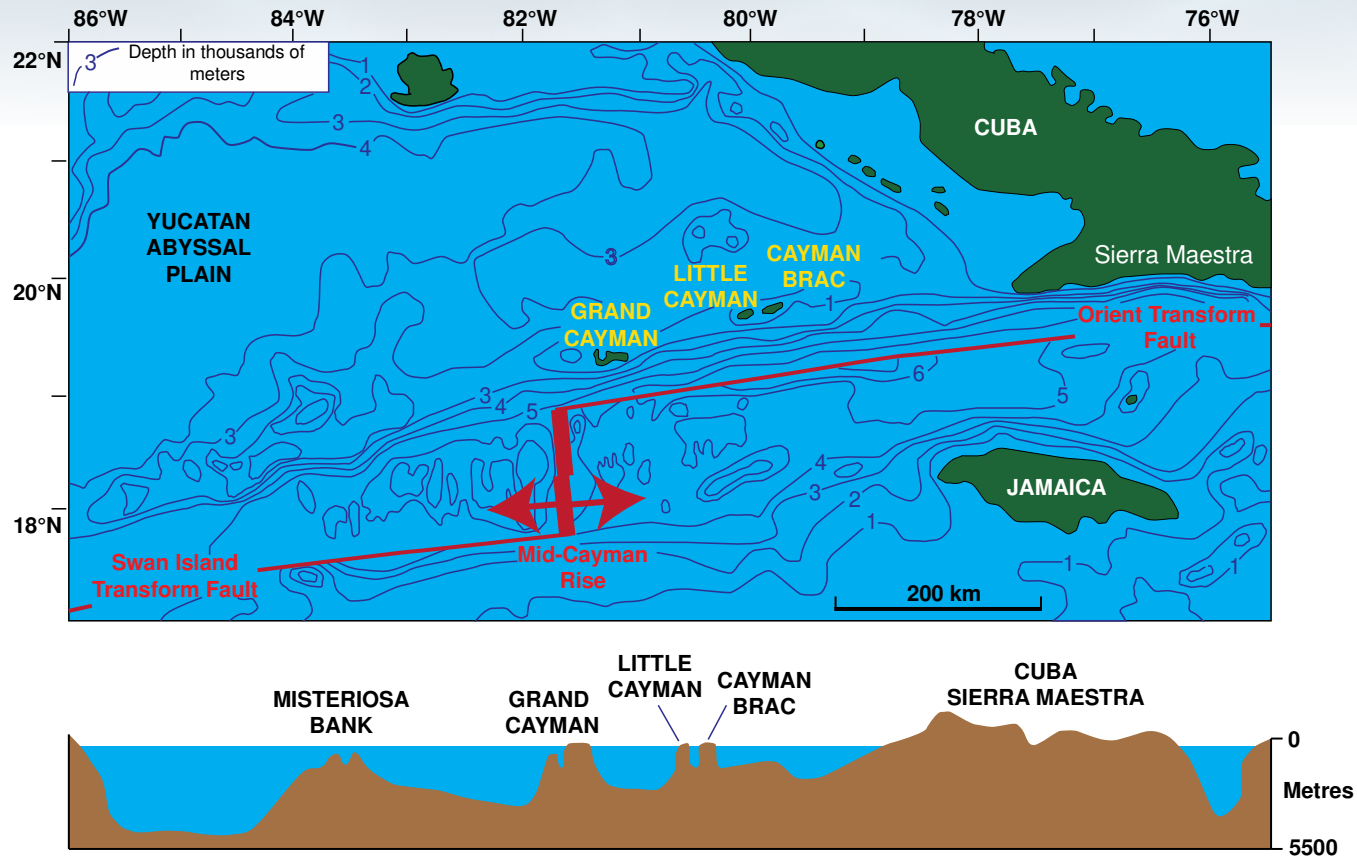


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Earthquakes

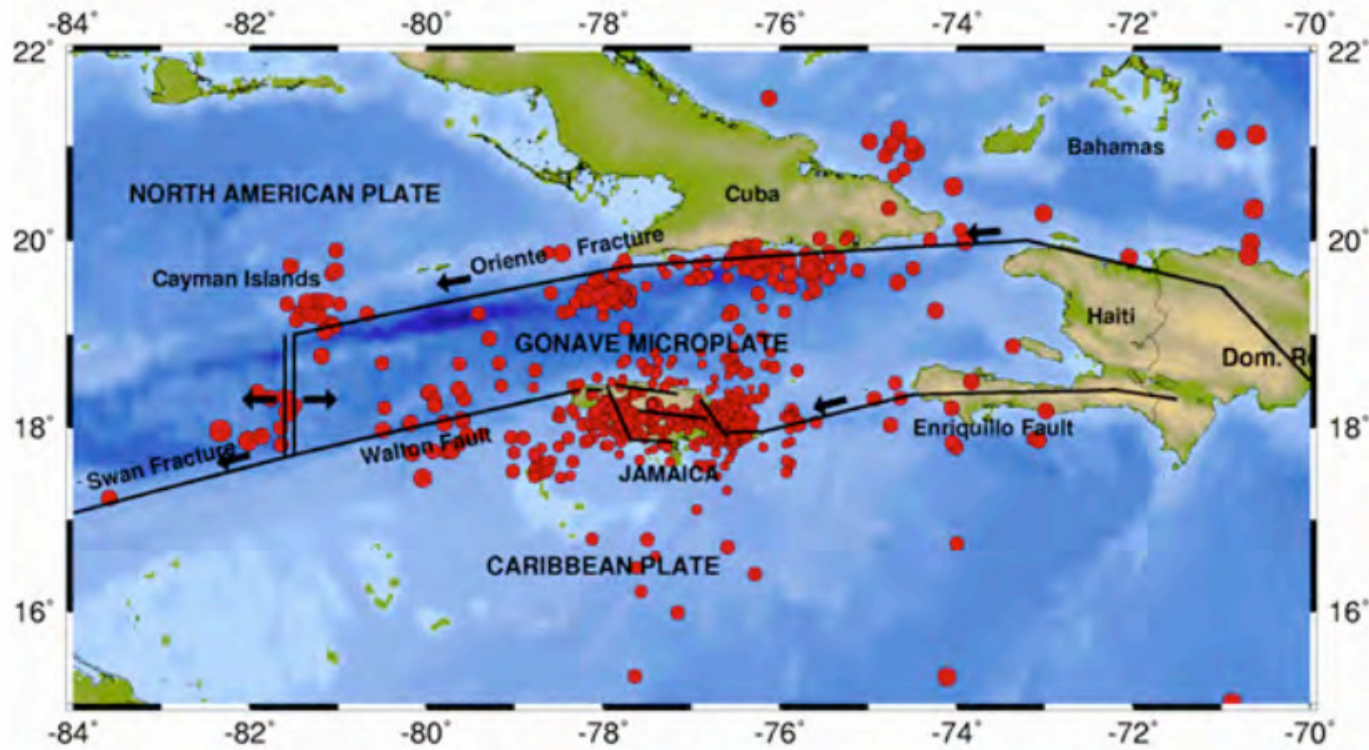


Earthquakes



Earthquakes

PAST EARTHQUAKE EPICENTERS



<http://www.mona.uwi.edu/earthquake>



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Groundwater, making the invisible visible

Water Authority - the Utility

Provide potable water

Reverse osmosis plants

Treat and dispose wastewater



2022 Groundwater

Water Authority – the Regulator

Manage groundwater

Abstraction of groundwater for various purposes

Disposal of water from different sources

Environmental protection



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Geological succession of Cayman Islands formed as sea level has changed through time

Deposition took place when sea-level was high

Erosion took place when sea-level was low

Interplay between deposition and erosion produced a complex succession of rocks

Knowledge of geological processes provides a basis for planning for anything subsurface activity

Knowledge of subsurface geology critical in developing drinking water supplies on the islands



Thank you for your
attention!

QUESTIONS & COMMENTS



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