Sea caves or Flank margin caves: do we understand cave formation at Tantanoola and Taragal?

Susan White, John Mylroi & Joan Mylroi

Sea Caves or Flank Margin Caves

Do we understand cave formation in coastal areas?

Susan White (Latrobe University, Bundoora),
John Mylroie & Joan Mylroie
(Mississippi State University)

Acknowledgements

Ken Grimes
Nicholas White

Sea Caves or Coastal Caves

What is the difference?

- **Sea caves** are formed by the MECHANICAL action of the sea
- **Coastal caves** occur on or near the coast and may have several mechanisms of formation.

Background

- Marine water is saturated in $CaCO_2$
- $CaCO_2$ does not usually dissolve in sea water
- Sea Caves form by mechanical action of the sea
- Many coastal caves are not sea caves

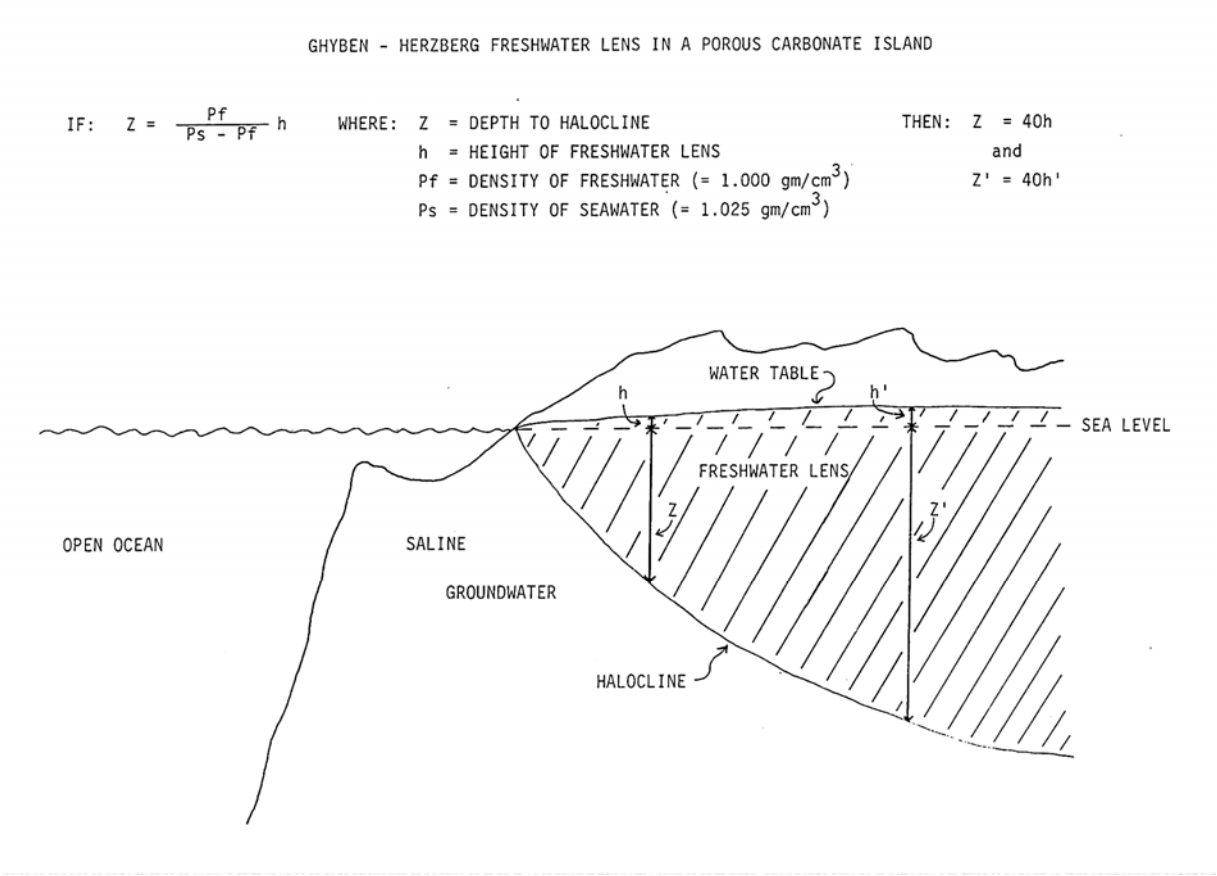
Flank Margin Caves

- Many caves are formed in a flank margin setting
- Based on Bahamas & Pacific island eg Marianas, studies over last 25 years.
- Now can be applied to continental settings such as south coast of Australia.

Carbonate Island Karst Model, CIKM

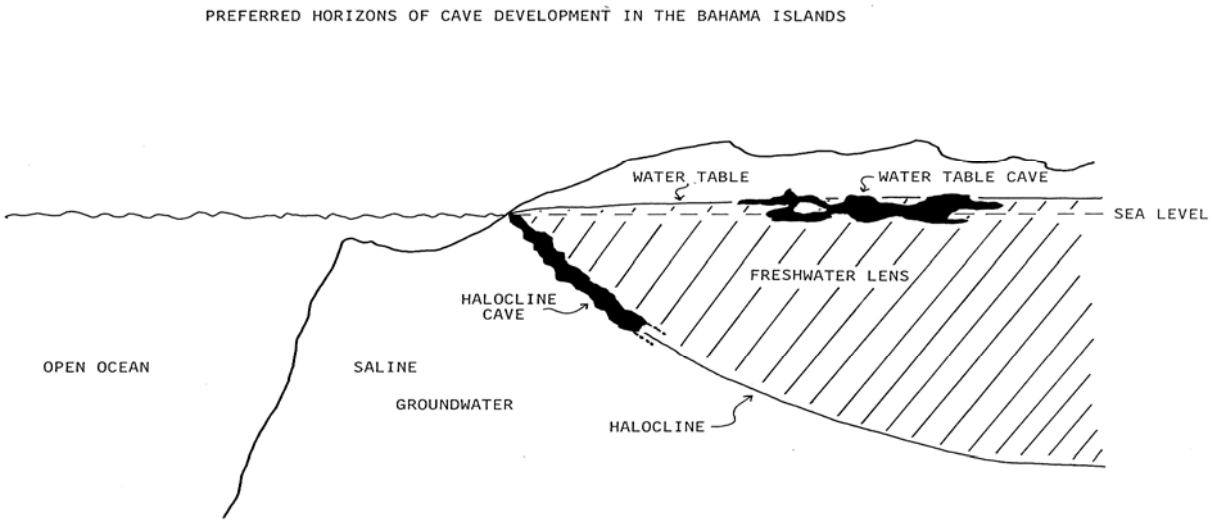
1: Fresh Water/Salt Water Mixing
2: Glacioeustasy
3: Local & Regional Tectonics
4: Simple Carbonate – Carbonate Cover – Composite Islands – Complex Islands
5: Relationship to continental margin coasts

Sea caves or Flank margin caves: do we understand cave formation at Tantanoola and Taragal? ***Susan White, John Mylroi & Joan Mylroi*.**



Mixing dissolution occurs at the vadose/phreatic water contact and at the fresh/marine water contact

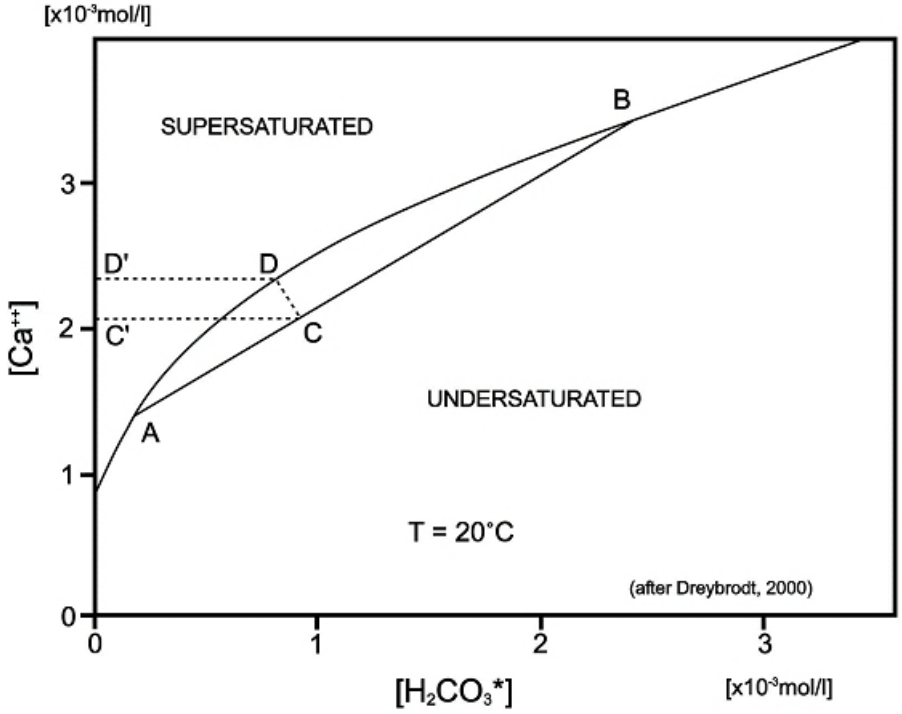
Preferred places of Cave Development in flank margin situation.

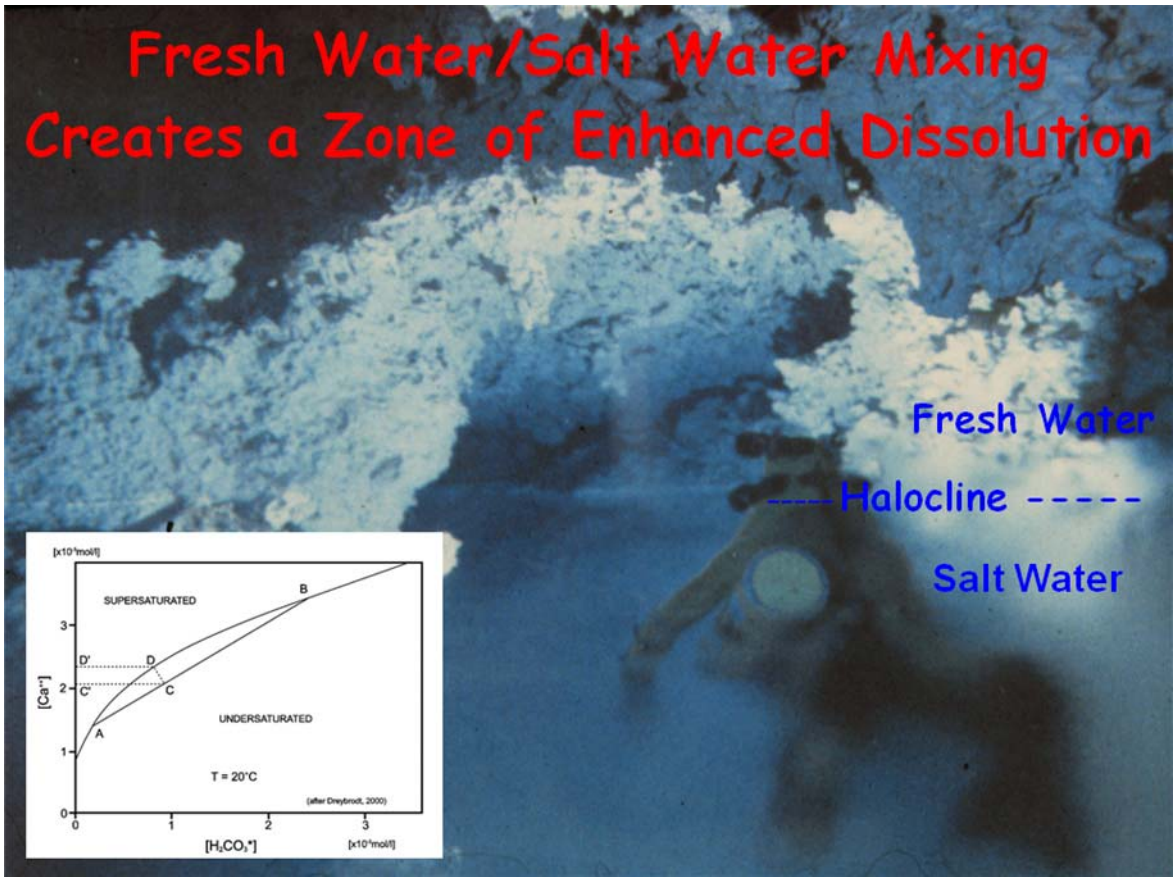


Cave Production: Making a "Flank Margin

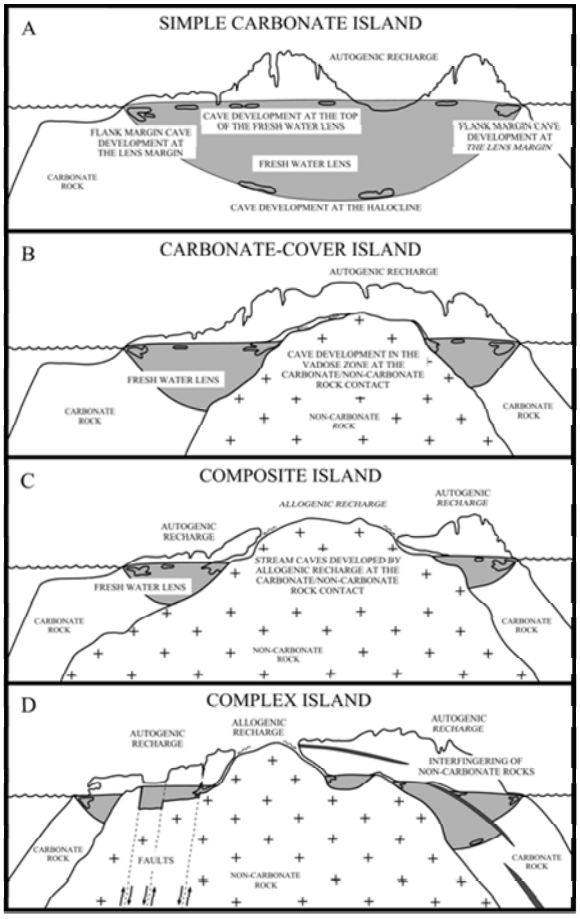
Superposition of the vadose/phreatic and fresh/marine mixing zones at the lens margin means cave development is favoured at the lens margin, under the flank of the land. Hence the name "Flank Margin Cave".

Sea caves or Flank margin caves: do we understand cave formation at Tantanoola and Taragal? ***Susan White, John Mylroi & Joan Mylroi*.**





Sea caves or Flank margin caves: do we understand cave formation at Tantanoola and Taragal? ***Susan White, John Mylroi & Joan Mylroi*.**



No non-carbonate rock influence on island hydrology.
BAHAMAS
Non-carbonate rocks under a carbonate veneer. The lens is partitioned.
BERMUDA (sea level low)

Carbonate and non-carbonate rocks exposed. Allogenic recharge occurs.
BARBADOS
Faulting, folding and facies relationships create complex lens configurations.
SAIPAN

The Gambier Karst Province is an extensive area of Tertiary marine limestone and overlying Quaternary dune limestone in south eastern South Australia and western Victoria. These are "soft rock" limestones: youthful, weakly-consolidated porous calcarenites (sandy limestones) that are quite distinct from the classical "hard rock" limestones of the east coast, and other parts of Australia.

The caves in the Quaternary dune fields are syngenetic with the initial early cementation of the limestone, but those in the Tertiary limestones postdate that cementation.

The caves in both limestones are characterized by cap rock effects, solution pipes, extensive low horizontal phreatic mazes and abundant collapse modification. They are locally well-decorated, especially with straws and moonmilk, which the ongoing collapse tends to destroy leaving many bare fractured walls.

The Tertiary limestones differ in showing good joint control on their passage orientation. Beside the gorge of the Glenelg River there are linear, stream caves. Near the coast there are extensive large flooded systems which formed during the lower sea levels of the glacial periods. Tank Cave has 6 km of flooded shallow horizontal passage and The Shaft extends to a water depth of 120m. The cenotes, large water-filled collapse dolines, are unique(?) within Australia. There are large springs rising from flooded caves at the coast and offshore.

The syngenetic caves in the dune limestone can be horizontally extensive but have little depth. The largest tend to be at the edges of the dunes - adjacent to the sea that existed when the dunes formed, and also to the later swamps. We use the term "flank margin caves" for the irregular chambers that formed where sea water mixed with fresh water at the old coast, and "swamp margin" for the later modifications by acidic swamp waters eating into the edge of the dunes. Both tend to be low-roofed horizontal crawly mazes alternating with rubble-filled domes rising towards the surface.