

Dr. Peter J. van Hengstum: Interactive virtual model of coastal karst basins

Confusing names, one central theme

Coastal karst basins are globally ubiquitous on karst landscapes, yet the sediments within these basins have remained largely untapped. Problematically, coastal karst basins go by many names: blue holes, banana holes, black holes, cenotes, anchialine caves, anchialine lakes, anchialine ponds, submarine caves, littoral caves, underwater caves, sinkholes, etc. All these names have been developed to describe regional and very specific environmental characteristics, but all these karst features can be unified. They are all environments in the coastal zone, variably affected by a coastal aquifer that may or may not have developed site-specific characteristics, they are open-systems, and most importantly, these basins form natural sediment traps. In general, 4 separate types of environments can develop in coastal karst basins:

- *Vadose environments*: located above the water table, in the unsaturated (vadose) zone and filled with air.
- *Littoral environments*: These occur when the coastal karst basin (CKB) is only partially submerged, resulting in the presence of a water table in the basin. The water table is important because it causes unique speleothems & sedimentation patterns such as calcite raft deposition, or it can promote typical intertidal ecosystems to develop in sinkholes like mangrove swamps.
- *Anchialine environments*: This environment develops in submerged CKBs that have restricted subaerial access through sinkholes, yet broad subsurface hydrogeologic connectivity to the ocean. Either a meteoric lens or saline groundwater may flood these environments, so it remains critical to define which groundwater mass is flooding a particular CKB to provide a hydrogeological context for the environment. Importantly, anchialine environments are dominated by *terrestrial* influences, which may be either geochemical, sedimentologic, or hydrogeologic. Examples include anchialine cenotes in Mexico and inland Bahamian blueholes or blackholes.
- *Submarine environments*: This environment develops in a completely submerged CKB that is flooded by saline groundwater, and has subsurface hydrogeologic connectivity to the ocean. Because these environments are flooded by marine water, they are completely dominated by *marine* processes. Any physical entrances open below sea level into the ocean, such as submarine caves or ocean blueholes.

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