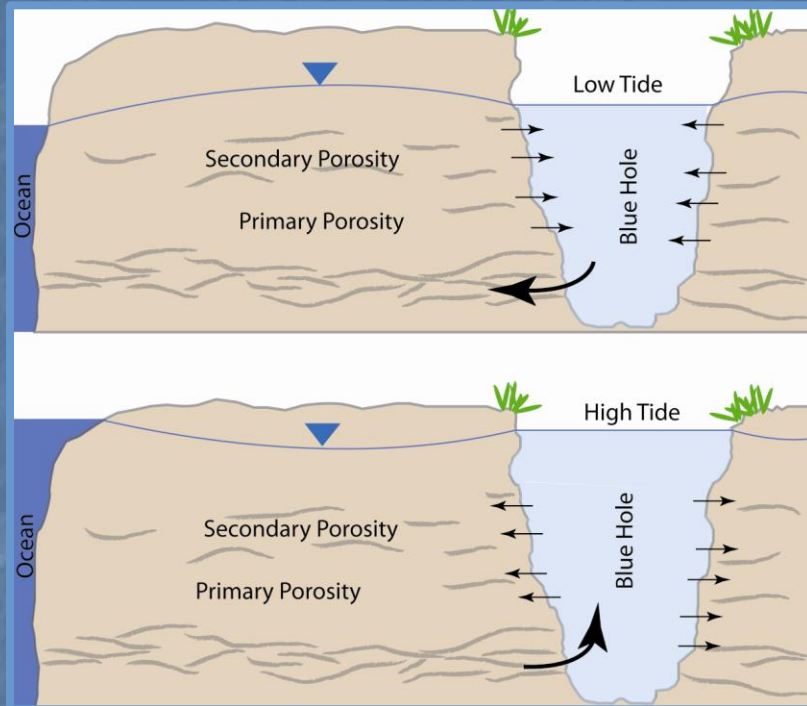


Post-depositional dissolution of carbonate minerals: Origins of secondary porosity in modern carbonate platforms

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Secondary porosity of modern carbonate platforms may affect porosity distribution of subsurface reservoirs and aquifers. Distributions of secondary porosity depend on two characteristics: (1) flow of water through the aquifers, and (2) the saturation state of the water.

Modern carbonate platforms typically lack confining units and topographic relief, characteristics required for flow. Their water elevations fluctuate with tidal frequencies, however, and we have shown, based on data from San Salvador Island and Rum Cay, Bahamas, that the tidal fluctuations are sufficient to exchange water from blue holes (vertical caves) with water in the surrounding matrix primary porosity.

Water in the blue holes has elevated organic carbon (OC) concentrations from primary production and input of terrestrial organic matter. The OC is trapped on the pycnocline, mineralized to CO_2 , which hydrates to carbonic acid, making the water undersaturated with respect to calcite. Tidal pumping forces undersaturated water into the primary porosity, creating secondary porosity. Distribution of secondary porosity should thus follow patterns of exchange, a concept which may inform predictive models of porosity distribution in ancient carbonate terrains.

