



Bermuda's Walsingham Cave System is a divers' paradise.

The blue-green waters of its submarine and subterranean caves and grottos are home to unique ocean life, and its limestone composition forms new, other-worldly walls, columns and curtains with every drop of rainwater.

As it turns out, the Walsingham Cave System is also a climate scientists' paradise, which is situated on the northeast coast of the island. Preliminary evidence suggests that the temperature of the groundwater flooding this underwater cave may be linked to the vigor of the Gulf Stream in the North Atlantic. This potentially makes the cave system an ideal location to study how the Atlantic Meridional Overturning Circulation, or AMOC (a deep ocean current), responded to, or forced, intervals of abrupt climate change over the past 12,000 years.

With funding from the Ocean and Climate Change Institute, Peter van Hengstum and Jeff Donnelly of the Geology and Geophysics Department have teamed up to continuously measure temperature and salinity in Walsingham Cave. These measurements will provide a cave-wide perspective of how oceanography in coastal lagoons and the western Sargasso Sea influences the hydrography in the underwater cave.

"Studies of submarine caves are an innovative solution to the problem of having so few high-resolution ocean climate records," van Hengstum said. "This is because underwater caves contain carbonate organisms suitable for traditional geochemical analysis and they can have high sedimentation rates."

Using advanced cave-SCUBA diving techniques, the researchers installed four hydrographic stations into Walsingham Cave in December 2011. The four hydrographic stations are strategically positioned to observe passages increasingly isolated from the ocean. These stations have been sampling temperature, salinity and depth every five minutes ever since.

"This research will be the first complete hydrographic analysis in a submarine cave using a continuous observation network," van Hengstum said. "It will provide essential preliminary data and infrastructure to leverage into a National Science Foundation-funded program completing a cave-wide calibration program of carbonate geochemistry in submarine caves."

Peter J. van Hengstum and Jeffrey P. Donnelly were awarded \$12,165 for the study, "Does the Gulf Stream regulate hydrography in Walsingham Cave, Bermuda? Implications for developing high-resolution records of Holocene Gulf Stream variability."