IRIS technique for monitoring of carbon cycle in coral reef ecosystem

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Complex ecosystem of coral reefs is formed through interaction of biological, physical and chemical processes. These coastal areas are sites of intense primary production and specific processes which can induce strong variations of dissolved inorganic carbon and associated high air-ocean CO_2 fluxes. Air-ocean CO_2 exchange in coastal area is a fundamental process in a global carbon cycle [1, 2].

For better insight in short and long term changes in complex coral reef ecosystem, laboratory controlled culturing experiments are performed in GEOMAR Helmholtz Centre for Ocean Research, Kiel. Along with monitoring of physical and chemical parameters of water, such as temperature, pH, salinity, alkalinity and oxygen saturation, continuous measurements of stable carbon and stable oxygen isotopes ($\delta^{13}C$ and $\delta^{18}O$) are performed. For determination of carbon and oxygen isotopic composition Thermo Scientific™ Delta Ray™ IRIS with URI Connect was used.

Delta Ray IRIS with URI Connect uses isotope ratio infrared spectroscopy (IRIS) to determine the isotope ratios. The laser light is generated by a difference frequency generation (DFG) mid-infrared laser which operates at 4.3 μm. Calculation of different carbon dioxide isotopologues and determination of stable isotope ratios from spectrum is possible due to absorption lines which are shifted relative to each other [3]. This technology provides possibility of having minute to minute measurements and thus to have an insight in variations in daily CO_2 cycle.

Continuous monitoring of CO_2 input from several different sources, and monitoring of response in water chemistry, will provide deeper understanding of processes associated with carbon fluxes.

[1] Frankignoulle *et al.* (1996) *Marine Ecology Progress Series* **145,** 123-132. [2] Lantz *et al.* (2013) *Marine Ecology Coral Reefs* **33,** 105-115. [3] Geldern *et al.* (2014) *Analytical Chemistry* **86,** 12191-12198.