

5 Year-long Monitoring of Barkley Canyon Cold-seeps with the Internet Operated Deep-sea Crawler “Wally”

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Abstract

Despite the technological advances of the last decades (e.g. ROVs, AUVs, cabled observatories), our knowledge of most deep-sea environments is still strongly limited by spatio-temporal sampling and observational capabilities. The novel Internet Operated Deep-Sea Crawler technology can provide high-frequency, multi-sensor data, during long-term deployments, 24/7 communication with researchers and broader spatial coverage (i.e. mobile platform) than fixed instrument installations. The crawler “Wally” is deployed at the Barkley Canyon methane hydrates site (NE Pacific, Canada; ~890 m depth) and connected to the Ocean Networks Canada NEPTUNE cabled observatory network (ONC; www.oceannetworks.ca). Here we present the environmental and biological datasets obtained from Wally instruments and cameras, during the first deployment phase (September 2010 to January 2015), as well as new features and preliminary results obtained since it was re-deployed (May 2016 – present). In addition to data provided by the standard payload of the crawler (i.e. ADCP, CTD, methane sensor, turbidity sensor and fluorometer), the hydrates community was video-monitored at different frequencies and timespans. Photomosaics were generated at two distinct locations, in order to map chemosynthetic bacterial mats and vesicomyid clam colonies covering the ~2-3 m high hydrate mounds, and document their temporal dynamics. The crawler followed the development of a deep-sea shell taphonomic experiment aiming to quantify biogenic carbon fluxes at the hydrates environment. The composition and diel activity patterns of the hydrates megafaunal community were studied with the use of linear video-transects conducted from February 2013 to April 2014. Since the summer of 2016, video-frames recorded at different locations of the site are analyzed for a biodiversity study and photomosaicing of the hydrate mounds continues, with 3D modelling of the mound structures also available as a new feature of the crawler deployed in May 2016. All data are archived in real-time and can be accessed online on the Ocean Networks Canada database. As deep-sea crawler technology and similar mobile, benthic platform technologies progress towards full operational autonomy, they will provide an even greater capacity for future monitoring and understanding of dynamic, extreme environments such as methane hydrate fields.

Keywords: *Internet Operated Deep-Sea Crawler Wally, Ocean Networks Canada, Barkley Canyon hydrates, Multi-sensor data, Video-monitoring*