Geophysical Research Abstracts
Vol. 17, EGU2015-12221, 2015
EGU General Assembly 2015

Using mobile, internet connected deep sea crawlers for spatial and temporal analysis of cold seep ecosystems and the collection of real-time classroom data for extreme environment education.

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Cabled internet and power connectivity with the deep sea allow instruments to operate in the deep sea at higher temporal resolutions than was possible historically, with the reliance on battery life and data storage capacities.

In addition to the increase in sensor temporal frequency, cabled infrastructures now allow remote access to and control of mobile platforms on the seafloor. Jacobs University Bremen, in combination with collaborators from the Robotic Exploration of Extreme Environments (ROBEX) project, CSIC Barcelona and Ocean Networks Canada have been operating tracked deep sea crawler vehicles at ∼890 m depth at the dynamic Barkley Canyon methane seep site, Pacific Canada during the last ∼4 years. The vehicle has been able to explore an area of ∼50 m radius, allowing repeated visits to numerous microhabitats. Mounting a range of sensors, including temperature, pressure, conductivity, fluorescence, turbidity, flow and methane concentration sensors, as well as various camera systems a large dataset has been compiled. Several methane pockmarks are present in the survey area, and geological, biological and oceanographic changes have been monitored over a range of timescales. Several publications have been produced, and in this presentation we introduce further data currently under analysis.

Cabled internet connectivity further allows mobile platforms to be used directly in education. As part of the ROBEX project, researchers and students from both terrestrial and planetary sciences are using the crawler in an ongoing study project. Students are introduced to statistical methods from both fields during the course and in later stages they can plan their own research using the in-situ crawler, and follow the progress of their investigations live, then analyse the collected data using the techniques introduced during the course.

Cabled infrastructures offer a unique facility for spatial investigation of extreme ecosystems over time, and for the ‘hands on’ education of future students.