Geophysical Research Abstracts
Vol. 12, EGU2010-10752, 2010
EGU General Assembly 2010

Long-term observations of tilt, seafloor pressure and temperatures in the Logatchev Hydrothermal Vent Field, Mid-Atlantic Ridge, 15°N.

Heinrich Villinger (1), Hans-Hermann Gennerich (1), Marcus Fabian (1,2)

(1) University of Bremen, Geoscience, Bremen, Germany (vill@uni-bremen.de, +49 421 218 65369), (2) Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, Robert-Schuman-Platz 3, D-53175, Bonn, Germany

The Logatchev Hydrothermal Vent Field (LHF) was one of the foci of the German DFG-funded Priority Program 1144 where over the last 5 years attempts were made to monitor hydrothermal and magmatic activity by long-term measurements of (1) seafloor deformation (subsidence, uplift, tilt), (2) tremor (vertical seafloor acceleration, bottom pressure) (2) bottom water temperature variations and (4) variation of outflow temperatures of black smokers. In addition we measured horizontal temperature distribution and vertical temperature profiles in biological communities (mussel fields).
Seafloor deformation was measured with an Ocean Bottom Tilt Station (OBT) with a biaxial bubble tilt sensor with a resolution of 1*10-6 rad. Ocean Bottom Pressure (OBP) – an obvious proxy for uplift or subsidence- was measured with a Paroscientific Digiquartz Pressure Sensor with an absolute resolution of 5 Pa (equivalent of 0.5mm depth change). A microelectromechanical systems (MEMS) accelerometer of type Kistler with about 10-5 m/s2 nominal resolution was mounted in the OBT's sensor pressure tube to measure vertical acceleration. A short mooring at the seafloor with 25 temperature sensor distributed over 25m, located close to the outflow plume of a black smoker recorded variations in plume activity. In addition a high temperature sensor was placed directly inside the outflow of two black smokers and recorded temperatures over a week resp. over almost one year.
In summary, all our deployed systems worked very well and data quality was good to excellent. However we also had to face the occasional data loss due to power failure or corrosion problems inside of underwater connectors. Because of its very high resolution the precise leveling of the tilt station with the help of an ROV was a challenge.. Unfortunately due to logistical problems with ROV and/or cruise scheduling we lost one complete cruise and during the last cruise to LHF in January 2009, not all instruments could be recovered due to extended bad weather conditions.
In our presentation we will present an overview of our instruments, discuss our technical design principles, demonstrate the capabilities of our instruments and show and discuss the data collected over the last 4 years. In conclusion, a meaningful interpretation of long-term time series of seafloor deformation, in particular tilt and pressure, is only possible with simultaneous observations of the physical oceanography in the area and the use of sensor arrays instead of single point observations.