Geophysical Research Abstracts
Vol. 12, EGU2010-8487-1, 2010
EGU General Assembly 2010

Distribution, structure and temporal variability of hydrothermal outflow at a slow-spreading hydrothermal field from seafloor image mosaics.

Thibaut Barreyre (1), Javier Escartin (2), Mathilde Cannat (2), Rafael Garcia (3), MoMAR'08 Science Party (), and Bathyluck'09 Science Party ()

(1) ENS / IPGP, France, (2) CNRS / IPGP, France, (3) University of Girona, Spain

The Lucky Strike hydrothermal site, located South of the Azores along the Mid-Atlantic Ridge, is one of the largest and best-known active hydrothermal fields along the ridge system. This site within the MoMAR area is also the target for the installation in 2010 of a pilot deep-sea observatory with direct telemetry to land, to be part of the European Seafloor Observatory Network (ESONET). The Lucky Strike hydrothermal site has seen extensive high-resolution, near-bottom geophysical surveys in 1996 (Lustre'96), 2006 (Momareto06), 2008 (MOMAR08) and 2009 (Bathyluck09). Vertically acquired black-and-white electronic still camera images have been projected and georeferenced to obtain 3 image mosaics covering the zone of active venting, extending $\sim$ 700x800 m2, and with full image resolution ($\sim$10 mm pixels). These data allow us to study how hydrothermal outflow is structured, including the relationships between the zones of active high-temperature venting, areas of diffuse outflow, and the geological structure (nature of the substrate, faults and fissures, sediments, etc.). Hydrothermal outflow is systematically associated with bacterial mats that are easily identified in the imagery, allowing us to study temporal variability at two different scales. Over the 13-year period we can potentially track changes in both the geometry and intensity of hydrothermal activity throughout the system; our preliminary study of the Eiffel Tower, White Castle and Mt Segur indicate that activity has been sustained in recent times, with small changes in the detailed geometry of the diffuse outflow and its intensity. At longer times scales (hundreds to 1000 years?) imagery also shows evidence of areas of venting that are no longer active, often associated with the active structures. In combination with the high-resolution bathymetry, the imagery data thus allow us to characterize the shallow structure of hydrothermal outflow at depth, the structural and volcanic control, and ultimately quantify the heat flux associates with this hydrothermal outflow. Image mosaics are also key for the installation of instrumentation required by temporal studies, and for the infrastructure of the ESONET pilot seafloor observatory. This type of survey techniques and studies can also be extended to other areas of interest, such as hydrothermal fields, cold seeps, etc.