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VentDB: Integrative data management for seafloor hydrothermal spring geochemistry

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Integrative data management is a critical and effective tool to support inter-disciplinary approaches in research that are necessary to understand the complex interaction of diverse processes such as the ones occurring in deep-sea hydrothermal vent environments. The study of these environments builds on a range of different data types including geological information about vent fields, chemical data for vent fluids, basement, and precipitated sediments, and information about observed biological species. These data types not only need to be easily accessible to the research community, but linked in a way that they can be analyzed and visualized as an integrated data set.

One of the data types relevant to the study of deep-sea chemosynthetic environments is the chemistry of the more than 280 active hydrothermal vent fields found on the seafloor, in all the major oceans of the world (Baker and German, 2004). Chemical data on seafloor hydrothermal springs have provided great insight into the processes that drive hydrothermal venting and its role in crustal formation, seafloor processes, seawater chemistry, and global geochemical cycles. Several reviews of seafloor hot springs, including their chemistry, the processes that control it, and the impact of venting on geochemical fluxes have been written over the past decade. In spite of this high level of interest and significance, no widely available database of seafloor hot spring chemistry and characteristics has been compiled to date.

We convened two mini-workshops in Fall 2005, one at the Ridge2000 meeting in Vancouver and one at the Fall AGU meeting in San Francisco, to discuss the design and construction of a database for seafloor hydrothermal spring chemistry. An international audience of more than 35 researchers readily agreed on the value of such database, and provided recommendations for its scope and functionality. Based

on these recommendation, we have designed a development plan for the VentDB database: VentDB will be a fully integrated system similar to the PetDB database for igneous rock geochemistry or SedDB for sediment geochemistry that allows to integrate hot spring chemistry with a variety of other datasets. The database will accommodate results of in-situ and time-series analyses as well as those from more conventional discrete samples and will include major, minor, and trace species, gases, and isotopes, along with relevant physical parameters such as temperature and water depth. Both raw data and zero-Mg end-member compositions will be stored together with appropriate data quality measures for analytical measurements and zero-Mg end-member calculations. The system will comprise data for hot and warm springs along mid-ocean ridge and back-arc spreading axes, well springs on arc and hot-spot volcanoes, off-axis and ridge-flank springs, and springs in forearcs, such as those on the Mariana serpentinite mud volcanoes and offshore Central America. Data on gas-hydrate seeps and submarine springs on continental margins will be accommodated as well.

VentDB will be intimately linked with the Ridge2000 and MARGINS Data Management Systems (www.marine-geo.org), PetDB (Petrological Database for the Ocean Floor, www.petdb.org), SedDB (Data Management System for Marine Sediment Geochemistry, www.seddb.org), and the Alvin/Jason Frame-grabber (online access to Alvin's video imagery, www.whoi.edu/marops/vehicles/alvin/) to ensure integration of the geochemical data sets for seafloor hydrothermal springs with as many data types as possible that are critical for the study of these environments.