InterRidge Global Database of Active Submarine Hydrothermal Vent Fields
(the "InterRidge Vents Database")

Version 2.0,
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1. Introduction

1.1 Purpose of the database

The purpose of the InterRidge Global Database of Active Submarine Hydrothermal Vent Fields, hereafter referred to as the "InterRidge Vents Database," is to provide a comprehensive list of active and inferred active (unconfirmed) submarine hydrothermal vent fields for use in academic research and education. As stated by the InterRidge Working Group on Global Distribution of Hydrothermal Activity (InterRidge News 9.1, April 2000): "The idea of this data-base is that it should become the international standard for all known sites of submarine hydrothermal activity which can be updated simply by submitting an electronic message to the InterRidge Office." Hydrothermal activity is categorized as active, unconfirmed, or inactive, and the year and means of confirmation at the sea floor is referenced for each vent field. The database includes a vocabulary of vent field names and information that may be useful in mapping, including position (latitude, longitude), depth, region, tectonic setting category, national jurisdiction, and ocean. Additional information in the database includes names of individual vent sites within vent fields, spreading rate for those vent fields at spreading centers, maximum temperature or temperature category (high or low) for active vent fields, and notes on site description, deposit type, host rock, and biology for some of the vent fields.

1.2 Background and history of the database

The original motivation for the InterRidge Vents Database came from the Working Group (WG) on Global Distribution of Hydrothermal Activity, active from 1997-2002. As quoted from the 2006 online version of the InterRidge Vents Database (hereafter referred to as "Version 1"), "This database was established in order to centralise information of confirmed and 'suspected' hydrothermal vent sites. The location and geological/biological characteristics of the sites are provided where available. This database was established in 1999. It was largely compiled by Mark Hannington." Hannington's compilation derived from a database on the worldwide distribution of seafloor polymetallic sulfide deposits produced for the Geological Survey of Canada in 1994 with a supplement for shallow hydrothermal systems in 1999 (Hannington et al. 2002).

Version 1 was posted online by the InterRidge Japan office (2000-2003) and transferred to the Germany office (2004-2006). Individual HTML files for each vent field were organized and displayed by DBMan (Database Manager that provides a web interface to add, remove, modify or view records in a flatfile ascii database). During these several years, modifications to the vent field listings were performed by the InterRidge Coordinators.

In parallel, during the decade 2000-2009, Hannington updated and enhanced the database for seafloor hydrothermal deposits, published in 2002 for the Central Data Repository of the International Seabed Authority (ISA) as the "Global Database of Seafloor Hydrothermal Systems, including the Digital Database of Geochemical Analyses of Seafloor Polymetallic Sulfides, Version 1.0" (hereafter referred to as the "ISA Database"). The ISA Database was revised in 2004 (Hannington et al. 2004), and the latest revision in 2009 will be posted online in 2010. Also in parallel, Edward Baker of the U.S. NOAA Vents Program, a member of the InterRidge WG on Global Distribution of Hydrothermal Activity, continued throughout the decade to update a list of locations at which hydrothermal plumes were detected in systematic, water-column surveys for hydrothermal activity.

The following is a description of the history of updates and modifications to the InterRidge Vents Database from Sep. 2007 to March 2010:

In 2007 Version 1 was exported from a copy of the 2006 InterRidge website into a CSV file which could be manipulated in EXCEL.

For the revision to Version 2.0, Beaulieu merged 4 spreadsheets of global vent fields:

1) the Version 1 spreadsheet (212 listings),
2) a spreadsheet from Ed Baker and available at NOAA Vents Program website (version 19 Aug. 2009),
3) a spreadsheet from Mark Hannington (version 11 Aug. 2009, in preparation for revision of ISA Database), and
4) a spreadsheet from Sven Petersen (version 30 Sep. 2009), in particular for vent field maximum temperature and host rock.

For the spreadsheets from Hannington and Petersen, we were selective for the vent fields that were listed as, or potentially, active and excluded listings for inactive deposits.

After the merger of the 4 spreadsheets (which resulted in 462 listings), an additional 92 vent fields were added from the primary literature and from cruise reports and press releases for the most recent discoveries through the end of 2009. Additional global and regional compilations were also consulted (see selected references section).

In general, the vent fields listed in the InterRidge Vents Database may be considered a subset of those listed in the ISA Database; however, some of the active and unconfirmed listings in Version 2.0, 5 March 2010, have yet to be incorporated into the ISA Database. The InterRidge Vents Database differs from the ISA Database in several ways. The ISA Database categorizes deposit type and includes geochemical data for hydrothermal deposits (including inactive deposits). The InterRidge Vents Database is tailored towards the discovery of active vent fields (year and means of confirmation) and provides a vocabulary that includes name aliases and the names of individual vent sites within each field.

1.3 What's new in Version 2.0
First, Version 2.0 has more than double the number of vent field listings (554 in the 5 March 2010 release) vs. Version 1 (212). Version 2.0 is comprehensive for active and inferred active (unconfirmed) submarine hydrothermal vent fields discovered through the end of 2009. The InterRidge Vents Database will grow as new listings are added by the InterRidge Coordinators. The full database is uploaded into a Drupal 6 Content Management System. Taxonomy terms with controlled vocabulary were introduced for Activity, Tectonic Setting, Region, Ocean, National Jurisdiction, and Maximum Temperature Category. Each unique Vent Field Name ID is matched to a hierarchical vocabulary Feature ID for the same vent field in the in the Marine Geoscience Data System (MGDS). The full list of vent fields can be exported as a comma-separated-value (CSV) file.

2. Database contents
2.1 Drupal 6 Online Database
Each entry ("node") in the Drupal 6 database contains the following ("fields" in the database, "columns" in the exported CSV file):

Name of vent field
  The Name ID uniquely identifies a vent field. This Name ID is associated with controlled vocabularies (http://www.marine-geo.org/tools/web_services.php) for Feature_ID VentField in

MGDS. We distinguish vent field (assemblage of vent sites) from vent site (e.g., Tica vent at EPR, 9 50'N vent field). In order to distinguish vent fields in proximity to each other (e.g., on same ridge segment), we relied on the published literature with objective criteria when possible (such as 4th-order ridge segments); otherwise the determination is subjective and generally based on distance between fields (e.g., greater than several km), depth, and local geological setting.

Feature ID in MGDS
The Name ID is associated with controlled vocabularies for Feature_ID VentField in MGDS (http://www.marine-geo.org/tools/web_services.php).

Name alias(es) for vent field
Other Names used in the literature for the same vent field.

Name(s) of individual vent sites
Names of individual vent sites contained within the vent field. Aliases for vent site names are given in parentheses with an equals sign, such as "Solwara 4e (= Fenway)." These are associated with controlled vocabularies for Feature_ID Vent in MGDS.

Activity
Hydrothermal activity is categorized as: Active, Unconfirmed, or Inactive. We consider the activity confirmed when indicated by visual observations at the sea floor (i.e., ground-truthing) that may or may not also include temperature measurements.

Maximum Temperature
Maximum Temperature Category (High or Low)
Maximum temperature (deg. C) is provided for active vent fields; the "cell" is blank if unconfirmed and "NotApplicable" if inactive. For those active vent fields in which a maximum temperature is NotProvided, a category is assigned as High if chimneys and/or black smokers were observed or Low if only diffuse venting was observed. Again, the "cell" is blank if unconfirmed and "NotApplicable" if inactive.

Latitude
Longitude
Positions are provided in decimal degrees to four decimal places. Negative values for latitude are degrees S, and negative values for longitude are degrees W.

Ocean
The 8 ocean categories conform with the InterRidge Cruise Database: Arctic, Indian, Mediterranean, N. Atlantic, N. Pacific, S. Atlantic, S. Pacific, Southern. Following the standards of the International Hydrographic Organization, the Arctic Ocean includes the mid-ocean ridge north of Iceland, and the Southern Ocean is defined as south of latitude 60 S.

Region
Region generally indicates the regional setting of the vent field along the world plate boundaries. Exceptions include vent fields at intra-plate volcanoes and coastal faults. Region categories are updated from Version 1. Most of the Regions conform to the "LocArea" in the ISA Database. The Region tends to form part of the hierarchical vocabulary for each vent field Name Feature_ID VentField in MGDS.

National Jurisdiction
National Jurisdiction was determined by querying the VLIZ Maritime Boundaries Geodatabase, ver. 5, Oct. 2009, using the latitude and longitude for each vent field.

Maximum or Single Reported Depth
Minimum Depth
  Depth (m below sea level) is given for hydrothermal activity and/or deposits. Either a range
  (deepest-shallowest) or single reported depth is provided.

Tectonic Setting Category
  Each vent field was assigned to 1 of 5 tectonic setting categories: arc volcano, back-arc
  spreading center, intra-plate volcano, mid-ocean ridge, or other.

Full Spreading Rate
  For each vent field categorized as mid-ocean ridge or back-arc spreading center, the full
  spreading rate velocity (mm/a) was derived from Bird (2003), accessed via GeoMapApp.

Host Rock
  Host rock is from a spreadsheet provided by S. Petersen in 2009, otherwise categorized as
  basalt-hosted, sediment-hosted, ultramafic-hosted, or NotProvided. This "column" was not
  vetted for Version 2.0.

Deposit Type
  Deposit type is listed from Version 1 or from a spreadsheet provided by M. Hannington in
  2009, otherwise NotProvided. Abbreviations include: polymetallic massive sulfide deposits
  (PMS), low-temperature hydrothermal vents and associated mineral deposits (LTH), near-field
  metalliferous sediments (NFS), distal metalliferous sediments (DIS), and vein and breccia
  deposits (VSD). This "column" was not vetted for Version 2.0.

Notes on Vent Field description
  Notes describing the vent field are generally quoted directly from the literature. However,
  some of the site descriptions remain from Version 1 and may be similar to the "Description" in
  the ISA Database. This "column" in the database also contains notes relevant to other
  "columns," for example, indicating that the vent field location or depth is approximate, or
  providing more information on the regional or tectonic setting.

Notes relevant to biology
  Notes on biology are generally quoted directly from the literature. However, some of these
  notes remain from Version 1.

Year and how discovered
  For the year and means by which discovered, visual confirmation at the sea floor is listed first,
  unless otherwise noted. Other information related to the discovery is listed in chronological
  order.

References for discovery
Other citations
  References in brackets "[ ]" were not consulted in full by the InterRidge Coordinator in 2009
  (Beaulieu).

2.2 Static KML file for Version 2.0, 5 March 2010
A subset of the database columns for all vent fields is provided as a static KML file with release
date 5 March 2010. The spreadsheet from which the KML file was produced is available through
GeoMapApp > Datasets > Oceanic Hydrothermal Vents > Global Vent Distribution - InterRidge.
The full database Version 2.0, release date 5 March 2010, is also available as an EXCEL

spreadsheet upon request to InterRidge. The static files are comprehensive through the end of 2009 and have the following number of listings:
229 active (107 MOR, 62 arc, 49 back-arc, 5 intra-plate, 6 other), 273 unconfirmed (156 MOR, 58 arc, 59 back-arc), 52 inactive (37 MOR, 6 arc, 8 back-arc, 1 intra-plate).

3. Related databases for more information

International Seabed Authority (ISA) Central Data Repository (http://www.isa.org.jm/en/home)
  "The Central Data Repository (CDR) holds centralized data of public and private information on marine mineral resources acquired from various institutions worldwide. The Authority uses this data to standardize and evaluate data for quantitative mineral assessments." The ISA Database mentioned in this documentation can be accessed via the "Sulphides and Vents database" tab.

MGDS (http://www.marine-geo.org/)
  Marine Geoscience Data System (MGDS) at Lamont-Doherty Earth Observatory of Columbia University (USA) provides access to data portals for the NSF-supported Ridge 2000 and MARGINS programs. GeoMapApp is a standalone data visualization and analysis tool developed by the MGDS.

Ridge2000 Data Portal (http://www.marine-geo.org/portals/ridge2000/)
  (hosted by MGDS)

NDSF Data Portal (http://www.marine-geo.org/portals/ndsf/)
  (hosted by MGDS)

PetDB (http://www.petdb.org/)
  PetDB is a scientific information system that maintains a geochemical data collection of ocean floor igneous and metamorphic rocks. PetDB utilizes the MGDS Feature ID vocabulary and has sample locations in GeoMapApp.

VentDB (http://www.ventdb.org/)
  "VentDB is an effort funded by the US National Science Foundation to build and operate a data management system for hydrothermal spring geochemistry that will host and serve the full range of compositional data acquired on seafloor hydrothermal vents from all tectonic settings." VentDB is being developed in 2010 and will utilize the MGDS Feature ID vocabulary and have sample locations in GeoMapApp.

Global Volcanism Program (http://www.volcano.si.edu/world/)
  Many of the arc and intra-plate volcanoes in the InterRidge Vents Database have been assigned an I.D. by the Global Volcanism Program.

Alvin Dive Log & Metadata (http://www.whoi.edu/page.do?pid=10735)
  The InterRidge Vents Database provides dive numbers for some of the vent fields discovered by the submersible Alvin.

Global Oceanographic Data Center (GODAC) Portal (http://www.godac.jp/)
  Databases for imagery, biological and rock samples collected with Japanese research submersibles, and access to JAMSTEC cruise reports.

ChEssBase (http://www.noc.soton.ac.uk/chess/database/db_search.php)
  "The aim of ChEssBase is to provide taxonomical, biological, ecological and distributional data of all species described from deep-water chemosynthetic ecosystems, as well as bibliography and information on the habitats." Listings in ChEssBase are also available at the Ocean Biogeographic Information System (http://www.iobis.org).

4. Acknowledgements

5. Selected references

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