



MetaFunctions/ Genomes Mapserver

A stand-alone GIS application, providing powerful and easy access to metagenomic and environmental information, used for analyses and regularly updated.



Background

The METAFUNCTIONS project, coordinated by the Max Planck Institute for Marine Microbiology, Bremen (Germany) began in October 2005. This project combines expertise in bioinformatics, computer science, geographical information systems (GIS) and marine sciences to develop a data-mining system that correlates genetic patterns in genomes and metagenomes with contextual environmental data.

The project reinforces the leading position of Europe in the emerging area of using metagenomics for marine and microbial environmental research, including aquatic biodiversity aspects. The highly ambitious and challenging overall objective of *MetaFunctions* is to correlate possible functions to genes obtained from genome and metagenome projects which lack functional assignments

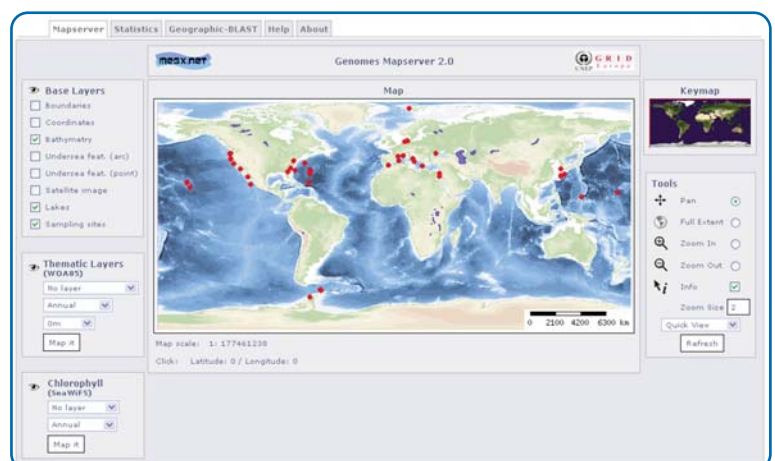
(hypothetical genes). This is being done based on an innovative trans-disciplinary combination of marine sciences & biogeochemistry, GIS, microbial ecology, genome analysis and computer science/bioinformatics. The MetaFunctions project requires an innovative, trans-disciplinary partnership between four entities.

GRID-Europe was responsible for the development of the "Genomes Mapserver", the Internet-based GIS application to retrieve information from the "environmental/genomic" database.

Genomes Mapserver

The Genomes Mapserver is a platform-independent application, developed in an open source environment, and based on a modular approach: modules are a response to the needs of the other partners and allow further evolutionary developments, following the evolution of the technology. Several specialized modules were created and added during the phase of "Genomes Mapserver" development.

The database core is split in two components: a genome/sequence layer and a GIS layer. The GIS layer itself is composed of selected "key" environmental data layers, processed by GRID-Europe. Key environmental data layers constitute the strata representing major substantial environmental variables mainly for aquatic ecosystems comprising physical, chemical, geological and biological parameters (e.g. ocean water temperature and salinity, concentration of pollutants/nutrients, and organic matter, etc.). They constitute a base for data visualization and analysis in the "Genomes Mapserver". "



<http://metafunctions.grid.unep.ch/mapserver>

The version 2.0 of the "Metagenome Map Server" was released on 1 March 2007. It includes worldwide marine chemical and physical parameters data. At the moment, the WOA (World Ocean Atlas) and WOD (World Ocean Database) dataset are available, as well as Chlorophyll remote sensing data from the SeaWiFS sensor.

MetaFunctions Partners

- > Max Planck Institute for Marine Microbiology (MPI, lead party)
- > Institute of Computing Science, Poznan University of Technology (PUT)
- > Technology Transfer Centre, Bremerhaven, Bremerhaven Institute for Biological Information Systems (TTZ)

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Upcoming Activities

The last two phases of the project include:

> **phase 5:** Provide access to information from both the genomic and environmental sides through a spatial (GIS) approach based on a map server application: development of the "Metagenomes Mapserver" (Duration 16 months). (Dec 2006 - Mar 2008)

> **phase 6:** Developing plans and strategies for exploitation and dissemination (Duration 1 month). (Mar 2008)

In the long run the proposed "Genomes Mapserver" will evolve into a flexible application with high potential payoff. It will enable the European scientific community to tap into a new mostly unexplored data source. MetaFunctions will have a large impact on European scientific and technological capabilities in marine, aquatic and environmental genomics. It will be possible to create new inter-disciplinary linkages and thus answer questions of ecological, health and biotechnological relevance.

About GRID-Europe

UNEP/DEWA/GRID-Europe is one of UNEP's major centres for data and information management, with a unique, "value-adding" mandate in the handling of global and regional environmental data, which in turn support the environment assessment and early warning activities of UNEP and its partners. Located in the "Maison Internationale de l'Environnement" or "International Environment House" (MIE/IEH) in Geneva, GRID-Europe serves as the unique francophone centre for the global GRID network. DEWA/GRID-Europe is supported by a "Partnership Agreement" between UNEP, the Swiss Federal Office for the Environment (FOEN) and the University of Geneva.