Paleoclimate Database

Meet the needs of visualization

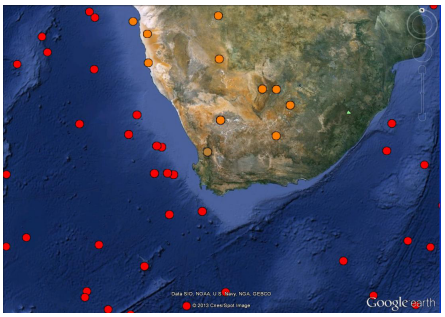
C. Gmuender[1], L. Jonkers[2]

[1] Simultec AG, Zurich, Switzerland
[2] Institut de Ciència i Tecnologia Ambientals (ICTA), Universitat Autònoma de Barcelona, Spain
now at School of Earth and Ocean Sciences, Cardiff University, Cardiff, Wales, U.K.

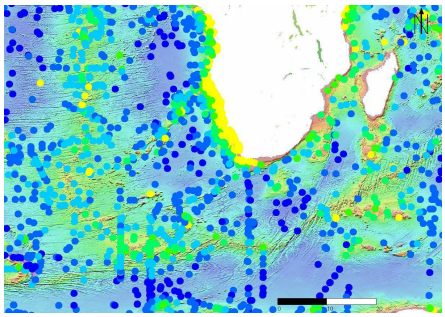
NEEDS

Visualisation

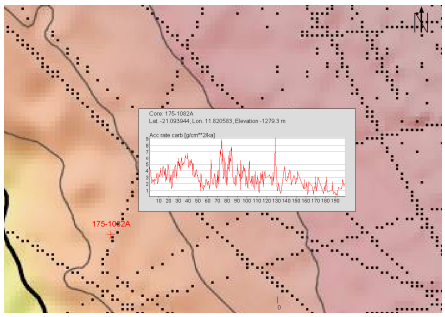
Show the core extraction place in its geographic context



Filter and classify the datasets by common attributes



Show the measurement data on the fly



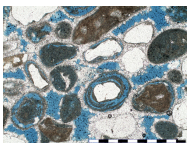
Requirements

Every dataset must be associated to exactly one coordinate pair in space

The number of parameters, units, drilling methods, etc. must be of a countable number

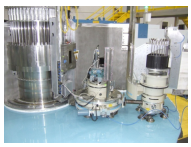
The measurement data must be stored in a structured way

DATABASE



Why a new database ?

The elaboration of paleoclimate datasets is very time and cost consuming. It is therefore essential to share such valuable data among scientists. Besides scientific publications, web-based databases play an important role in data sharing[1]. The two largest web databases, PANGAEA (http://www.pangaea.de) and the US National Climatic Data Centre (http://www.ncdc.noaa.gov/paleoclimate-data), store only the general information about a dataset in the database while the measurement data is stored separately in data files. To evaluate the relevance of a dataset for his task, a scientist has to find candidate datasets, download their measurement files and visualize the data in a spreadsheet application. This is far away from the optimum.



Cluster
ClusterId
Name
Description

Profile
ProfileId
ClusterId
Name
Description
MethodId
SubMethodId
Instrument
DataSetId
PrimarySourceId
UploadDate
UnitId
DistanceUnitId
ErrorUnitId
ParameterId
PrimaryAuthorId
Unpublished
OwnerId
ReadGroupId

Sample
ProfileId
Distance
SampleValue
SampleError
Note

Method
MethodId
Name
Description

IsSubOf
MethodId
SubMethodId

SubMethod
SubMethodId
Name

DataSet
DatasetId
ClusterId
Name
Lat
Lon
Zco
Length
Project
DataTypeId
SampleMethodId
Description
KeyWords
SampleDate
UploadDate
PrimaryAuthorId
Unpublished
OwnerId
ReadGroupId
WriteGroupId

Parameter
ParameterId
Name
ShortName
DefaultUnitId

DataType
DataTypeId
Name

IsMethodOf
DataTypeId
SampleMethodId

SampleMethod
SampleMethodId
Name
Description

AgeModel
AgeModelId
DataSetId
Name
Description
AgeUnitId
DepthUnitId
ErrorUnitId

AgeValue
AgeModelId
Depth
Age
AgeError

Unit
UnitId
Name
ShortName
UnitTypeId

UnitType
UnitTypeId
Name

UserGroup
GroupId
Name
GroupType

Pub
DataSetId
SourceId

Source
SourceId
Title
Citation
Abstract
Contact
PublicationYear
Journal
Pages
Doi

AutorShip
AuthorId
SourceId

Author
AuthorId
Name
Contact

GateUser
UserId
UserName
Organisation
FirstName
LastName
Email

Membership
UserId
GroupId

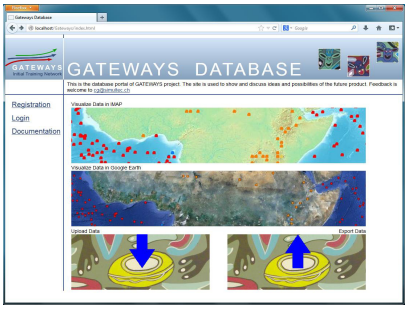
Simultec AG, Hardturmstrasse 261, 8005 Zürich, http://www.simultec.ch, info@simultec.ch

Paleoclimate Database

Meet the needs of visualization

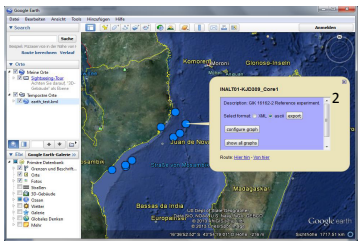
VISUALISATION AND EXPORT

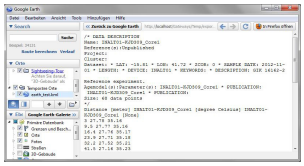
For map visualization, two techniques have been used. A simple visualization can be done by showing the datasets in Google Earth. A more complex visualization tool was implemented in Java language. The Java application is a simple GIS tool that allows for filtering and classifying the data sets. Different background maps can be displayed. Data sets can be visualized in x-y-graphs in both solutions. The added value of such a visualization tool is enormous, because it allows for instant data access and comparison.

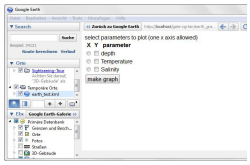


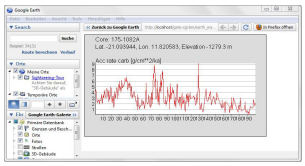
GATEWAYS Data Portal

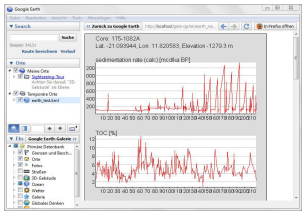
Google Earth Workflow





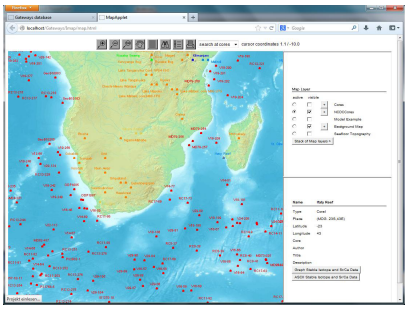




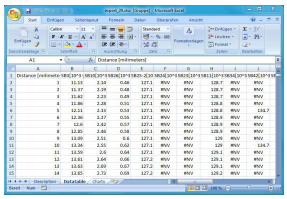


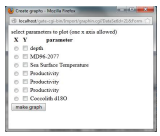
1 Choose dataset from geographical location
2 Select to export (a), configure graph (b) or show all graphs (c)
3a Export is shown in Google Earth window (save via browser)
3b Select parameters to draw in x and y – axis
4b Graph is shown in Google Eart window
3c All profiles are drawn versus depth

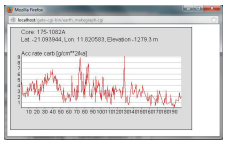
Mapico Workflow



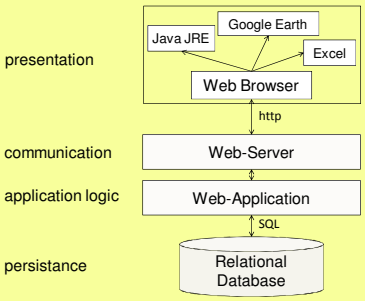
1 Find dataset by filtering, database search or on map
2 Select to export (a), configure graph (b)
3a Export opens in the application suited for the type of export (Excel for xlsx, XML-Editor for xml, Editor for ASCII)
3b Select parameters to draw in x and y – axis
4b Graph opens in a new browser popup







Application Architecture



XML Data Exchange Format

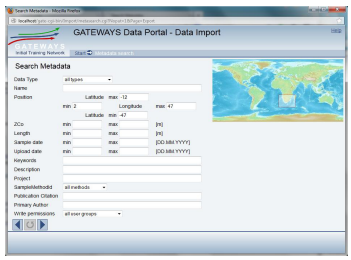
An XML format for Paleoclimate Data:

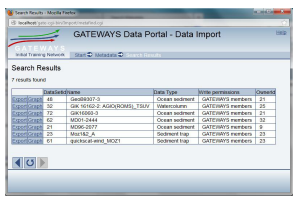
Advantages:
- Strictly defined (XML schema)
- Format validation at writing time
- Machine readable (XML parser)
- Extensible (parser skips unknown tags)

Disadvantages:
- Larger than just pure data
- Rather complex to read

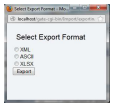
→Can be used for data exchange between different databases and software modules

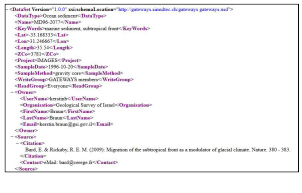
Text based Workflow

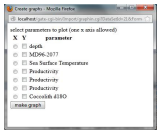


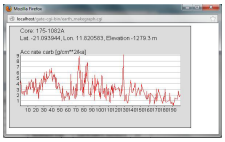


1 Perform database search by prescribing attributes
2 Select dataset from results, select export (a) or graph (b)
3a Select export format (XML, ASCII, XLSX available)
4a Save export file to disk or view it in browser (5a)
3b Select parameters to draw in x and y – axis
4b View graph or save it to disk









References:
Anderson, D. M., Bauer, B. A., Buckner, C. R., Gille, E., Gross, W. S., Hartman, M., Morrill, C., Shah, A. M., and Wahl, E. R., 2011. Web 2.0 Collaborations Address Uncertainty in Climate Reconstructions of the Past Millennium. Earth Science Informatics.4(4), pages 161-167, DOI: 10.1007/s12145-011-0086-3.

The work described in this poster has received funding from the European Community's Seventh Framework Programme FP7/2007-2013 – Marie-Curie ITN, under grant agreement n° 238512, GATEWAYS project.

Simultec AG, Hardturmstrasse 261, 8005 Zürich, http://www.simultec.ch, info@simultec.ch