



Project of Strategic Interest NEXTDATA

Scientific Report for the reference period **01/01/2012-31/12/2012**

WP 2.3 - Archive of data from non-polar ice cores and long-term biological data (Resp. Mattia De Amicis, Un. Milan Bicocca)

Partners: UNIMIB, URT Ev-K2-CNR

1. Scheduled activities, expected results and Milestones

As reported in the Executive Plan, the activities of the first year include the construction of a central repository of potentially drillable glaciers, the census of the glaciers, to be performed using mainly satellite images, and the data transfer to a geographic information systems. A Geodatabase of the glacial areas of the main mountain ranges (Himalayas, Andes, Alps, etc..) was planned to be built primarily using satellite and aerial imagery at various resolutions. The analysis of all the parameters that lead to the choice of the potentially drillable glacial areas is supported by the use of a "Decision Support System" (DSS). The activities of the first years also include an analysis of several glaciological, international research, political and logistical aspects and the compilation of a priority list of perforations, on the basis of the "scientific questions" raised by the international scientific community during the research meetings, when the strategies for the measurements are discussed. A census of the biological long life data (plant seed bank) of interest for the project was also planned for the first year as well as the identification of two dedicated sites, one for the construction of a physical archive of ice cores, ice measurements and sampling and the other one for the conservation of long term biological data.

Milestones:

M2.3.1 (PM12): Completion of the data and metadata glacier archive.

M2.3.2 (PM12): Startup of the construction of the physical archive of ice and biological data.

2. Deliverables expected for the reference period

D2.3.1 (PM12): Database of mountain glaciers suitable for ice core drilling.

3. Activities, which have been actually conducted during the reference period

3.1 Research activities

During the first project year a thoroughly research work has been carried out, aimed at identifying the existing archives and reviewing the scientific literature concerning ice cores drilled in non-polar glaciers. After having performed a careful evaluation of the available repository archives, we have downloaded and analysed the data stored in the World Glacier Monitoring Service (WGMS) archive and evaluated their information content. The WGMS data have been subdivided according to the geographic position of the glaciers and to the kind of analyses performed on the ice cores. At the same time, an archive of ice core data available at DISAT (Environmental Sciences Department at UNIMIB) and from other data from the literature has been created. Such data will be stored, during the second project year, in the same database as the aforementioned (WGMS) data. In the second part of the first year, the implementation plan for the construction of the ice cores database has started, taking into account the requirements of the other project WPs which are interconnected with this WP. Three project WPs, in fact, will share the same database for the storage of drill core data; during the first year, a series of meetings took place to discuss the best way to implement the common database and optimize the final end users data access. For this, the DISAT-UNIMIB database will be developed in three modules dedicated, respectively, to the glaciers archive, the ice drilling and the core analysis.

In the meanwhile, the GLIMS (Global Land Ice Measurements from Space) free database has been used to acquire the geometrical data of the drilled glaciers, to be stored into a cartographic GeoDatabase. The latter is intended to become the main cartographic visualization tool for the project, accessible through the DISAT UNIMIB cartographic portal using the Open Geospatial Consortium (OGC) services.

A survey of the current satellite imagery from ASTER (Advanced Spaceborne Thermal Emission and Reflection Radiometer), LANDSAT TM and Landsat Enhanced Thematic Mapper Plus, and of aerial photographs of some focus areas (e.g., the Himalayas and the Alps), is also being performed, to map the world glacier cover and to make future studies of the potentially drillable glaciers.

In the framework of WP 2.3, the procedure for the implementation of the archives for the conservation of genetic information contained in high-altitude plant seeds (e.g. Rhododendri, Medicinal and Aromatic Plants), often in danger of extinction, is ongoing.

This activity will also permit to verify, through comparison with the data that will be collected in the future, the effects of climate and environmental changes on plant communities and their biodiversity. In this context, thee germinators have been purchased and installed at Lombardy Seed-Bank – University of Pavia in order to study the effects that environmental changes have on seed germination.

3.2 Applications; technological and computational aspects

The research activities will lead to the creation of a database that will be made available to the users via the Internet portal.

3.3 Formation

Three PhD contracts has been activated; Starting date 1 January 2013.

3.4 Dissemination

Dissemination activities have not been carried out during the first year.

3.5 Participation in conferences, workshops, meetings

Staff members of W.P 2.3 have attended three internal meetings on the design of the core database.

4. Results obtained during the reference period

4.1 Specific results (Data libraries, Measurements, Numerical simulations, etc)

A “conceptual model” for the database has been implemented, to be subsequently published online.

4.2 Publications

None in the first year.

4.3 Availability of data and model outputs (format, type of library, etc)

Preliminary database of the drill ice core derived from the World Glacier Monitoring Service.

4.4 Completed deliverables

Preparation of the database of glacier suitable for ice core drilling.

5. Comment on differences between expected activities/results/deliverables and those which have been actually performed.

Some of the activities planned for the first year have been postponed to the second year, because the agreement between CNR and UNIMIB was signed only in September 2012.

6. Expected activities for the following reference period

In the second year, the survey and collection of information on drill ice core in non-polar glaciers will continue and, after the complete installation of WDB database on the DISAT server, the data and metadata on ice cores will be included in the GeoNetwork portal.

The cartographic Geodatabase of world glaciers, linked by means of the GLIMS project to the archive containing information on already drilled glaciers, will be set up. At the same time, we will proceed with the collection of the available satellite data (images, DTM, etc.) for the

analysis of Alpine and Himalayan glaciers. These data will be included in the GeoDataBase and will be also used in the future works contributing to the creation of a Decision Support System (DSS) for the identification of drillable glaciers. In particular, we will process and analyse the satellite images from ASTER (Advanced Spaceborne Thermal Emission and Reflection Radiometer) and from LANDSAT TM and Landsat Enhanced Thematic Mapper (already used in the recent past to generate the GLIMS database), and the surface temperature and albedo data from multi-temporal MODIS images.

Digital terrain models will be used to estimate glacier topography; we are evaluating the possibility to use national models to this end. Digital terrain data from SRTM (Shuttle Radar Topography Mission) will be also archived, providing a global homogenous information with 30 m spatial resolution. The topographic data will be used to infer a set of primary attributes related to the slope and shape of the glacier slopes, size and aspect, relief energy and convexity/concavity; these parameters will be integrated with those derived from satellite imagery to obtain information on glacier drillability.

During the second year, we will look for a site suitable for the storage of ice cores and biological data; we will also identify the laboratories where the analyses on collected samples will be conducted. A feasibility study will be also carried out for the creation of a Museum of Ice and Paleoclimatic Research on mountains.