



Project of strategic interest NEXTDATA

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

Unit: URT Ev-K2-CNR

The CNR institution of research for Third Parties, thanks to the competences matured during the years in the framework of the research activities carried out in high-altitude areas, the management of experimental facilities in extreme environments, the running of and participation in international measurement programmes, is involved in all the WPs included in NextData project.

In particular, in the reference period URT Ev-K2-CNR played an active role in the following WPs: 1.1, 1.2, 1.4, 2.1, 2.6.

WP 1.1 - High-altitude climate observation system

1. Expected activity and results

Within the WP1.1, the in-situ measurement activities on the mountain regions considered by Project (Alps, Italian Apennines, HKKH, Rwenzori, Andes) will be prosecuted, also favoring the technical and scientific implantation of the measurement programmes already activated. Moreover, we carried out feasibility studies concerning the installation of new infrastructures for the execution of climate and environmental monitoring, i.e. within the Mediterranean basin. We carried out a survey to define the current status of technologies for the implementation of transportable systems suitable to be utilized in regions where the installation of standard measurement stations is impossible, unfeasible or unaffordable. During the first year of the project, we will be in touch with the national and international scientific community for discussing the scientific questions that will gain advantage from the execution of measurement activities in mountain areas. In particular, thanks to the interaction with the scientific community, the data of interest (including measurements of meteorology, air quality, hydrological cycle and biodiversity) will be identified. Moreover, suitable strategies will be defined according to European and International initiatives, e.g.

UNEP, GMES, GEO/GEOSS, SHARE, GIIDA – CNR, ICOS and ACTRIS. Finally, contacts will be developed with companies and/or industries to define applicative needs.

Milestones:

M1 (PM8): “Scientific questions” definition.

M2 (PM12): Results of first year measurements, feasibility studies for new infrastructures and survey about the technology for transportable and energetically autonomous measurement systems.

2. Deliverables for the reporting period

D1.1.1 (PM8): Report about the “scientific questions”.

D1.1.2 (PM12): Report describing the activities, data transfer to archives and to the General Portal.

D1.1.3 (PM12): Report about the technology for transportable and energetically autonomous measurement systems.

3. Activities of the reporting period

URT Ev-K2-CNR was in charge of the station managing and the data handle for the existing SHARE stations. In particular, the methodologies and the guidelines for the validation of meteorological data have been defined.

In order to guarantee the collection of high quality data in continuous and quick interventions on the monitoring stations in case of malfunctioning, URT Ev-K2-CNR acquires compatible spare sensors for the supplying of the whole network.

URT Ev-K2-CNR worked on the definition of the “scientific questions” (deliverable D1.1.1). During the reference period, URT Ev-K2-CNR and ISAC-BO were in touch with some of the major Project/Programmes concerning the investigation of atmospheric composition and the environment in mountain areas (ACTRIS, UNEP-ABC, WMO-GAW, GEO, ILTER).

Activities carried out in Himalayan areas are focused mainly in ***Nepal***, at the International Pyramid Laboratory-Observatory, installed by Ev-K2-CNR in 1990, at 5.050 m asl in Sagarmatha National Park, in collaboration with the Nepal Academy of Science and Technology. This structure represents a strategic logistic base for supporting monitoring activities carried out along Khumbu Valley, in the region of Mt. Everest, where a network of meteo-climate monitoring stations and the GAW-WMO Nepal Climate Observatory Pyramid are installed. Data collected through this programme are extremely important for NextData (WP 1.1 and WP 1.2). These observation sites need daily checks, furthermore periodical technical interventions concerning also management of transmission systems of data regularly recorded, in Italy.

The Laboratory, that is able to host till 20 persons, is used as scientific/operative base for researchers and technicians involved in research activities and pilot projects carried out in Sagarmatha National Park region. During the reference period, about 80 researchers and technicians involved in several international projects has been hosted.

Moreover, the Pyramid is able by its satellite communication systems, to transmit in real time data collected by the stations. These data will be gathered in the archive of monitoring network of SHARE (WP 2.1) and then transfer to General Portal (WP 2.6).

Environmental conditions at above 5.000 m a.s.l, in the remote valley of Khumbu, need a regular supervision, a careful maintenance and periodical improvement in order to guarantee a right working of this structure as unique resource for international scientific community. The management of the Pyramid Laboratory-Observatory is entrusted to URT Ev-K2-CNR. It makes use of a Nepalese technicians on field, actually composed by eight people, that daily manage the structure and all the monitoring stations. The staff's duty is to identify possible anomalies of instruments, in order to permit timely interventions of restoration, that often are followed by remote intervention from Italian technicians, thank to the use of technology for remote check. This operation has a fundamental importance in order to reply to engagements taken with national and international entities (UNEP, WMO, NASA, ecc) supplying them continuous and high level data.

Periodically courses on site and in Italy are organized for the local staff, about managements of equipments, data processing and data transmission systems, etc...

During the reference period, we guaranteed the regular operation of the AWSs along the Khumbu Valley, thanks to the interventions of the local technical staff which worked in close collaboration with the Italian staff.

Moreover, we prosecuted the calibration and check activities by using a "travelling standard". URT Ev-K2-CNR in close collaboration with ISAC – BO, are in charge for the analysis of the intercomparison results, also actuating the necessary actions to re-establish the correct functioning of AWSs in case of necessity or to improve the AWS functionality. To this aim, we also collaborated with ENEA-UTMEA for defining the correct methodology for check and calibrate the short-wave and long-wave radiation sensors working at the AWSs. At the end of October it has been necessary to perform a technical intervention to restore the AWS at Changri Nup glacier which was fallen down for the presence of strong wind. Technical operations have been carried out by the Pyramid technicians, under the coordination of Gian Pietro Verza. Station supporting pole has been repositioned and together with sensors and datalogger. The filed work was successfully done.

In 2012 the operations of calibration of Pheriche, Kala Patther and Lukla stations have been carried out through the parallel installation of a reference station (AWS QC). URT Ev-K2-CNR personnel has worked in cooperation with ISAC-BO and ENEA for the analysis of the calibration results, in order to guarantee the execution of the needed technical interventions for the optimization of the monitoring systems.

In **Pakistan**, in collaboration with the Pakistan Meteorological Department (PMD), URT Ev-K2-CNR, prosecuted the handling of the AWS network already existing in the Baltoro region: Askole, Urdukas e Concordia.

During summer 2012, URT Ev-K2-CNR performs a field mission to Urdukas AWS. PMD staff notice in fact the absence of the power supply system during the last ordinary check. Battery has been repositioned together with new regulator. Also the memory card was replaced. After the switching on of the system, an error on temperature and pressure data was found. In October the sensors have been replaced.

Within the activities related to the feasibility study for the establishment of a new permanent station to monitor the atmospheric composition under UNEP-ABC program in Pakistan, a monitoring campaign has been carried out from the end of August to the middle of November in Askole village through the portable system Nano-SHARE.

Data analysis is ongoing at ISAC-BO, in order to evaluate the variability of the atmospheric composition in the Baltoro region, but also to test the proper functioning of the portable system. The information provided to URT Ev-K2-CNR will contribute to the 1.1.3 – Technologies for the development of portable and autonomous systems.

In **Uganda**, Automatic Weather Station installed at 4.700 m a.s.l on Rwenzori, has been periodically checked from local technicians, rightly trained for management of equipment. At present this station is not operative due to a few technical problems and in these months we are evaluating its possible replacement.

URT Ev-K2-CNR has planned a field mission for the re-establishment of the station in early spring 2013. The AWS installed in 2006 will be removed and new sensors and datalogger will be reactivated. It will measure: temperature, relative humidity, atmospheric pressure, total precipitation, wind speed and direction, four components radiation and snow level. Data will be recorded in a datalogger and sent to Italy thanks to a remote connection. It is in planning the possible installation of the old station at the entrance of the Rwenzori National Park.

In **Italy**, analysis of data collected by the stations installed on Forni, Dossè and Gigante-Mt. Bianco Glaciers continued and this permit to deep knowledge on Alpine supra glacier micrometeorology. These data permit to quantify energy balance both for Forni Glacier than for Dossè Glacier. Moreover it was possible elaborate modelling of snow accumulation by snow pits, sonic ranger and georadar data.

The download of data collected by glacial stations of SHARE is regularly managed by URT Ev-K2-CNR staff. In June a mission on Forni Glacier was organized and in this occasion a technical intervention was carried out for station restoring.

URT Ev-K2-CNR supported the implementation of the station at Campo Imperatore – Monte Portella (Gran Sasso d'Italia, Abruzzo) by providing the meteorological sensors, the radio-communication system for data download and instrumentation remote control, as well as the sampling heads. From June to October, field missions to AWS Forni have been organized in order to restore the communication system of the station.

It is planned a field mission in summer 2013 for the installation of a new AWS on the top Mt. Bianco (4.810 m asl), in collaboration with ARPA Valle d'Aosta. The station will measure temperature, relative humidity, atmospheric pressure, total precipitation, wind speed and direction, four components radiation and snow level. A dedicated support pole for the positioning of the sensors will be built in order to guarantee the stable setting of the sensors.

3.1 Research activities

3.2 Application, technological, and IT developments

Definition of the algorithms for the implementation of semi-automatic routines for AWS data validation.

3.3 Training

We prosecuted the formation activity of the local staff involved in the managing and maintenance of the AWS in Nepal and Pakistan. The formation activities have been carried out by Italian personnel both in-situ (during the maintenance campaigns) and by remote (during tele-control activities).

3.4 Dissemination and outreach

URT Ev-K2-CNR has participated to the “Festival della Scienza 2012” (Genova) for presenting the monitoring activities in the high mountain regions explored by NextData.

3.5 Conferences

ISCCC – 2012, 2-4 aprile 2012, Manali, India

GEO Work Plan Symposium, 30 marzo – 2 maggio 2012, Ginevra, Svizzera

GEO European Project’s Workshop, 7-8 Maggio 2012, Rome, Italia

Conference on Cryosphere of the Hindu Kush Himalayas: State of the Knowledge, 14 – 16 May, 2012, Kathmandu, Nepal

NASA SERVIR MINX Workshop, 11-13 giugno 2012, Kathmandu, Nepal

Sixth National Conference on Science and Technology – Economic, Growth through Science, Technology and Innovation, 25-27 September 2012. Kathmandu, Nepal

ILTER coordination committee, 13 November 2012, Rome, Italy

GEO Plenary IX, 22-23 November 2012, Foz de Iguaçu, Brazil

American Geophysical Union Fall Meeting, 1-7 December, 2012, San Francisco, USA

4. Results obtained during the reporting period

4.1 Specific results (databases, measurement results, model output, etc)

Data-base of measurements and meteo-climatic variables recorded at the SHARE stations.

4.2 Publications

Bonasoni P., Cristofanelli P., Marinoni A., Vuillermoz E., Adhikary B. Atmospheric Pollution in the Hindu Kush-Himalaya Region Evidence and Implications for the Regional Climate, MOUNTAIN RESEARCH AND DEVELOPMENT, in press (2012).

Congress abstracts:

Adhikary, B., E. Vuillermoz, A. Marinoni, P. Cristofanelli & P. Bonasoni. 2012. Chemical Transport Modeling: a decision support a tool for policy makers for sustainable development planning. Sixth National Conference on Science and Technology – Economic, Growth through Science, Technology and Innovation, Kathmandu, Nepal, 25-27 September 2012.

Bonasoni, P., A. Marinoni, P. Cristofanelli, P. Laj, R. Duchi, E. Vuillermoz, B. Adhikary, T.C. Landi & D. Putero. 2012. High level of pollution transported up to 5000 m a.s.l. in the Southern-Himalayas: continuous observations since 2006 at NCO-P GAW global Station. Sixth National Conference on Science and Technology – Economic, Growth through Science, Technology and Innovation, Kathmandu, Nepal, 25-27 September 2012.

Vuillermoz, E., A. Marinoni, P. Bonasoni , GP. Verza, G. Diolaiuti, A. Senese , C. Smiraglia , D. Bocchiola, A. Soncini & U. Minora. 2012. Studying Himalayan glaciers to understand atmospheric dynamics and ongoing climate variations. Data and findings from the Changri Nup Glacier (Nepal, Himalaya). Sixth National Conference on Science and Technology – Economic, Growth through Science, Technology and Innovation, Kathmandu, Nepal, 25-27 September 2012.

Adhikary, B., E. Vuillermoz, R. Toffolon, P. Cristofanelli, A. Marinoni, R. Duchi & P. Bonasoni. 2012. SHARE Project: climate observations for environmental monitoring in the Himalayas. ISCCC – 2012, Manali, India, 2-4 April 2012

Senese, A., R.S. Azzoni, A. Zerboni, G. Diolaiuti, M. Maugeri & C. Smiraglia. 2012. Proposta di metodologia per lo studio delle relazioni tra albedo e detrito sopragliaciale su un ghiacciaio alpino, il Ghiacciaio dei Forni (Alpi centrali, Lombardia). IV Convegno Nazionale AIGEO, Palermo, Italy, 2-5 October 2012.

Vuillermoz, E., A. Marinoni, P. Bonasoni, GP. Verza, G. Diolaiuti, A. Senese, C. Smiraglia, D. Bocchiola, A. Soncini & U. Minora. 2012. Studying Himalayan glaciers to understand atmospheric dynamics and ongoing climate variations. Data and findings from the Changri Nup Glacier (Nepal, Himalaya). Conference on Cryosphere of the Hindu Kush Himalayas: State of the Knowledge, Kathmandu, Nepal, 14 – 16 May, 2012.

Adhikary, B., P. Bonasoni, P. Cristofanelli, A. Marinoni, R. Duchi, F. Calzolari, T. C. Landi, D. Putero, S. Fuzzi, S. Decesari, E. Vuillermoz, P. Stocchi, G.P. Verza, Sarika Kulkarni, South Asian Aerosols: Observations and regional scale modeling perspectives from the Nepal Himalayas. American Geophysical Union, Fall Meeting, December 1-7, 2012, San Francisco, USA

Cristofanelli, P., R. Duchi, B. Adhikary, P. Bonasoni, M.C. Facchini, F. Fierli, S. Fuzzi, F. Calzolari, S. Decesari, T. C. Landi, P. Laj, A. Marinoni, D. Putero, P. Stocchi, Mineral dust transport at the Nepal Climate Observatory – Pyramid" (27°57' N, 86°48' E, 5079 m a.s.l.). American Geophysical Union, Fall Meeting, December 1-7, 2012, San Francisco, USA.

Facchini MC, L. Giulianelli, C. Carbone, F. Montero-Martinez, S. Gilardoni, M. Rinaldi, A. Marinoni, P. Bonasoni, P. Cristofanelli, Chemical characterization of fine and coarse aerosol in the free troposphere at GAW-WMO station of Mt. Cimone (Italy), American Geophysical Union, Fall Meeting, December 1-7, 2012, San Francisco, USA.

M. Rogora, A. Lami, A. Marchetto, G. A. Tartari, G. Tartari, F. Salerno A. Boggero, La ricerca a lungo termine sui laghi in aree remote: effetti del cambiamento climatico sulla chimica dei Laghi Paione (Alpi Centrali, Italia) e dei laghi della Piramide (Himalaya, Nepal). Congresso della Società Italiana di Ecologia, 10 - 13 September 2012, Alessandria, Italia.

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

None.

4.4 Completed deliverables

D1.1.1, D1.1.2 and D1.1.3.

5. Comments on possible discrepancies between expected and attained activities/results/deliverables

None.

6. Expected activities for the next period

- 1) Prosecution of technical-scientific support for the execution and implementation of the in-situ measurement in the area of interest of the project and carrying out of specific climate and environmental monitoring programs, including hydrological cycles and biodiversity
- 2) Implementation of new systems for the performing of climate and environmental monitoring activities deriving from the results of the first year of activity
- 3) Development of proper procedures for field data acquisition and dedicated measurement protocol
- 4) Development and improvement of technologies related to the use of portable monitoring stations to monitor climate and atmospheric parameters
- 5) Data exchange with other international monitoring network

WP 1.2 - GAW-WMO climate observatories

1. Expected activity and results

The goal of this Work Package, carried out in close collaboration with WP 1.1 , is first and foremost to ensure the continuation of observation and analysis activities currently being conducted at the GAW-WMO Global Stations under Italian management, providing for the implementation of observation programmes and technological resources. At the same time, it will be possible to provide support to specific GAW-WMO regional stations present in Italy and/or affiliated to the SHARE programme (in both high-altitude and remote areas). This will constitute a significant upgrade of the monitoring and study activities currently performed at these research and monitoring infrastructures, as well as a crucial support for the establishment of a national climate monitoring network. The monitoring activities implemented will involve in particular the measurement of climate-altering gaseous compounds and pollutants, physico-chemical properties of aerosol, short- and long-wave radiation fluxes, and meteorological parameters.

During the first year, the measures carried out, under Italian leadership, in the two GAW-WMO global stations such as the research climatic station at Mt. Cimone (2165 m above sea level, Northern Apennines) and the Nepal Climate Observatory - Pyramid (5079 m above sea level, Lobuche, Nepal) will be supported and implemented. Moreover, in collaboration with WP1.1, a feasibility study to test the upgrade capacity of the GAW-WMO program measuring regional stations located on the national territory and/or related to the SHARE project, will be carried out. Strategies for the strengthening of observational programs at these stations will be established in accordance with national and international initiatives (GAW-WMO, GMES, EU projects).

Milestones:

M1 (PM8): Definition of the “scientific questions”.

M2 (PM12): Definition of the measurement strategies. Feasibility studies for upgrading the Regional Stations GAW-WMO, in synergy with the SHARE-Italia network

2. Deliverables for the reporting period

D1.2.1 (PM8): Report describing the status of GAW-WMO stations managed by Italian Institutions or related with the SHARE project

D1.2.2 (PM12): Report describing the feasibility of upgrade actions for measurement stations within GAW-WMO.

D1.2.3 (PM12): Report describing the activities, data transfer to archives and to the General Portal

3. Activities of the reporting period

At the Nepal Climate Observatory – Pyramid (NCO-P), we executed the technical interventions for the improvement of the power supply system and the enlargement of the station laboratories (a photovoltaic system for the production of 10.3 kW/h has been built, a new set of batteries for energy accumulation has been installed and the laboratories have been enlarged, see picture below). The experimental set-up has been strengthened by installing a new system for the monitoring and the on-line characterization of PM₁ and PM₁₀ as well as for the aerosol size distribution in the accumulation and coarse fraction ranges. Moreover, we provided technological, logistic and energetic support for the installation of a Mercury analyser working within the UE Project GMOS (Global Mercury Observation System).

In collaboration with ENEA-UTMEA, it has been redefined the strategy for the measurements of solar radiation fluxes at the GAW-WMO Global Station NCO-P by the acquisition of new instrumentation. To perform these activities new radiometers (K&Z CMP 21) have been acquired.

To the aim of fulfill to the recommendations from the Joint Scientific Committee (JSC) of GAW-WMO concerning the start of measurements for precipitation chemistry at the GAW-WMO Global Station NCO-P, during June – July, the URT Ev-K2-CNR personnel implemented and upgraded the set-up for the rainfall analysis (both sampling and storage systems). The sampling activity started on June, 18th 2012. It prosecuted until the end of October with a daily frequency and with weekly frequency in the following. It has been also defined the sampling protocol for snow precipitation that foresees the weekly collection of sample in winter season.

During March – April 2012, a maintenance campaign has been executed at NCO-P for the check and calibration of the experimental set-up. Technicians and researchers from URT Ev-K2-CNR and the Pyramid personnel, participated to this campaign.

In the last months of 2012 contact with the Irish Aviation has been taken for the acquisition of a Lidar Liosphere, currently installed at Dublin airport. In the forthcoming months the instruments could be installed in Nepal at NCO-P to study aerosol profile and then at the Mt. Cimone station in Italy, but also at the CKNP and Rwenzori National Parks. Dr. Giovanni Martucci (C-CAPS, ECI, NU institute of Galway) in collaboration with the Italian researchers, will take care of Lidar data elaboration and processing.

In December 2012 URT Ev-K2-CNR reinforced its relationship with ICIMOD, participating in the monitoring campaign of SusKat (Sustainable Atmosphere for the Kathmandu Valley) Project, promoted within UNEP-ABC, to strengthen the knowledge on atmospheric pollution dynamics in the Kathmandu Valley. In this context the Ev-K2-CNR Representative Office in Nepal and the NCO-P station have been included in the monitoring site of the project. Starting from next January in Kathmandu new measurements on ozone, aerosol composition and distribution, meteorology and radiation will be made..

URT Ev-K2-CNR personnel already executed the inspection to the Campo Imperatore – Monte Portella high mountain station on July, 20th 2012.

Recently, the atmospheric observatory located at Chacaltaya (La Paz University), joined GAW-WMO thanks to an international consortium (composed by CNRS, LGGE, IRD, LSCE, PSI, CNR-ISAC, Ev-K2-CNR) which supported the re-establishment of the atmospheric observations on the Bolivian Andes. On April, 2nd -3th 2012, ISAC-BO personnel in collaboration with URT Ev-K2-CNR executed the maintenance and set-up of the surface ozone analyser working at Chacaltaya.

3.1 Research activities

3.2 Application, technological, and IT developments

None.

3.3 Training

During the maintenance campaign at NCO-P (Nepal), we prosecuted the activity devoted to the formation of local staff with the aim of increasing their capacity of managing and maintaining the experimental instrumentation.

3.4 Dissemination and outreach

URT Ev-K2-CNR participated to the “Festival della Scienza 2012” (Genova) for presenting the monitoring activities in the high mountain regions explored by NextData.

3.5 Conferences

Inception Workshop: Reducing the Impacts of Black Carbon and other Short Lived Climate Forcers, 1-3 April 2012, Kathmandu, Nepal

International Expert Consultation on Mountains and Climate Change, 4 April 2012, Kathmandu, Nepal

International Conference of Mountain Countries on Climate Change, 5-6 April 2012, Kathmandu, Nepal

NASA SERVIR MINX Workshop, 11-13 June 2012, Kathmandu, Nepal

ABC Science Meeting, , 13-14 September 2012, Beijing, China

Sixth National Conference on Science and Technology – Economic, Growth through Science, Technology and Innovation, 25-27 September 2012. Kathmandu, Nepal

American Geophysical Union, Fall Meeting, 1-7 December, 2013

4. Results obtained during the reporting period

4.1 Specific results (databases, measurement results, model output, etc)

None.

4.2 Publications

Bonasoni P., Cristofanelli P., Marinoni A., Vuillermoz E., Adhikary B. Atmospheric pollution in the Himdu Kush – Himalayan Region – Evidnces and Implications for the Regional Climate. Mountain Research Development, in press.

P. Cristofanelli, F. Fierli, A. Marinoni, R. Duchi, J. Burkhart, A. Stohl, M. Maione, J. Arduini, and P. Bonasoni. Influence of biomass burning and anthropogenic emissions on ozone, carbon monoxide and black carbon concentrations at the Mt. Cimone GAW-WMO global station (Italy, 2165 m a.s.l.). Atmos. Chem. Phys. Discuss., 12, 21399-21435, 2012.

P. Cristofanelli, H.E. Scheel, F. Calzolari, R. Duchi, A. Marinoni and P. Bonasoni, Analysis of surface ozone trends at the Mt. Cimone GAW Global station (Italy), IGAC 2012, 17 -21 September 2012, Beijing, China.

Marinoni A., P. Bonasoni, P.Cristofanelli, P. Laj, R.Duchi, E. Vuillermoz, B. Adhikary, T. C. Landi, D. Putero and S. Fuzzi. High level of pollution transported up to 5000 m asl in the Southern-Himalayas: continuous observations since 2006 at NCO-P GAW global Station, IGAC 2012, 17 -21 September 2012, Beijing, China.

4.3 Data and model output availability (format, etc)

None.

4.4 Completed deliverables

D1.2.1, D1.2.2 and D1.2.3.

5. Comments on possible discrepancies between expected and attained activities/results/deliverables

None.

6. Expected activities for the next period

Prosecution of observational and research activities at the GAW-WMO Global Stations managed by Italian Institutions.

Upgrade of the Italian GAW-WMO and/or SHARE remote stations.

In particular:

- start of a feasibility study for the execution of SO₂ measurements at remote mountain sites;
- continuation of the feasibility study for the installation of a CRDS system at remote mountain sites.

WP 1.4 - Environment and climate data from ice cores

1. Expected activity and results

Glaciers that flow from their catchment areas with negative mean annual temperatures can become formidable archives of climatic and environmental information. Over the past 150 years there has been observed an inexorable retreat of these glaciers with losses from 30% to 70% of the total volume. The anthropogenic influence amplifies this effect, and leads to the need to protect such information, which, year after year, are destroyed. Given the impossibility of protecting the entire glacier, are important recover and store ice cores from the most important extra-polar glaciers on the Planet. The work will be initiated by the glaciers with easier logistics or where there are already activities related to this project (eg Alps, Himalaya and Karakorum), or radar measurement of the catchment area in order to define thickness, internal layering and feasibility of drilling. If, in the collection of data information are already present all the necessary information, drilling operations will be done in the first year, both as a test or to the bedrock.

Milestones

M1 (PM6): Drawing of the procedure of field activity.

2. Deliverables for the reporting period

D1.4.1: Report of the field activities and drilling sites selection.

3. Activities of the reporting period

Compared to the Deliverable planned for the first year, which provided the only definition of field activities and the selection of the sampling sites, was made a drilling activities on the Colle del Lys (Valle d'Aosta) with ice core storage, and testing in the field of logistics, ice core technical and management activities of mid-latitude glacier, to be well define the remote areas perspective and logistical difficulties.

In particular, the drilling at the Colle del Lys has allowed to making a 32 m borehole with ice cores of 8 mm in diameter, the sampling of the chips for low contamination analysis and establishes procedures for drilling in mountainous areas. The field activities have also permit to evaluate the used equipment and the critical points of the drilling system.

In particular URT Ev-K2-CNR took care of planning and organization of the whole mission from a logistic point of view. Moreover, during the mission a Nepalese technician of Pyramidstaff was involved.

In view of the next drilling campaigns, URT Ev-K2-CNR bought a new probe drilling (ECLIPSE model by IceField inc. – Canada) able to drill till 500 m of deep, using also drilling mud.

URT Ev-K2-CNR personnel participated to several meeting finalized to plan the future activities. In particular in July 2013 a field mission will be organized at Colle Gnifetti, in order to test the new different drilling systems, that will be equipped with solar power system.

In summer 2014 a drilling campaign in Pakistan at 6.500 m on the Gasherbum mountain is foreseen.

3.1 Research activities

3.2 Application, technological, and IT developments

None.

3.3 Training

During the activities at the Colle del Lys were hosted two technicians from Nepal and Pakistan in order to train them on the technical and logistical aspects of drilling in ice. This has allowed us to build an initial working group for future activities in the Himalayas and Karakorum.

3.4 Dissemination and outreach

The drilling at the Colle del Lys has been the subject of great media attention that reported a significant emphasis on NextData project activities. URT Ev-K2-CNR disseminated several articles and press releases.

3.5 Conferences

None.

4. Results obtained during the reporting period

4.1 Specific results (databases, measurement results, model output, etc)

None.

4.2 Publications

None.

4.3 Data and model output availability (format, etc)

None.

4.4 Completed deliverables

D1.4.1: Report on the field activities and drilling sites selection. Completed.

5. Comments on possible discrepancies between expected and attained activities/results/deliverables

Compared to the Deliverable scheduled for the first half, which provided the only definition of field activities, was made a mission of drilling on the Colle del Lys with storage of carrots and testing in the field of logistics, technical and management of core glacier

6. Expected activities for the next period

URT Ev-K2-CNR, in collaboration with UNIMIB, is working to plan the activities for the next two years which will be devoted to the carrying out of an ice core drilling, at 6.500 m above sea level, on Gasherbrum (Pakistan Karakorum).

URT Ev-K2-CNR will accurately define the plan for the transport of samples under refrigerated conditions, in order to guarantee the non-alteration of the obtained core samples.

WP 2.1- Archive of high-altitude observation networks

1. Expected activity and results

Census of available data recorded from stations located in high altitude and remote area, included also in the GWA-WMO project will be carried out. Analysis of existing environmental and climatologic DB and evaluation of the possibility of sharing will be carried out and a proposal of a shared data storage will be developed.

Milestones:

MI (PM12): Census of data obtained within the project.

M2 (PM12): Feasibility study on the storage data in HKKH

2. Deliverables for the reporting period

Report about the existing data and the structure of the archives and report about the feasibility study on the storage data in HKKH (D1 (PM12) and D2 (PM12)).

3. Activities of the reporting period

SHARE stations data collection and development of a database system integrated with SHARE GeoNetwork

These activities include the development of the data access service and its integration in the existing SHARE GeoNetwork.

The first step has been the analysis on the existing data and issues related to the different recording formats and validation specifications. Another analysis was carried out about the current state of the art for catalogue system, archiving and online publishing meteo-climatic data. WDB (Weather and Water Data Base), a software developed by the Norwegian Meteorological Organization, has been chosen. This system is designed to “store meteorological, hydrological and oceanographic (MHO) data in a PostgreSQL database management server” (<https://wdb.met.no/doku.php>) but, the customization of the system to the needs of NextDATA project and the extension of the database to other physical parameters is possible.

The WDB source files can be downloaded at <https://github.com/wdb>.

Within this activity, the UNIMI and IAMC research units (WP 2.3, WP 2.4) were involved to verify the adaption of WDB to the storing of glacial and marine data. It was decided to use it and support was given for the installation of WDB in their servers.

The general schema of the system is shown in Fig. 1. The access to the informations is the metadata catalogue SHARE GeoNetwork with its upgrades and the data are stored in the dedicated DBs.

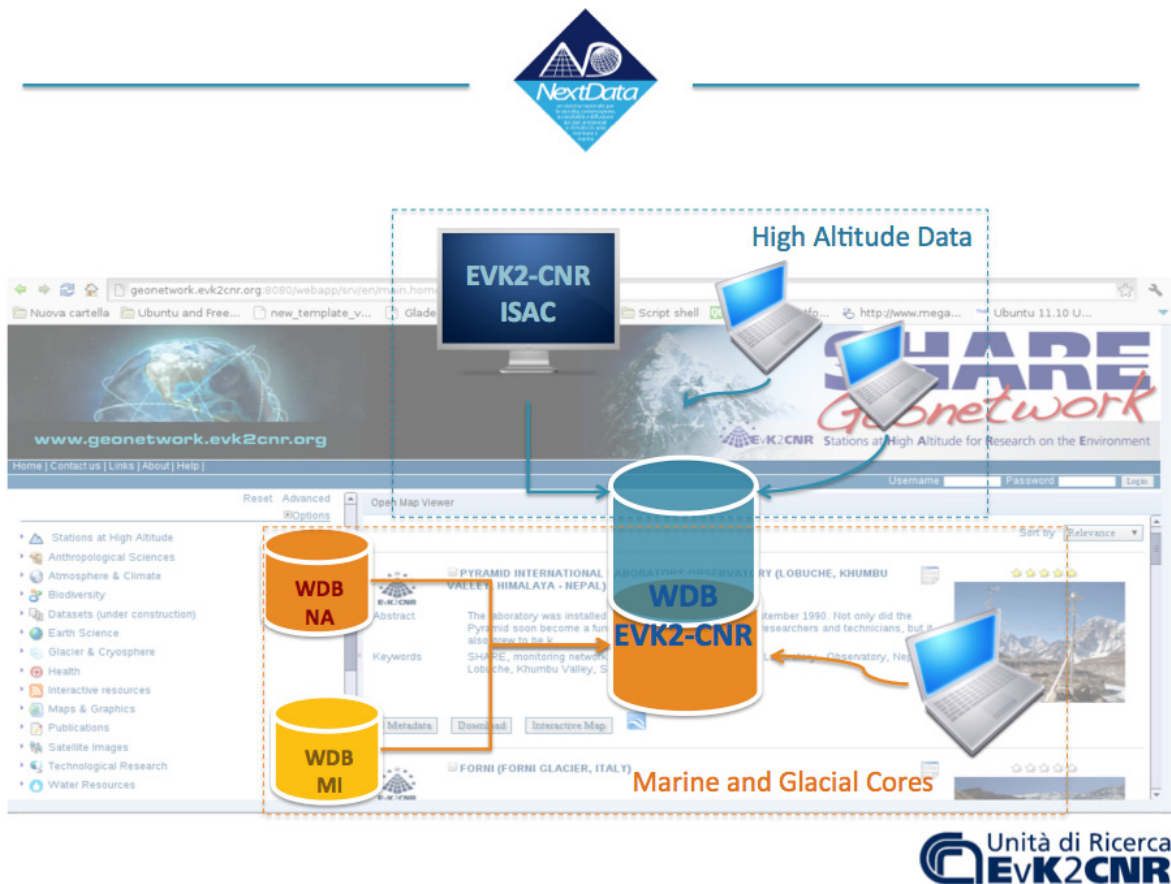


Fig. 1. General scheme of the DBs implemented in NextData.

Upgrade and Development of the SHARE GeoNetwork

This activity has mainly focused on the integration of Google Maps cartographic data in the GeoServer available with GeoNetwork: sat images, street maps, physical maps and hybrid maps. The system was deeply modified to bring the configurations to the publication of the Google's layers: the main issue is related to the change of the cartographic parameters to make them compatible with the publication in Google. The interface of GeoNetwork SHARE was then changed in the configuration files and scripts with their dependencies that concern the segment mapping.

A feasibility study has been carried out about the possibility of developing a new service integrated with GeoNetwork in order to search and retrieve data acquired from the stations.

During the first year of activities, in collaboration with WP 2.3 and WP 2.4, the structure of cataloging metadata of SHARE Geo Network has been extended to store information on ice and marine cores. A hierarchical structure was identified, which includes the following schematic organization into different levels:

Project ---- > Cruise ---- > Sampling sites

Each level is described by metadata, connected with each other according to a Parent/ Child bond. The last level, related to the sampling stations, will be cataloged and linked to WDB “Weather and Water Database” (Norwegian Meteorological Institute, 2012), which includes the alphanumeric data from cores.

3.1 Applications; technological and computational aspects

WDB is a stable and extensible database developed for the collection of meteorological, hydrological and oceanographic data: it is an open source software based on the PostgreSQL relational database and runs under Linux. WDB is also developed in compliance with the standards proposed by the WMO.

For the first installation has been used a test server running Debian "squeeze" (Debian 4.6 net - basic installation-i386) at the University of Cagliari. Installation was followed by a deep revision of the WDB database for loading data points representing the stations at high altitudes.

The adaptation of the data base has been necessary because the WDB has been realized for spatial data storage (GRIB, BUFR formats) originating from weather reports analysis or forecasts and therefore the customization step in SHARE has provided the insertion of approximately 600 new physical parameters in accordance with the variables measured by automatic stations.

The raw and validated data from the stations are not directly loaded into the database, so a Python script has been developed in order to decode the data in a compatible format with WDB. In particular, it was necessary to produce a synthetic metadata of the data of the stations with the schema metadata WDB.

To allow the loading of data from stations also for non-expert users a new graphical interface has been developed and it is possible to:

- insert new synthetic metadata regarding any new data provider;
- convert data from automatic weather stations (raw or validated) in a format compatible with WDB;
- load data directly in WDB.

The whole system of decoding and data entry has been tested with the data from Periche and Lukla stations, chosen as reference because their data format is different.

A PHP page (web publication) test with a mask to query the database has been also implemented. With the PHP mask it is possible to query the database by choosing:

- data provider
- automatic ID
- start date
- parameter.

The test of the entire chain of data entry from the input raw and validated data of the station to querying the database has been successfully concluded at this time and does not present any problem at the moment. At present we are loading data into the DB.

In synergy with WP 2.6 and as reported in the deliverable D2.1.2: it has been carried out a feasibility study for a Modelling Center and Data Analysis in Islamabad, Pakistan. Moreover, it has been started a Center for Numerical Modelling and Earth Observation in Kathmandu, Nepal, coordinated by the Nepalese researcher Dr. Bhupesh Adhikary, which main activity in this first year has been dedicated to running a modeling system at regional scale dedicated to meteorological forecast and pollutant transport.

3.2 Training activities

In this activity a PhD student has been involved from the International PhD in Environmental Science and Engineering at the University of Cagliari with the research on: "Implementation and management of High Altitude Data System for climatological research".

3.3 Dissemination

No dissemination activities during this start-up period.

3.4 Participation in conferences, workshops, meetings

- M. T. Melis, 2012 - "Rio+20 Side Event: Mountain Knowledge Solutions for Sustainable Green Economy and Improved Water, Food, Energy, and Environment Nexus", Data and Information Management, Rio De Janeiro – June 18, 2012.
- M. T. Melis, 2012 - Workshop SEED: "Contribution of science and cooperation to the sustainable development of the Central Karakorum National Park" Innovative technologies for territorial management, Islamabad 4-7 June, 2012.
- F. Locci, M. T. Melis, 2012 - Workshop: International PhD in Environmental Science and Engineering Summer School: Implementation and management of High Altitude Data System for climatological research. Sept 10-14, 2012.

4. Results obtained during the reference period

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

From March 2012 to September 2012 high altitude Database has been installed and implemented. A graphical user interface (GUI) in Python has been developed to load data into the Database in a user-friendly manner. A PHP connection page to the Database has been developed with a query mask, that will be accessible during the second year of the project. The information system has been tested for Periche and

Dosdè stations; these stations are two cases studies for the different format data received from the data logger, comprehensive of all data format of all 15 stations of the EvK2 CNR Committee network.

In synergy with the WP 2.3 and WP 2.4, the structure of cataloging metadata of SHARE Geo Network to store ice and marine cores has been defined.

4.2 Publications

Locci F., Melis M.T. and Dessì F. (2012) Share Geonetwork project: implementation of a web-service platform for high mountain climate research. Environmental modeling and software. Elsevier (under submission).

Poster presentation

Dessì F., Melis M.T. and Busilacchio M. (2012) The SHARE GeoNetwork Portal: Metadata Sharing for High Altitude Scientists. NAST (Nepal Academy of Science and Technology), The Sixth National Conference on Science and Technology, Kathmandu, Sept 25 - 27, 2012

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

The system preparation is ongoing. It is expected that the system will be online and fully operational by the end of 2012.

4.4 Completed deliverables

D2.1.1: Report on the existing data and the structure of the archives.

D2.1.2: Feasibility study for a data collection center in HKKH.

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

The knowledge and the availability of SHARE data has allowed for starting the operation of data input into the WDB system; this activity was originally planned only for the second year of the project.

6. Expected activities for the following reference period

Completion of data entry into the WDB system and launch of the new GeoNetwork with related new services.

**WP 2.2 (Archive of marine observation networks and climate reconstructions) -
WP2.3 (Archive of data from non-polar ice cores and long-term biological data) -
WP 2.4 (Archive of paleoclimatic data from sediment cores)**

Activities carried out during the reference period

URT EV-K2-CNR, as coordinator of the Sub-project number 2, on “Long-term archives of digital data on environment and climate and pilot studies on data use”, during the reference period, took part in several coordination meetings. Such meetings, organized in cooperation with other WPs components, aimed to provide information on the design of archives and metadata sheets functional to each WP and to share the options about the software to be used during the project. In this way, all actions concerning the data transfer towards the central portal of NEXTDATA and the archive consultation by end users will be easier.

The implementation of Geonetwork – WBD archive system and management of data and metadata is ongoing also for WPs 2.3 and 2.4. The URT Ev-K2-CNR supports the realization the archive in terms of technical information transfer and know-how for the development of these structures.

WP 2.6 - Portal for access to data and pilot studies on data use

1. Expected activity and results

A numerical modelling center will be established in Nepal, with a possible office in Pakistan, where local researchers and technicians will work in order to realize and disseminate climatic and environmental simulations focused on HKKH region, and including the dynamic of aerosol and behaviour of glaciers.

Milestones:

M1(PM12): Preliminary results of activities carried out in modelling center.

2. Deliverables for the reporting period

D2.6.1: Report on preliminary results of activities carried out in modelling center.

3. Activities of the reporting period

In the context of WP 2.6, in addition to the provision of archives of data collected in the frame of the NextDATA project for the realization of the General Portal, URT Ev-K2-CNR activities also concern the opening of a calculation and climate modeling centre in Nepal. This centre will support stakeholders and the local government in the definition of appropriate environmental policies, through the use of meteorological and atmospheric data recorded by the Ev-K2-CNR weather stations, for the elaboration of predictive models, starting from the already existing ones. The Ev-K2-CNR Office in Kathmandu will host the numerical center where will be installed a HP-DL 585 server with 64 cores, 128GB RAM and 8 Tera bytes of store. At present this server is installed at Mercantile Communications Pvt, company that manages all telecommunications in Nepal, able to supply constant furniture of power.

URT Ev-K2-CNR is starting a feasibility study to realize a modelling center in Pakistan too. At this regard, in this period URT Ev-K2-CNR contacted Pakistan Meteorological Department, Karakorum International University, Ministry of Science and Technology, Pakistan Science Foundatio, Ministry of Climate Change.

Moreover within WP2.3 it is foreseen the implementation of environmental archives to preserve seed plant biodiversity of the high altitude wild plants, fundamental also for the study of the effect of climate change on plant communities. In this context three incubators have been bought and installed at the Lombardy Seed Bank – University of Pavia, to study the impact of environmental changes on seed germination.

3.1 Applications; technological and computational aspects

In these months, Dr. Bhupesh Adhikary, Nepalese researcher, responsible of Modelling Center, transferred the NCAR “Weather Research Forecasting” model, 3.3.1 version, on its server.

3.2 Formation

URT Ev-K2-CNR supported the Summer school organization on “ Climate, Aerosols and the Cryosphere” June 2012, Valsavarenche and will finalized its contribution in organizing the Summer school on “Climate change and the mountain environment” will be held in 2013.

3.3 Dissemination

None.

3.4 Participation in conferences, workshops, meetings

Conference on Cryosphere of the Hindu Kush Himalayas: State of the Knowledge, 14 – 16 May, 2012, Kathmandu, Nepal.

NASA SERVIR MINX Workshop, 11-13 June 2012, Kathmandu, Nepal

Sixth National Conference on Science and Technology – Economic, Growth through Science, Technology and Innovation, 25-27 September 2012. Kathmandu, Nepal

American Geophysical Union, Fall Meeting, 1-7 December 2012, Fan Francisco, USA

4. Results obtained during the reference period

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

Main characteristics of General Portal were defined. The Portal will be divided in two main archives with Earth data (on GeoNetwork) and gridded data, reanalysis data and numerical simulations.

4.2 Publications

None.

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

None.

4.4 Completed deliverables

The results of the activities carried out so far will be integrated with those we will obtain in the next months to complete the deliverable D2.6.1, to be delivered at the end of the first year.

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

We have not identified particular problems or deviations from the activities foreseen in the Executive Plan.

6. Expected activities for the following reference period

Activities on modelling elaboration will continuous in the forthcoming months in the Kathmandu Modeling centre, moreover activities concerning the activation of a data elaboration center will pursue in Pakistan too.