Project of Strategic Interest NEXTDATA

Deliverable D2.1.1
Census of the field data collected during the project activities

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The census of the field data collected by the Ev-K2-CNR network of monitoring stations in high mountain regions represents the first step to develop data access services and their integration in the SHARE GeoNetwork.

This activity included the analysis of the existing data and the solution of issues related to the different recording formats and validation specifications of the various stations. Another study concerned the exploration of the currently available options for cataloguing, archiving and online publishing meteo-climatic data. After careful analysis, the WDB (Weather and Water Data Base) system, a software developed by the Norwegian Meteorological Organization, has been selected. This system is designed to "store meteorological, hydrological and oceanographic (MHO) data in a PostgreSQL database management server" (https://wdb.met.no/doku.php). The customization of the system to the needs of the NextDATA project and the extension of the database to other physical parameters is possible and it will be implemented in the second year.

The WDB source files can be downloaded from the link https://github.com/wdb. Access to the station information is provided by the metadata catalogue provided by the SHARE GeoNetwork with its upgrades. The data are stored in dedicated DBs.

Overview of the existing data

In past years, the Ev-K2-CNR Committee has installed stations at high altitude in three continents: Asia, Europe and Africa; and in four countries: Italy, Pakistan, Nepal and Uganda, creating a network that includes a total of eighteen stations: fourteen Automatic Weather Stations (AWS) and four Atmospheric Observatories, two of which are global stations of the WMO-GAW program.

The sensors installed in the fourteen SHARE AWSs include:

1. thermohygrometer
2. soil moisture sensor
3. barometer
4. combined wind speed-direction sensor

5. CNR1 net radiometer
6. electric rain gauge
7. geothermometer
8. soil heat flux sensor
9. pyranometer
10. UVA radiometer
11. snow depth sensor
12. heat flux sensor

The SHARE Atmospheric Observatories are installed in laboratory buildings; sensors include:

1. Condensation Particle Counter (**NCO-P, Cimone**)
2. Differential Mobility Particle Sizer ((10 nm – 500nm) **Cimone)**
3. Ultrasonic anemometer (wind speed and wind direction) (**Cimone)**
4. Optical Particle Counter (300 nm – 20 μm) (**NCO-P, Cimone, Campo Imperatore**)
5. Automatic Weather Station (air temperature, atmospheric pressure, relative humidity, dew point temperature, wind speed, wind direction) (**NCO-P, Cimone, Campo Imperatore**)
6. Particle Soot Absorption Photometer (**Cimone**)
7. Silicon photodiode (UV-B) (**Cimone**)
8. Gas Chromotograph-MS analyser (Halogenated gases) (**Cimone, NCO-P**)
9. Combined Relative humidity and Air temperature sensor (relative humidity and air temperature) (**Cimone, NCO-P**)
10. UV absorption analyser (surface ozone) (**Cimone, NCO-P, Campo Imperatore, Chacaltaya)**
11. Silicon cell pyranometer (solar radiation) (**Cimone**)
12. Integrating Nephelometer (aerosol scattering coefficient at 525 nm) (**Cimone**)
13. Gas Chromotograph-ECD (nitrous oxide, sulfur exafluoride) (**Cimone**)
14. Gas Chromotograph FID (carbon monoxide, methane) (**Cimone**)
15. Multi Angle Absorption Photometer (equivalent black carbon) (**Cimone, NCO-P**)
16. Gas Chromatograph RGD (carbon monoxide) (**Cimone**)
17. Aerosol chemistry (PM10 mass, inorganic, organic, metals and mineral dust) (**Cimone**, **NCO-P**)
18. Scanning Mobility Particle Size (15nm-32μm) (**NCO-P**)
19. PM1-PM10 monitor (β-attenuation) (**Cimone**, **NCO-P**)
20. Concentration of 222Rn (α-spectriscopy) (**Cimone**)
21. Non Dispersive Infra-red Absorption (carbon monoxide) (**Cimone**)
22. Global pyranometer (short-wave incoming solar radiation) (**NCO-P**)
23. Global pirgeometer (long-wave incoming solar radiation) (**NCO-P**)
24. Integrating Nephelometer (aerosol scattering coefficient at 450, 550, 700 nm) (**NCO-P**)
25. Sun-photometer (Aerosol Optical Depth, Wter Vapor, 440-870 Angstrom, SDA Fine/Coarse AOD, SDA Fine Mode Fraction) (**NCO-P**)
26. Chemiolumiscence analyzer (NO, NO2, NOx) (**Campo Imperatore**)

(legend: ASD = Aerosol Size Distribution, ANC=Aerosol Number Concentration, EBC=Equivalent black carbon)

The following tables (Table 1 and 2) summarize the sensors for each station and for the two GAW observatories:

Table 1. Sensors operating in the Automatic Weather Stations managed by Ev-K2-CNR.

COUNTRY	STATION NAME (AWS)	SENSORS											
		Thermohygrometer	Soil moisture sensor	Barometer	Combined wind speed-direction sensor	CNR1 net radiometer	Electric rain gauge	Geothermometer	Soil heat flux sensor	Pyranometer	UVA radiometer	Snow depth sensor	Heat Flux sensor
ITALY	AWS1 Forni	x		x	x	x				x		x	
ITALY	AWS Dosdè - Levissima	x		x		x				x		x	
ITALY	AWS Mt. Bianco- Osram	x		x		x				x		x	
NEPAL	AWS Namche Bazar	x		x	x		x			x			
NEPAL	AWS Lukla	x	x	x	x	x	x	x	x	x			x
NEPAL	AWS Pheriche	x		x	x		x			x			
NEPAL	AWS Pyramid Laboratory- Observatory	x	X	x	x	x	x	x	X	x		x	x
NEPAL	AWS Kala Patthar	x		x	x		x			x	x		
NEPAL	Changri Nup Glacier	x			x	x							
NEPAL	AWS Mt. Everest, South Col	x		x						x	x		
PAKISTAN	AWS Askole	x		x	x		x			x			
PAKISTAN	AWS Urdukas	x		x	x	x	x			x		x	
PAKISTAN	AWS Concordia	x		x	x	x	x			x		x	
UGANDA	AWS Rwenzori	x		x	x		x			x			

Table 2. Sensors operating in the two GAW Atmospheric Observatories.

Sensors in Laboratories	Mt. Cimone	Climate Ob. Pyramid
Condensation Particle Counter	x	-
Differential Mobility Particle Sizer (ASD (10 nm 500nm)	x	-
Ultrasonic anemometer	x	-
Optical Particle Counter ASD(300 nm 20 µm)	x	0.25 up to 32µm
Automatic Weather Station	x	x
Particle Soot Absorption Photometer (PSAP)	x	-
Silicon photodiode (UV-B)	x	x
Gas Chromatograph-MS analyser	x	-
Combined Relative humidity and Air temperature sensor	x	x
Silicon cell pyranometer	x	x
Integrating Nephelometer	x	x
Gas Chromatograph ECD	x	-
Gas Chromatograph FID	x	-
Multi Angle Absorption	x	x
Gas Chromatograph RGD	x	-
Aerosol chemistry	x	x
Scanning Mobility Particle Size (15nm-32µm)	-	x

During the years of activity, a great deal of atmospheric and meteorological data have been collected and archived by the network of stations. These data constitute an important observational patrimony for climatological research.

The meteorological data collected by the AWS are divided in two categories:

- Raw data from the instrument: these are data collected by the AWSs directly from the data logger, without handling.

- Validated data: these are data processed and subject to a quality control process;

The validation process of the data recorded by the SHARE AWS network follows the CEOP or WMO guidelines, depending on the parameter considered.

Four parameters, namely dew point temperature, specific humidity, u – v components of wind direction and net radiation (calculated when four components of radiations are available in the same site) are computed by using the "CEOP Derived Parameter Equations" available at http://www.joss.ucar.edu/ghp/ceopdm/refdata_report/eqns.html. In particular, the last two parameters were computed by using GEMPAK. The derived parameters have the flag "I". In case the parameters are estimated using dubious values, flagged "D", the data flag of the parameter is also put equal to "D".

In the quality control process, first the data have been visually checked, looking for extreme and unusual low/high values and/or periods with constant values. Nocturnal radiation data have been checked for non-zero values; wind speed and direction for sensor freezing and/or unusual high values. Where possible, cross-checking between different measured parameters (e.g., precipitation and relative humidity) was also performed to assure consistency between the variations of different variables under the same conditions.

All data are stored in txt or xls file format. An example of the data structure for the AWS is reported in Fig. 1.

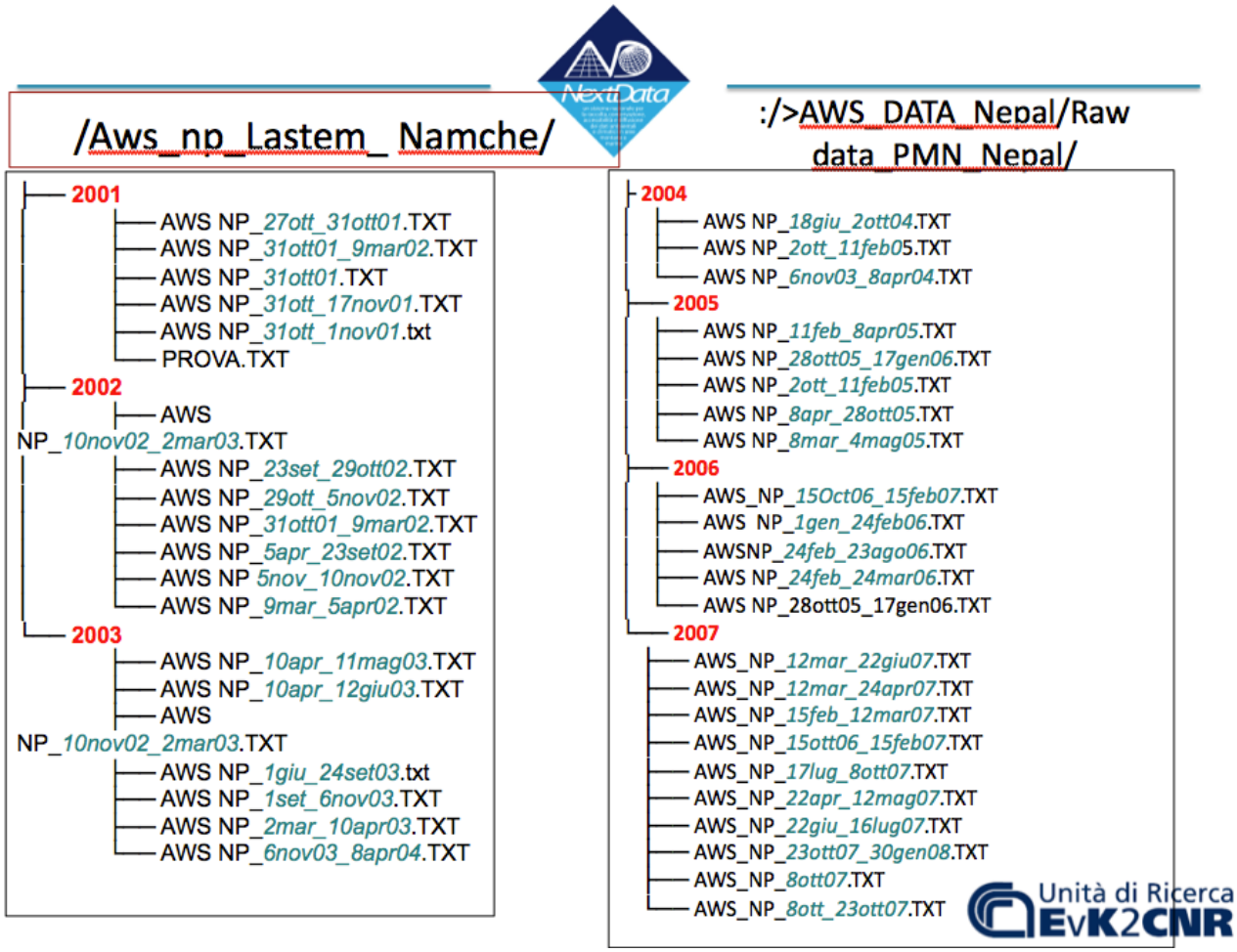

Fig. 1. Example of data file structure.