Report of the Meeting of the WMO CCI Expert Team on Climate Database Management Systems (CDMSs)

25 – 27 April 2012, Geneva, Switzerland

WCDMP 78

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(H Kontongomde)

1 Introduction (opening)

The WMO CCI OPACE 1 Expert Team on Climate Database Management Systems (CDMSs) met at the WMO, Geneva, from 25 – 27 April 2012. Steve Palmer, Denis Stuber, Anyuan Xiong, Radim Tolasz, Bruce Bannerman and Rachid Sebbari attended from the team. Dr William Wright, co-chair of the OPACE 1, Hama Kontongomde and Karolin Eichler from the WMO were also in attendance. Lloyds Gilkes from Barbados and Boubacar Barry from Guinea members of the Team could not attend the meeting. The director of the OBS department Wenjian Zhang, Peiliang Shi, director of WMO Information Systems branch, Steve Foreman and Mohan Abayasekara from the WMO Secretariat, joined the discussions later.

The opening remarks were provided by Peiliang Shi, director of WMO Information Systems branch providing context for the work particularly in light of the WMO Information systems (WIS) and the Global Framework for Climate Services (GFCS). Peiliang Shi welcomed the members of the Team, and expressed his gratitude for the positive efforts made by CCI to engage with WIS and WIGOS on the important area of metadata, noting the productive meeting with Steve Foreman the preceding day. That meeting was called by Dr Wright to ensure that proposed paths on metadata and interoperability were aligned with the WIS vision and implementation plan.

Dr William Wright (co-Chair OPACE 1) welcomed the participants and expressed the importance of the ET-CDMS to international climate service delivery, monitoring and research through its activities in coordinating data management and data access globally. He congratulated the ET's co-leaders Steve Palmer and Denis Stuber on their work to date and their commitment to the Team completing its work during the Intersessional period. He outlined the likely future links with GFCS and how the Team's work aligned with the other activities being undertaken by the OPACE in data rescue and observational standards. He briefly commented on the three work areas identified by the co-chairs as priorities for the remainder of the Intersessional Period, noting:

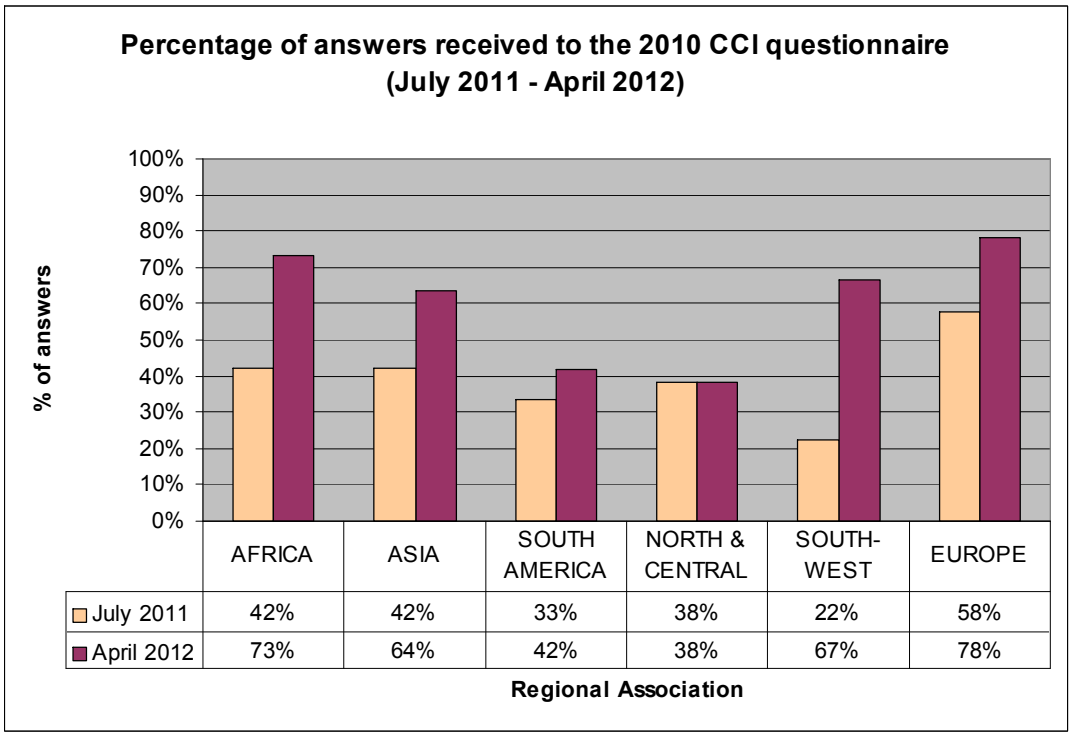
- the importance of the CDMS survey to ascertain what systems were being used and what the problems and issues were, particularly in less developed countries;
- the need for the CDMS specifications document to be completed and to address emerging needs such as more frequent World Weather Record updates;
- the challenges associated with data exchange, defining metadata, and interoperability.

Dr Wright concluded by thanking the team members for their participation, and thanking the Secretariat and ET leadership for their efforts in organizing the meeting.

Steve Palmer, Co-lead of the Expert Team, recalled the outcomes of the Exeter meeting and briefed the meeting on what has been achieved so far.

2 WMO Survey on CDMSs

A presentation of the number of responses received for the CDMS survey which started in 2010, showed a completion rate at time of meeting of 65%. A first analysis of the questionnaire was available in July 2011 but with only 44% of answers.



	AFRICA	ASIA	SOUTH AMERICA	NORTH & CENTRAL	SOUTH-WEST	EUROPE
July 2011	42%	42%	33%	38%	22%	58%
April 2012	73%	64%	42%	38%	67%	78%

It was agreed to extend the deadline for questionnaire responses to June 2012 in order to improve the response rates for some WMO regions (response rates remained below 50% in the Americas, and it was agreed to specifically approach them encouraging a response). Denis Stuber agreed to enter the Members' data into a specific database and update his earlier preliminary analysis during July and August. By the end of August the first analysis should be sent to ET-CDMS members for discussion.

It was noted that having contact with the persons in charge of the national CDMSs greatly facilitates survey process. It would therefore be wise to have a CDMS focal point in each NMHS. Such an arrangement would facilitate monitoring, and ensure faster responses to any following questionnaires especially noting that the first questionnaire is the most difficult.

Finally, it was agreed that the database that contains the survey data should be maintained and made available to the WMO Secretariat to facilitate monitoring and east decision-making. The possibility to link or to include this database with the WMO Country Profile would have to be analysed.

CDMSs latest news

A review of recent progress on the six current identified CDMS (CLIDATA, CLISYS, CLIWARE, CLIMSOFT, CLDB and CliDE (the new Australian system)) in general use revealed progress in new installations, and development of new functionalities with an emphasis on station metadata. The detailed information on those CDMSs are presented in Annex 4.

Four of those CDMSs have been developed in compliance with WIS standards.

Discussion on whether efforts should be made to pare back CDMS to one open source model rather than the current six concluded that while desirable, it was highly impractical. Instead, efforts should be made to encourage all CDMS to converge towards common mandated functionalities which would be easier and cheaper to support. Compliance with the CDMS specification document would assist with this, one way being to link access to ongoing support funding to compliance (see below).

3 Review of CDMS specifications

Discussion of the current state of the Specifications document indicated most nominated writers had failed to complete their tasks on time. A new deadline of April 2013 was set.

There was considerable discussion on metadata and how to represent it in the document. The need to encourage Members to better store and manage their station metadata was noted.

There was also considerable discussion on the scope of CDMSs, inspired by a series of presentations of the different proposed chapters of the CDMS Specification document in preparation:

Chapter 1: INTRODUCTION, Steve Palmer
Chapter 2: GENERAL CDMS INFORMATION, Anyuan Xiong
Chapter 3: CDMS COSTS, Anyuan Xiong
Chapter 4: SYSTEM CHARACTERISTICS, Bruce Bannerman
Chapter 5: SYSTEM FACILITIES, Bruce Bannerman
Chapter 6: DATA DIGITIZATION, Alpha Barry
Chapter 7: METADATA MANAGEMENT, Denis Stuber
Chapter 8: DATA MANAGEMENT, Radim Tolasz
Chapter 9: DATA PRODUCTS, Rachid Sebbari
Chapter 10: CLIMATOLOGY EXPERTISE, Steve Palmer
Chapter 11: SYSTEM SUSTAINABILITY, Steve Palmer

The presentations considered what functionality should be present within a CDMS to cater for data management, data products (from simple reports through to normals, mapping, storage of gridded analyses and model data, remote sensing data, etc), data digitisation and capacity to store images, and system facilities. Alternative ways of providing the more complex functions, such as linkaes to separate custom software were also discussed (see Section 5 below). Each of the many features was assessed as being Mandatory (or required) , Recommended or Optional, as a guide to the developers of CDMS and potential future users. There tended to be

general agreement on most assessments provided initially by the authors, and the agreed functionality assessments are summarised schematically in ***Annex 1***

Finally there was discussion about the long-term sustainability of CDMS, the problem being that aid agencies and development agencies almost always provided funding for a limited period only (individual projects). The problem was to mobilise long-term funding to keep systems going. Dr Wright noted the need for some kind of pooled funding, including that supposed to be available from GFCS for observations and data, but possible drawing on a variety of other sources. It was agreed that further work was required to assess whether such an approach was feasible, but this sits well beyond the remit of this group, though it is consistent with a discussion paper on resource mobilisation being developed by Dr Wright. A consideration for this group was whether access to such long-term funding was dependent on CDMS achieving compliance on at least the mandatory features identified in the specifications document.

The work plan for the next two years in terms of the CDMS specification document was discussed, with the current authors retained, and it being agreed that drafts for review should be available by April 2013.

4 Update to the Guidelines on Climate Data Management

An update to the *Guidelines on Climate Data Management to include a Section on CDMS* should be deferred until these documents have been completed. It was agreed that a template based on the approach taken by Anyuan Xiong would be circulated, and authors asked to populate the template for their areas of responsibility.

5 CDMSs component approach

Considerable discussions took place around to what extent many of these features, particularly on the product side, should be part of the “entity” of the CDMS, or whether they should be produced outside the CDMS. One example of the latter was evaluating the ETCCDI climate monitoring indices, which could be evaluated using pre-existing software developed by WMO (RClimDex) from data stored within the CDMS, and the result returned to the CDMS.

Bruce Bannerman presented a helpful schematic diagram of CDMS functionality and potential functionality as the basis for the group to evaluate core CDMS functionality versus what should be calculated outside. He raised the prospect of harnessing the power of Open Spatial Standards based Services through Web Services for at least the more complex tasks. A problem with this is that D & LDC would not have the ability or facilities at this time to avail themselves of such an approach, with it being noted that many do not even have reliable Internet access, or for that matter, communications infrastructure. It was decided that for the next few years at least, CDMS and/or links to auxiliary software, should perform most of this work, but that the Web Services approach should definitely be pursued as a future development path. It was also agreed that work would need to commence on the development of a Climate Observations Application Profile to facilitate future Open Spatial Standards based Web Services. It was agreed that this concept should be conveyed to GFCS, as it would be very relevant to future climate service delivery in an efficient way.

6 Stations Metadata and WMO Core Profile

The need to highlight the differences between so-called Discoverability (WIS) metadata and Stations (WIGOS) metadata was emphasised, and it was agreed to describe the Climate

requirements for each separately. In the case of Stations metadata, it was important to agree on a set of basic requirements that support most climate services. A discussion paper by Bruce Bannerman would provide much of this information. Bruce also clarified his concept of a Climate Observations Applications Schema based on ISO19156, Observations and Measurements standard, describing its utility in querying disparate data holdings in an integrated way.

A clarification of terms on metadata and data exchange was exhaustively discussed on Day 1 as it was considered that all participants were aware of the distinction, and that for reporting purposes, the short paragraph in Bruce's document would suffice.

In summary: 'Stations Metadata'

> 'Stations Metadata' is data about how and where meteorological observations and measurements were made and the conditions that they were made under, and has a time-series component. It is used to support a range of activities that allow climate professionals to understand the fitness for purpose of specific data and in many cases improve the quality of climate observations data.

In summary: SDI 'Discovery Metadata'

> SDI 'Discovery Metadata' is data describing a dataset and is intended to facilitate the discovery and assessment of a spatial dataset to determine if it is fit for re-use for a purpose that may be at odds with the reason that it was originally created.
> (see Annex 2)

Comparison of Metadata summary elements

Discovery Metadata Element	Stations Metadata Elements
Dataset title	Station Identifier and history
Dataset reference date	Station Geographic Location and history
Dataset responsible party	Station Local Environment conditions
Geographic location of the dataset (by four coordinates or by geographic identifier)	Station Instrumentation and Maintenance and history
Dataset language	Station Observing Practices and history
Dataset character set	Data Processing
Dataset topic category	Historical Events
Spatial resolution of the dataset	Communication and Correspondence
Abstract describing the dataset	
Distribution format	
Additional extent information for the dataset (vertical and temporal)	
Spatial representation type	
Reference system	
Lineage	
On-line resource	
Metadata file identifier	

Metadata standard name	
Metadata standard version	
Metadata language	
Metadata character set	
Metadata point of contact	
Metadata date stamp	

Table 5: Comparison of 'Discovery Metadata' and 'Stations Metadata' Summary Elements

7 Improvement of Volume A

Denis Stuber reviewed the history of metadata definition, and noted that "Volume A" contained much of the necessary information for a basic climate metadata schema. However it lacked certain features important to climate, e.g.:

- can't store climatically-important information such as shifts in stations, and information about obsolete stations;
- there was difficulty extending the number of stations because of the currently-restrictive WMO numbering system;
- the information was not in a database and not Web-enabled, which made access and modification difficult.

Dr Stuber described how a proposal by Mr Harald Daan (2002??) would overcome these problems if implemented. In fact Alexander Besprozvannyk from the Russian Federation developed a prototype system, but the work was abandoned before it could be refined and implemented. The group agreed that the Daan proposal would basically meet all the additional climate requirements for "station" (i.e. WIGOS) metadata.

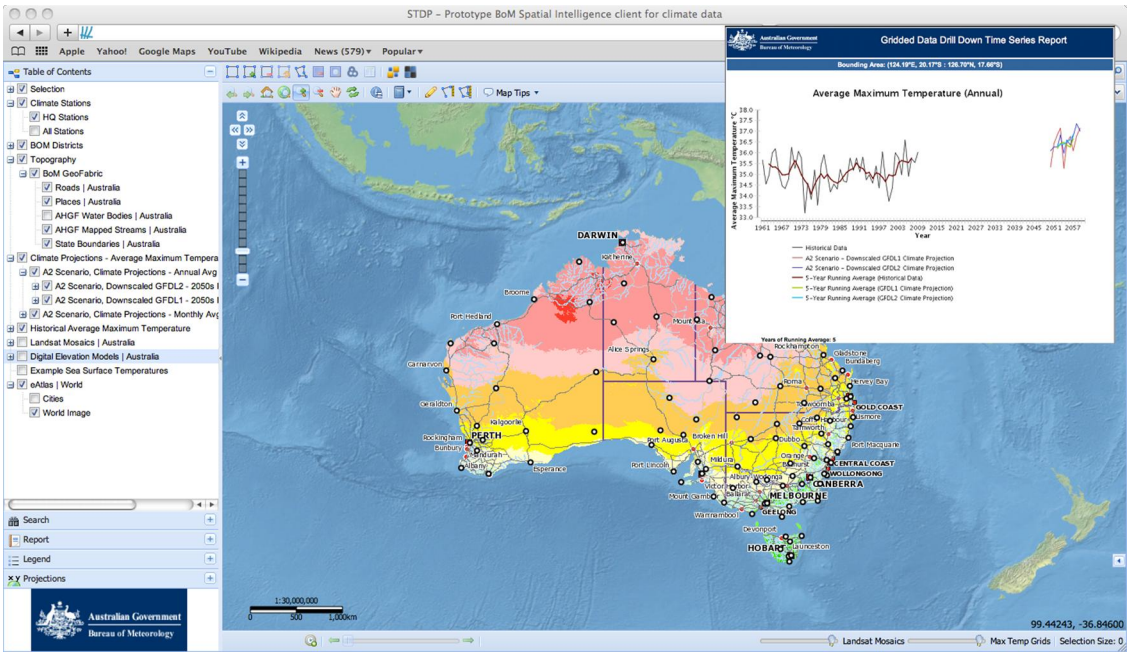
Dr Weijiang Zhang, Director Observing and Information Systems, attended the meeting on day 3 and made a number of pertinent comments. One was that CBS had responsibility for tasks such as updating "Vol A" to reflect climate needs, and that CCl needs should be communicated to CBS. Dr Zhang urged the CCl MG (or at least OPACE 1) to provide input into the recently-released WIGOS Implementation Plan over the next few weeks. He also requested this group to "think broadly" (some examples given below), but commented along the lines of he was impressed with the work and the energy of this group (See Annex 3)

8 Data Quality and relationship with MetOcean DWG

A Map drawn by Marie Françoise Voidrot Co-chair of the MetOceanDWG was presented and highlighted a common interest on how data quality is addressed. The Expert Team will liaise with the MetOceanDWG on that particular subject.

9 Data interoperability demo

9.1 *Australian prototype*



Bruce Bannerman gave a demonstration on interoperability via Web Services noting that, for instance, it was not necessary for individual CDMS to include GIS functionality, because with

Figure 1. Screenshop from Australia's Spatial Technologies Demonstration project, demonstrating GIS functionality via Webservices. In theory many different GIS could be accessed via WebServices to display data stored within a CDMS, without the GIS needing to be part of the CDMS functionality.

Open Spatial Standards based Web Services a user could display CDMS data using a variety of GIS (both proprietary and open source), and generate and exchange maps and data using common, agreed formats (WFS, WMS, WCS, etc). This could in principle sit across any underlying database structure, so that underlying data models and infrastructure did not need to be re-engineered. He demonstrated the Australian Spatial Technologies Demonstration Project as an example of the power of this methodology (Figure 1).

9.2 *France demo*

Gather into a unic interface the development made by the DWD, the Russian Federation, Meteo France and the CliSys CDMS. All of them using OGC standard :

10 Main actions to be undertaken for the rest of the Intersession Period:

- The Expert Team should work towards a Climate Observations Applications Profile, which Bruce would lead, along with Alexander Besprozvannykh and Denis Stuber.

- The Expert Team should work with the Open GeoSpatial Consortium (OGC) community to ensure climate needs are reflected in the product suites they develop, *with a view to developing, within this Intersession Period, a first cut at integrating stations' metadata with Climate Services Metadata, and conducting an interoperability experiment.* It is suggested that Bruce Bannerman and William Wright develop a short concept paper on this to make sure all ET-CDMS understand and approve the way forward
- Communicate CCl needs and priorities through TT-WIGOS-Metadata (Bruce), IPET-MDI (Bruce) and ICG-WIGOS (Williaml).

The Expert Team agreed that there was a need for ongoing consultation around these data exchange activities and the other activities (survey; specification doc), and it was agreed to hold bi-monthly Webex conferences for this purpose. The first of these was to be arranged for around mid-June.

It was also agreed that the amount of work to be undertaken in the remainder of the Intersessional Period, the complexity of some of the material and capacity for misunderstandings, testifies to the need to hold a further meeting of the ET within the current IP, provided there is sufficient WMO Budget to allow it.

The need to think further about strategies for sustainable CDMS capability, especially in D & LDC. This is a broader problem across CCl (and WMO), involving consideration of internal training, structures for Regional collaboration and support (wherein one or several countries provide expertise not available to all, and/or drawing on the Regional Climate Centre structure), user help groups, and resource mobilisation.

4. The need to think and consult broadly, e.g.,

- how the RCCs and WIS structure can be utilised to further the group's needs and vice versa (e.g., functionality; training & capacity building; infrastructure; specialised expertise);
- the metadata requirements for space-based data (not a current need to store within CDMS, but the metadata perhaps could be, though we don't see this as likely in the current Intersessional Period);
- the need to work with other communities of practice where specific benefits in doing so to ET-CDMS can be identified;
- be proactive in building climate requirements for data and metadata into WIS/WIGOS, as well as the GFCS

11 Summary of main recommendations

- The development of an Open Spatial Standards based Web Services approach for data exchange. The meeting noted that it would be impractical in some developing countries

who do not have access to high speed internet, but that hopefully this situation is only temporary.

Calculation of normals. The meeting considered that there was too much uncertainty around certain aspects of the normals calculation (e.g., the rules for missing data, short-period records, inhomogeneous series), and therefore that it was not practical as yet to encode such a procedure within a CDMSTo this end, it was agreed that an update to the current Guidelines on how to compute the climate normals (WMO-TD No.1377; WCDMP- No. 61) is required. For present purposes it is recommended that the normals be computed outside the CDMS and the results transferred to the CDMS. Dr Wright to raise the issue of updating WCDMP-61 with the CCl Management Group.

- Similarly, to enable computation of WWRs within CDMS a suitable product specification is required that can be coded. In this case it is believed there is sufficient detail in the current Guidelines (WCDMP No 77, 2012). This principle of being able to specify accurately, and therefore encode, the method of calculation applies to all other new products being considered for evaluation within a CDMS.

- Denis to approach the TT-DARE to ask them what functionality they need within a CDMS (e.g., data, images, metadata?) Perhaps images should be an optional feature of CDMS. Last sentence deleted because it raises questions, and was not an actionable item.

- RE sustainability – encourage the use of CDMS user groups to share the expertise. Includes e-mail, conferencing group. The issue of an Opensource CDMS community, with access to various levels of expertise, was raised.

- The meeting recommended that the WMO Secretariat request countries to assign a focal point for CDMS (in addition to focal points for other critical climate activities with NMHS as discussed at the CCl MG meeting in Denver last October).

- The meeting recommended to closely collaborate with observational programs regarding metadata, data quality, information exchange and others through existing links: Bruce Bannerman through TT-WIGOS-Metadata and IPET-MDI and William Wright through ICG-WIGOS and his links with GCOS/AOPC and ET-EGOS.

12 Summary of individual tasks assigned by the meeting

- Bruce Bannerman and William Wright to work with the OGC community to ensure climate needs are reflected in the product suites they develop, with a view to developing, within this Intersession Period, a first cut at integrating stations' metadata with Climate Services Metadata, and conducting an interoperability experiment.

- Denis Stuber to update his earlier preliminary analysis on CDMS survey and send it to the ET members for discussion by end? August 2012.

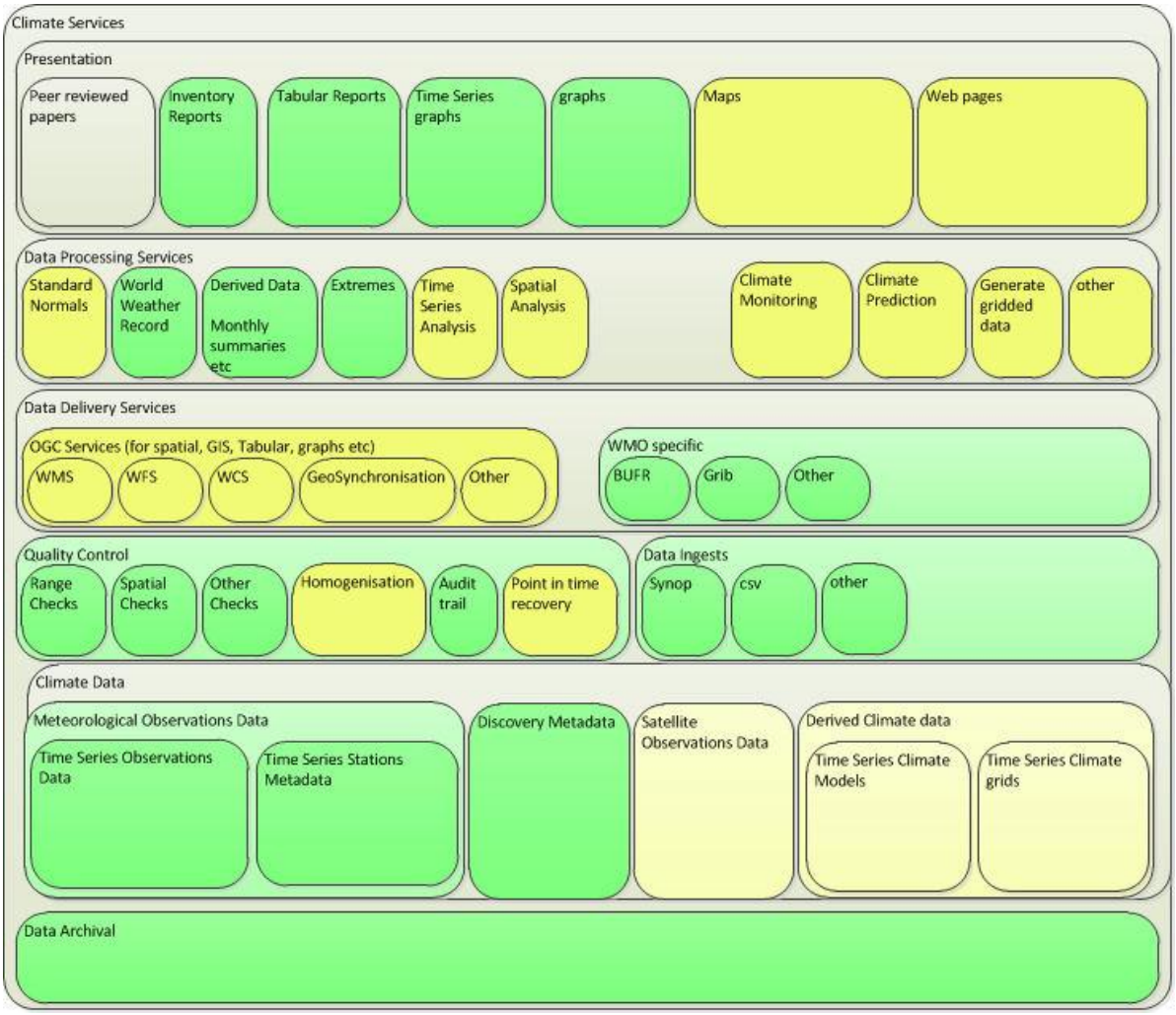
- Denis to approach the TT-DARE to ask them what functionality they need within a CDMS: e.g., data, images, what metadata) Further consideration should be given as to whether CDMS can handle Strip charts – images.

Assignment for the CDMS specification document

Writers	Chapters	Deadline
Steve Palmer	Chapter 1: INTRODUCTION,	September 2012
Anyuan Xiong	Chapter 2: GENERAL CDMS INFORMATION,	September 2012
Anyuan Xiong	Chapter 3: CDMS COSTS,	September 2012
Bruce Bannerman	Chapter 4: SYSTEM CHARACTERISTICS	October 2012
Bruce Bannerman	Chapter 5: SYSTEM FACILITIES,	October 2012
Alpha Barry	Chapter 6: DATA DIGITIZATION,	September 2012
Denis Stuber	Chapter 7: METADATA MANAGEMENT,	September 2012
Radim Tolasz	Chapter 8: DATA MANAGEMENT,	September 2012
Rachid Sebbari	Chapter 9: DATA PRODUCTS,	September 2012
Steve Palmer	Chapter 10: CLIMATOLOGY EXPERTISE,	September 2012
Steve Palmer	Chapter 11: SYSTEM SUSTAINABILITY,	September 2012

Annex 1

Component of a CDMS



Legend:

Green = Mandatory

Yellow = Recommended

Light Brown = Optional

Annex 2

12.1.1 Table 1: Stations Metadata

No.	Category	Metadata Type	Description
	Station Identifier		**Clearly identify the station and whose responsibility it is. It is very important to do so by reporting all the different codes, as some times WMO codes are not used locally and national codes are not known abroad. It is also useful to know which networks a station is included in.**
		Local Code	
		WMO Code	
		Name and aliases	
		Active/Closed	
		Beginning/End Date	
		Type of Station	
		Responsible Organization	
		Manual/AWS	
		Time zone	
		Networks	

	Geographical Data		**Geographical coordinates and exact dates of relocations along with other topographical details. Care must be taken in differencing N/S latitudes and E/W latitudes as well as with reporting fractions of degree (minutes and seconds or thousandths of degree)**
		Latitude	
		Longitude	
		Elevation	
		Dates of relocation	
		Topographical Information	

No.	Category	Metadata Type	Description
		Method of deriving lat/long	
		Resolution of lat/long	
	Local Environment		Document the station environment and instruments exposure: obstacles, e.g. land use, population growth, obstacles, exposure site land cover, etc.
		Local land use/land cover	
		Instruments exposure	
		Soil type	
		Site condition	
		Photographs	
		Site plans	
		Skyline diagrams	
	Station Instrumentation and Maintenance		Report the characteristics of the instruments in use and their sheltering, accuracy, calibration and maintenance; indicate how data are transmitted. Carefully note any changes in instrumentation.
		Type of instruments	
		Observer level of training	

		List of observed elements	
		Observing times	
		Units used	
		Observation instructions	
		Routine maintenance operations	
		Disposable items replacement	
		Corrections made by observer	

No.	Category	Metadata Type	Description
	Observing Practices		Keep documented what elements are observed and when, with special care to the enforcement of daylight saving times; report the exact moment of maintenance operations and any corrections made to data
		Observer information	
		Observer level of training	
		List of observed elements	
		Observing times	
		Units used	
		Observation instructions	
		Routine maintenance operations	
		Disposable items replacement	
		Corrections made by observer	

	Data Processing		Report units in use and give conversion factors if they don't belong to the metric system. Indicate special codes used and their meaning; mention in the metadata any amendment made to the recorded data: calculations, corrections, qc, homogenization and data interpolation. Report criteria for missing data, and if more than one instrument for the same element, which is considered the primary instrument.
		Units	
		Special codes	
		Calculations	
		Algorithms	
		QC applied? (yes/no)	
		Other details on QC	

No.	Category	Metadata Type	Description
		Homogenization applied? (yes/no)	
		Other details on homogenization	
		Data recovery effort? (yes/no)	
		Other details on data recovery	
		Treatment of redundant data	
	Historical Events		Add to metadata any significant changes in the station context that may affect data collection
		Changes in the social, political and institutional environment	
		Daylight savings dates	
	Communication		General correspondence such as e-mail between station operators and observers can include potentially valuable information about the quality of observations.
		Signal transport/data transmission	
		General correspondence	

Annex 3

Climatological needs for minimum Station Metadata in the frame of the WMO's Publication 9 Volume A

Draft, Denis Stuber, Meteo France

1. Station Metadata WMO Reference 23

Historic : a world catalogue of operational stations 24

What is Volume A? 24

What is the contents of Volume A 24

Format of the Volume A 26

Version 26

2. History of Volume A improvement attempts and Metadata station needs 27

2002 27

2003 28

2006 28

2007 28

2009 29

2010 29

3. Summary and analysis 30

4. Suggestion on Volume A Implementation 31

5. Proposal for climatological needs on Volume A 32

Identifier 34

Administrative 36

Geographical Location 37

Local Environment 38

Instrument 39

Parameter *40*

Transmission *41*

Observation and Measurement *42*

Data Processing *43*

Mission *44*

Quality *45*

Data information *46*

Production *47*

6. Reference and literature cited 58

13 Station Metadata WMO Reference

The question of Metadata is particularly highlighted nowadays and is pushed by the important worldwide exchange facilities. More and more data is shared around the world and increasingly data has to be described with a common language understandable by human and by computers. Metadata explains what represents this data and how to access and use it for the best.

A starting point to describe climatological data is to describe the origin of the data, the station, which means the location where sensors measure data or/and where meteorologists observe phenomenon. Station metadata elements are numerous and "ideally, a complete metadata should register all the changes a station has undergone during its lifetime, composing what is called the station history" (WMO 2003a).

At the international level, the WMO reference for operational station metadata is the WMO's Publication 9 Volume A. After presenting briefly the Volume A publication, this paper gathers attempts and wishes of improvements of this publication made since the last decade, then it suggests implementation solution and finally proposes attributes to add for climatological purpose.

13.1 *Historic : a world catalogue of operational stations*

- **1873-1953**: International Meteorological Organization (IMO) maintained a catalogue of observing stations, called "Fascicule II".
- **1953**: WMO Executive Council (EC-III) decided to prepare a new edition of this catalogue as "Publication No. 9 "Synoptic Weather Messages" in accordance with the principle that "all stations (surface and upper air) actually in operation and used for synoptic purposes shall be included and no others".

13.2 *What is Volume A?*

May be considered as the current WMO standard for station metadata exchange:

WMO standard & "station metadata": Volume A is the official WMO catalogue that describe operational stations

Exchange: It exists an official process to exchange and update this catalogue

Information is coming from the WMO members (feedback form available from the WMO site)

And WMO maintains the full catalogue and makes it available on its web site

13.3 *What is the contents of Volume A*

Volume A contains a complete list of all the surface and upper-air stations, in operation, which are used for **synoptic purposes** i.e. real time application. The contents are arranged in the order of the WMO Regions and in index number order within each Region. More than 12 000 stations are listed.

Volume A contains the information on the station name and identification number, location, elevation/pressure, the types and times of observations carried out.

REGION I - AFRICA / AFRIQUE

OCEAN ISLANDS / ILES DANS L'OCEAN

INDEX NUMBER	NAME	LAT.	LONG.	ELEVATION HP	ELEVATION H/HA	PRESSURE LEVEL	SURFACE OBSERVATIONS 00	03	06	09	12	15	18	21	OBS.H OBS.S	UPPER-AIR 00	06	12	18	OTHER OBSERV. AND REMARKS
61901	ST. HELENA IS. 1) ..	15 56S	05 40W	436	435		X	X	X	X	X	X	X	X	H00-24*	.	.	RW 2)	.	CLIMAT(CT);SEMI-AUT*;SUNDUR;WR
902	WIDE AWAKE FIELD (ASCENSION IS.) 3)	07 58S	14 24W	79	86		X	X	X	X	X	X	X	X		.	.	RW	.	A;CLIMAT(T);ROCOB IRREG.;WT
931	S. TOME	00 23N	06 43E	13	8		X	X	X	X	X	X	X	X	H06-18	W 4)	.	W 4)	.	CLIMAT(C);EVAP;SOILTEMP;SPECI;SUNDUR;WT
934	PRINCIPE	01 39N	07 25E	5	3		X	.	X	X	X	X	X	X		.	.	.	.	EVAP;SOILTEMP;SUNDUR
967	DIEGO GARCIA 3)	07 18S	72 24E	3	1		X	X	X	X	X	X	X	.		RW	.	W	.	C;CLIMAT(CT);NEPH;WR
968	ILES GLORIEUSES 5) .	11 35S	47 17E	4	3		X+	X+	X+	X+	X+	X+	X+	X+	H00-24	.	.	.	.	A;AUT+;C;SEA;SOILTEMP;SUNDUR
970	ILE JUAN DE NOVA 5)	17 03S	42 42E	10	9		X+	X+	X+	X+	X+	X+	X+	X+	H00-24	.	.	.	.	A;AUT+;C;SEA;SOILTEMP;SUNDUR
972	ILE EUROPA 5)	22 19S	40 20E	13	12		X+	X	X	X	X	X	X+	X+	H00-24	.	P	.	.	A;AUT+;C;EVAP;SEA;SOILTEMP;SUNDUR
976	SERGE-FROLOW (ILE TROMELIN) 5)	15 53S	54 31E	13	7		X	X	X	X	X	X	X	X+	H00-24	.	P	RW	.	A;AUT+;C;CLIMAT(CT);SEA;SOILTEMP;SUNDUR
979	LE COLORADO 5)	20 54S	55 26E		743		.	.	.	.	.	.	.	.		.	.	.	.	RSD
980	SAINT-DENIS/GILLOT (REUNION) 5)	20 53S	55 31E	25	21		X	X	X	X	X	X	X	X	H00-24	.	P	P	.	A;AUT;METAR;RADSAMP;SEA;SOILTEMP;SUNDUR;TOTRA
996	MARTIN DE VIVIES (ILE AMSTERDAM) 5)	37 48S	77 32E	29	45		X	X	X	X	X	X+	X+	X+	H00-24	.	.	RW	.	AUT+;C;CLIMAT(CT);SEA;SOILTEMP;SUNDUR;WN
997	ALFRED FAURE (ILES CROZET) 5)	46 26S	51 52E	142	143		X+	X+	X+	X+	X+	X+	X+	X+	H00-24	.	.	.	.	AUT+;C;SOILTEMP;SUNDUR
998	PORT-AUX-FRANCAIS (ILES KERGUELEN) 5)	49 21S	70 15E	30	29		X	X	X	X	X	X+	X+	X+	H00-24	.	.	RW	.	AUT+;C;CLIMAT(CT);SEA;SOILTEMP;SUNDUR;WN

1) STATION OPERATED BY THE UNITED KINGDOM / STATION EXPLOITEE PAR LE ROYAUME-UNI
2) +ON/LES 1-5
3) STATION OPERATED BY THE U.S.A. / STATION EXPLOITEE PAR LES U.S.A.
4) TEMPORARILY DISCONTINUED / TEMPORAIREMENT SUSPENDUE
5) STATION OPERATED BY FRANCE / STATION EXPLOITEE PAR LA FRANCE

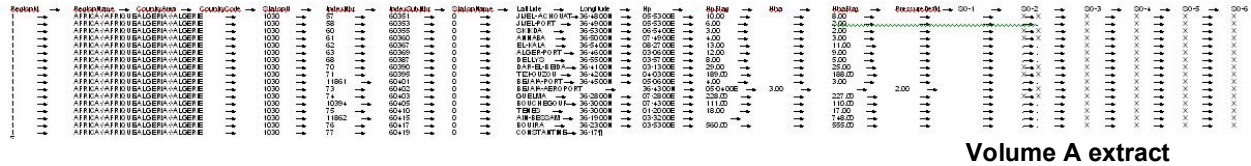
FootNotes

It also contains information made at the station (radiation, seismological, phenological, river stage, etc.), special types of stations (airport, lightship, coastal station, etc.), special services (Hurricane forecast centre, etc.). It is known as the Code Table A Observation and Remarks.

Additional notes, known as Footnotes, contain useful information on the stations (Code Table B) as stations anomalies (station temporarily closed, etc.), instrument in used (CLASS A PAN, station without barometer, etc.), transmission status (RW DATA TRANSMITTED VIA GTS ONE DAY LATER, etc.).

13.4 *Format of the Volume A*

In the past, the Volume A was printed, but nowadays it is deliver as a flat data file, in ASCII format, that is divided into 29 columns. If the 28 first columns are well structured and consist on specific and precise data, the 29th column is reserved for a large range of information.



Volume A extract

As well, a second file gives information for upper-air stations on the type of radiosonde, windfinding equipment, ground systems, radiation corrections applied to temperature observations and other local practices for the radiosondes and upper-air systems in use by Members (WMO Catalogue of Radiosondes and Upper-air wind Systems).

Country	Station #	Station Name	Lat.	Lon.	Hp	Hha	Upper-Air				CLIMAT	GUAN	Geo.	Radiation Corr.		Ground	Frequer	Radiosonde		Windfindin	Windfindir	Remarks
							0	6	12	18			Calc.	Y/N	Type	Equipment		Regula	Alterne	System/Me	Equipment	
FF. Column>	3	5	6		9		10				12	13	14	15		16	17	18		19		20
	60430	MILIANA	36 18N	02 14E	721	715	.	.	.	.		N		N								PILOT (Wind Only) station only
	60445	SETIF	36 11N	05 15E	1040	1033	.	.	.	.		N		N								PILOT (Wind Only) station only
	60490	ORAN-SENIA	35 38N	00 36W	91	90	P	P	W	P		N		N								PILOT (Wind Only) station only
	60525	BISKRA	34 48N	05 44E	89	82	.	.	.	.		N		Y	V93	Digicora	401-406	VRS80G?		GPS	Digicora	No TEMP obs 2005-2007
	60535	DJELFA	34 20N	03 23E	1185	1180	.	.	.	.		N		N								PILOT (Wind Only) station only
	60549	MECHERIA	33 35N	00 17W	1149	1150	.	.	RW	.		N		N	V93	Digicora	401-406	VRS80G?		GPS	Digicora	No TEMP obs 2007
	60559	EL-OUED	33 30N	06 47E	69	64	P	.	P	.		N		N								PILOT (Wind Only) station only
	60566	GHARDAIA	32 24N	03 48E	469	468	P	.	P	.		N		N								PILOT (Wind Only) station only
	60571	BECHAR	31 30N	02 15W	816	809	RW	P	RW	P	CT	N		Y	RS92	Digicora	401-406	VRS92G		GPS	Digicora	Checked Jul 07 using 31313 gro
	60590	EL-GOLEA	30 34N	02 52E	403	397	P	.	P	.		N		N								PILOT (Wind Only) station only
	60602	BENI-ABBES	30 08N	02 10W	505	500	.	.	.	.		N		N								PILOT (Wind Only) station only

Catalogue of Radiosondes and Upper-air wind systems extract

13.5 *Version*

The last revision of the Volume A is very recent: April 2010. And the latest edition of the flatfile of data Observing Stations is from 19 March 2012. The main modifications concern:

- Higher precision of horizontal coordinates: degrees-minutes-seconds (accuracy of +- 31 meters at the Equator versus 1852 meters for the previous version);
- Higher precision in vertical coordinates in meters rounded up to 2 decimals (centimetres versus meters for the previous version).

14 History of Volume A improvement attempts and Metadata station needs

Despite the latest modifications, the current Volume A, based on a flat file, suffers from several limitations:

- Difficulty to extend its capacity to describe the stations and so to answer to demands coming for example from the climatology community like the historical periods of station activities;
- Difficulty to extend the number of stations listed due to the WMO index number structure;
- Difficulty to manage and to access the data of Volume A as the volume A is not implemented with modern tools e.g. a database with its advantages and Web possibilities and services.

Those limitations are well known and several attempts were conducted in order to overpass them. In parallel, needs on Stations Metadata raised especially for exchange purpose.

14.1 *2002*

14.1.1 Volume A improvement

In January, Mr Harald Daan, the CBS rapporteur of Volume A, wrote a report on possible improvements of WMO Publication No 9 – Volume A (WMO 2002).

Mr Harald Daan noted that:

- If “real-time exchange has certainly been the primary purpose of VolA” other domains as **climatology**, agrometeorology, meteorological research, atmospheric chemistry, hydrology and geophysics (including seismology) are also interested.
- For **climatology**, the preservation of information on station changes and on obsolete stations would be very supportive.
- The index numbering system is limited and “in several areas, it is impossible to assign new numbers to stations.

Mr Harald Daan proposed a very detailed solution for a new structure of the Volume A that includes to:

- Enlarge the purpose of Volume A from "surface and upper air stations" to "all stations at fixed locations providing real-time meteorological observations;
- **Add historical periods**: “It should be recognised that the climatological community has very close links with the WWW, as both use the same observations, albeit in different frameworks of time. The only difference is that the data in VolA are of permanent importance for climatology, and remain so after stations are changed or deleted in VolA. This issue has been discussed above (para 5.1.1). **In addition, dates of start and closure should be added to the information.**
- Give rules for the allocation of a index number when a station moves.
- Prepare the Volume A to be “processable by computer”.

14.2 *2003*

14.2.1 Volume A prototype

WMO drew up a revised version of Volume A into a comprehensive database application (written in Access 2000) that takes into account Mr Harald Daan recommendations. In 2005 an expert was hired to develop the solution with an Oracle database, but in 2006, the design phase of the Oracle prototype eventually failed acceptance testing (WMO 2004 page 2).

14.3 *2006*

14.3.1 Volume A prototype

WMO enlisted the services of an expert from the Russian Federation, Alexander Besprozvannykh, to provide a revised version of Volume A as a standalone Oracle application (WMO 2008 page 2).

14.3.2 Standard to exchange Metadata

One of the terms of reference of the Expert team on "Climate Data Management including Metadata" (OPAG 1) of the Commission for Climatology is "**to establish standards for the exchange of metadata** and/or deposition in major data centres, with particular reference to the needs of the WMO Information System (WIS)" (WMO 2005)

14.4 *2007*

14.4.1 Volume A prototype

The prototype, CATREP from Mr Alexander Besprozvannykh, is ready and "it was concluded that the Application at its current mode has great potential and can completely replace the present operational version of Volume A.

But "during the same period due to re-structuring and a new strategic cost cutting approach by the IT division of the Secretariat, the Oracle servers within the Secretariat were closed down at the end of 2007 and relevant services outsourced to the United Nations International Computing Centre (UNICC). For this reason, implementation of redesigned Volume A within the Secretariat was not possible" (WMO 2008 page 2).

14.5 *2009*

14.5.1 Volume A improvement

The CCl expert team on WCP requirements for metadata (WMO 2009a) reports: "while extensive work has been accomplished to define content and format enhancements to the WMO's Publication 9 Volume A, formal action has not been taken to refine and implement the proposed changes. **The team recommends that the proposed changes be refined and clarified as needed, then submitted for review and adoption by the WMO**."

14.5.2 Standard to exchange Metadata

The group [CCl expert team on WCP] agreed that a first step would bet to develop a specific list of station metadata parameters, designating each as mandatory for climate, desirable, optional or unnecessary. This will provide immediate, tangible output and a basis for evaluation of various methods of representation and transfer (WMO 20099).

"CCL working group recommend that "an XML schema for station metadata exchange be defined. The CDMS developers present affirmed the need for a standard XML exchange schema definition" (WMO 2009b).
And also the same working group rules that "Today, no unique station metadata requirements for the climatological community have been identified. It appears that a manageable subset of possible station metadata might be adequate for discovering data and stations of interest. Principal components of such a subset include identifiers, name, locational coordinates, observing environment, parameters observed, observing frequency and period of record. Summary quality information about a station, such as scores for goodness of siting, consistency of operation and continuity of data provided, would also be valuable for climatological work."

14.6 *2010*

14.6.1 Volume A improvement

The Expert Team on Requirements and Implementation of AWS Platforms (ET-AWS) from the Commission for Basic Systems (CBS) review the necessity of WMO Publication No. 9, Volume A be adapted to include National Station Identifiers (WMO 2010b).

14.6.2 Standard to exchange Metadata

Part of the work plan of the Expert Team on Climate Data Base Management Systems (ET-CDMS) of the Commission for Climatology is to "Develop an open-standards based data exchange model that allows full data provenance to be distributed with the data**, particularly stations data**".

15 Summary and analysis

(1) For **international data exchange** Volume A appears to be the standard set of information on surface and upper air stations metadata. As the main contributors on Volume A are WMO members themselves, working on the improvement of Volume A for a climatological point of view will have a direct impact on all the community.

There are demands on Improvements of Volume A, from different meteorological and non-meteorological domains with for example addition of time periods, and addition of stations.

A complete solution for a revised Volume A has been designed in 2002 by Mr Harald Daan, the CBS rapporteur of Volume A but, despite several attempts, was never implemented. Nevertheless, coming from these attempts, the Russian Federation (Alexander Besprozvannykh) has developed the CATREP prototype which is a web application based on OGC[1] standard, which has been approved but never implemented by WMO.

(2) In parallel, needs to dispose of standard Stations Metadata are constant **for international exchange**.

Succeeding in the implementation of a revised Publication 9 Volume A will merge our 2 requirements : (1) enlarge Volume A to the desired panel of information on station metadata and (2) give to Volume A, with both syntactic and semantic design, the status of standard that we need for international exchange.

[1]Open Geospatial Consortium : to serve as a global forum for the collaboration of developers and users of spatial data products and services, and to advance the development of international standards for geospatial interoperability.

16 Suggestion on Volume A Implementation

- Volume A as a database, and not a flat file, appears as a necessity in terms of timely data exchange. It is suggested that the Ocean Data Acquisition Systems (ODAS) metadata could be considred as an example of how to set this up. ODAS metadata are part of a database that is easily accessible and that contains beginning and end dates of activities of the stations. Metadata is queriable through the web (http://www.argo.gov.cn/odas/access.aspx, 28 March 2012) and could be directly updated by the owners of the stations.

- A specification phase for the metadata including climatologists and IT professional team appears necessary. This phase would have to take into account:
    - all the work done so far (Mr Harald Daan report, CATREP development, etc.)
    - the implementations that already exist like the database implementation of Volume A by the DWD[2] (DWD_Web Map Service), the Russian Federation with its WIS_DCPC_WFS (POSGIS database), also the demonstration on stations discovery in WIS (WMO 2009a page 7), etc.
    - requirements coming from WMO and its different Programmes and Commissions.

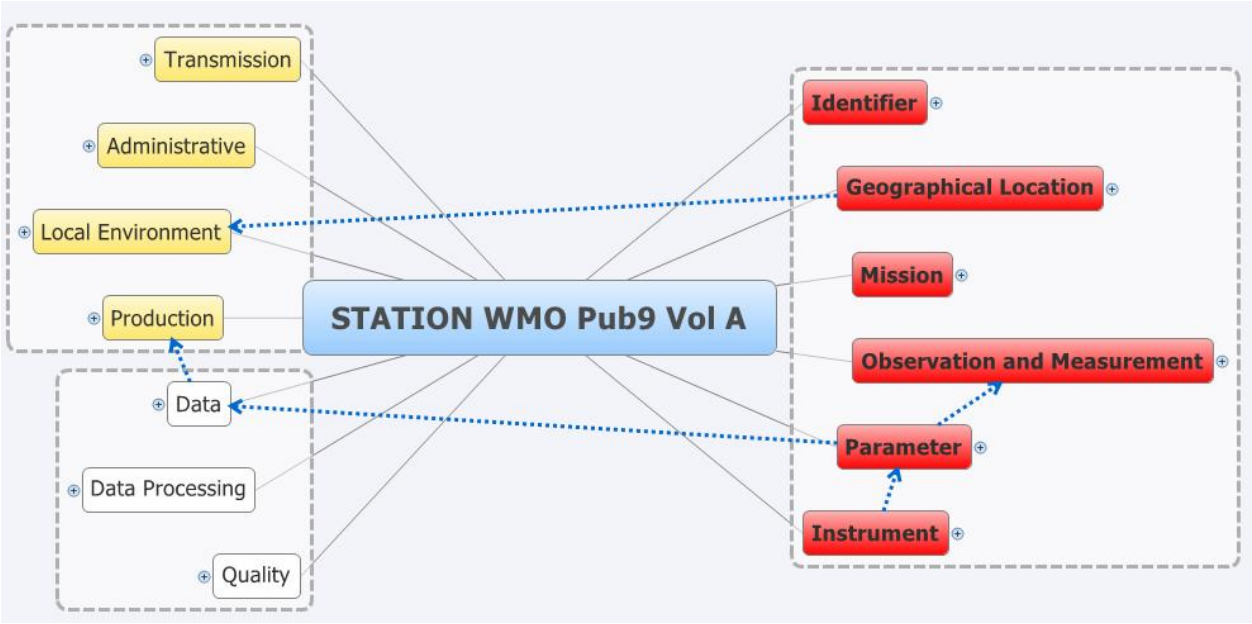
- Maintaining such database application with web facilities may prove to be expensive in budget and/or human resource (development, maintenance, etc.). This task, if not handled directly by WMO in its premises, could be given to a World Centre mandated by WMO.

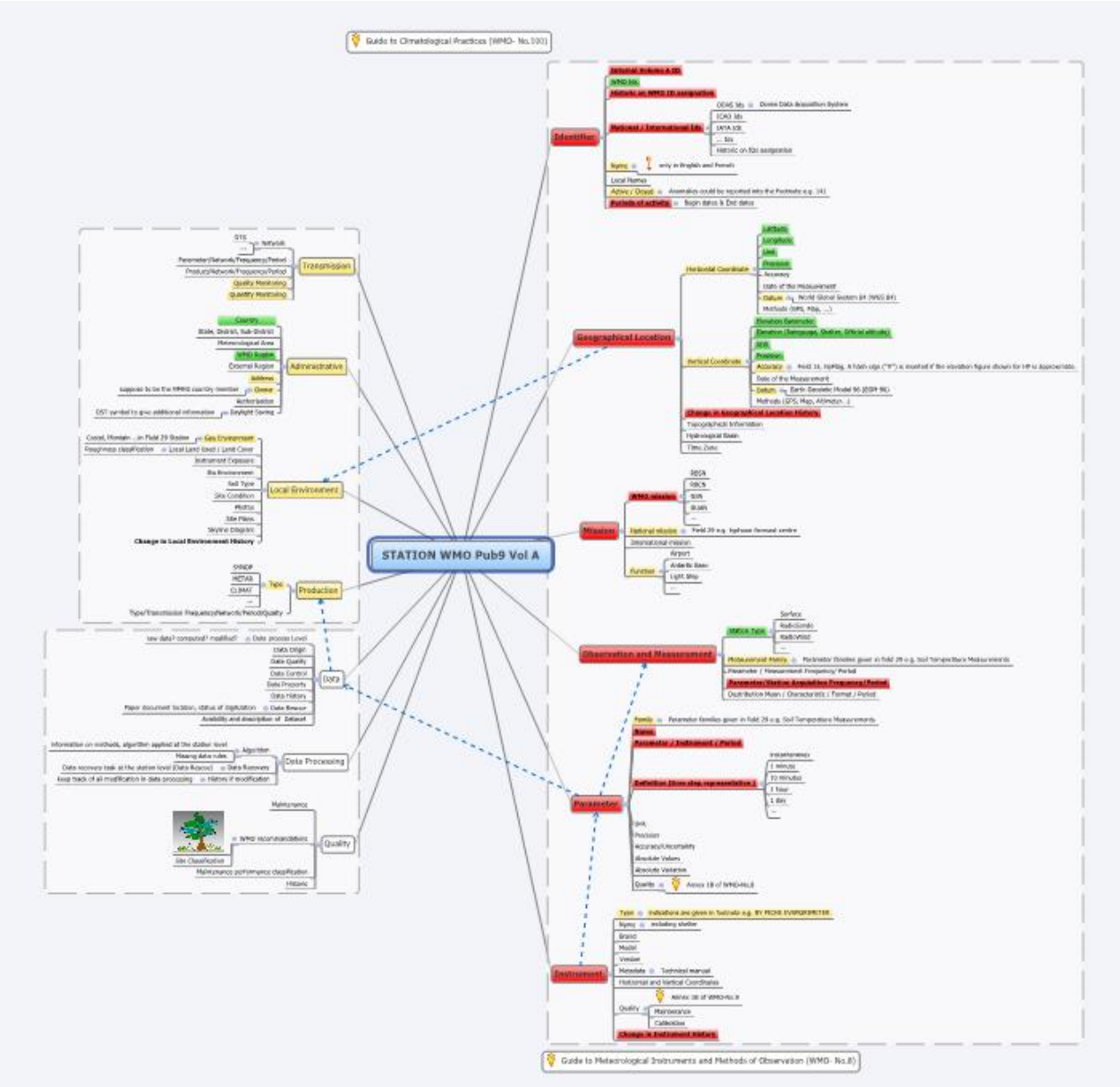
2 Deutscher Wetterdienst

17 Proposal for climatological needs on Volume A

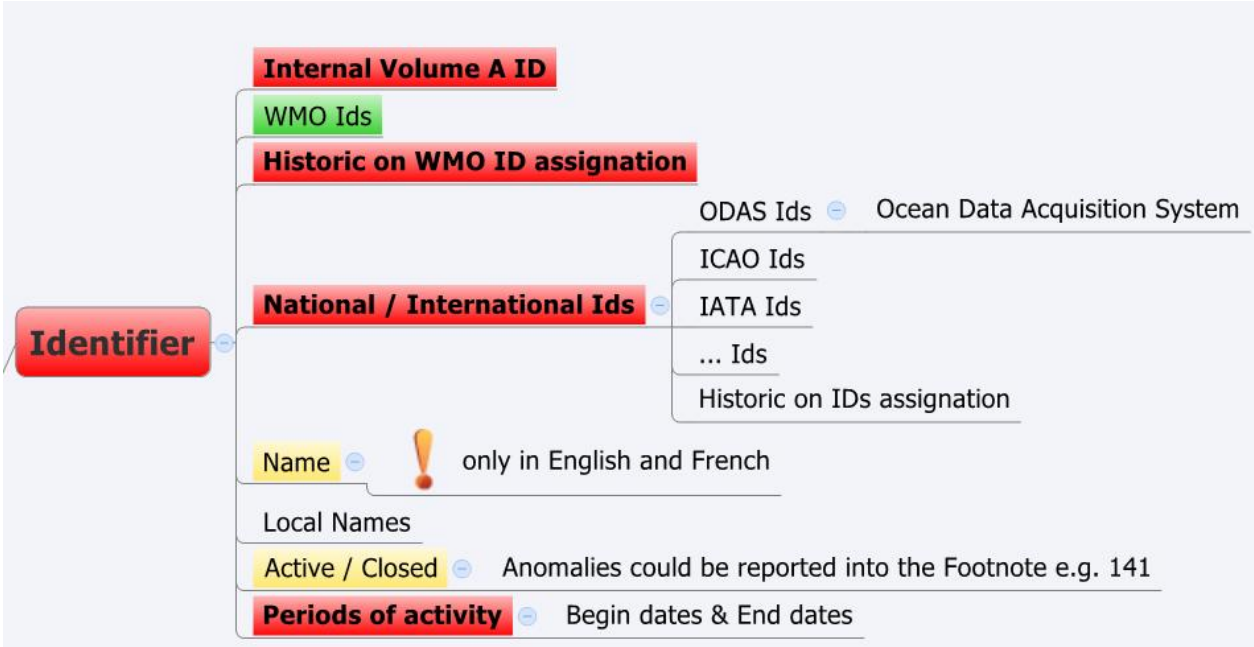
Here below is a synthetic representation of station metadata divided into 12 characteristic boxes. Colour coding indicates current thinking as to whether the desired information exists (in whole or part) and whether it is needed. The meaning of the box colour is as follow:

In bold red	At least one element essential for climatological purpose is not present
No color	The Volume A does not give information on this characteristic; if this characteristic is recommended for climatological purpose it does not represent the "essential minimum"
In yellow	The Volume A gives partial information on this characteristic and more detailed information is needed for climatological purpose
In green	The information given by Volume A is sufficient for climatological purpose




Guide to Climatological Practices (WMO- No.100)
STATION WMO Pub9 Vol A
Identifier
Geographical Location
Mission
Observation and Measurement
Parameter
Instrument
Transmission
Administrative
Local Environment
Production
Data
Data Processing
Quality
Guide to Meteorological Instruments and Methods of Observation (WMO- No.8)

17.1 *Identifier*



17.1.1 Periods of activity

Gives all the periods of activities for each station. It allows to keep in the Volume A not only the stations operational but also all the ones which were operational in the past. It keeps equally the periods where possibly a stations was not operational. (WMO 2002 section D)

17.1.2 Historic on WMO ID assignation

In Volume A each station is given a WMO Id. It could happen that this WMO Id has been assigned to different operational stations during the history of Volume A. e.g. the WMO Id given to station B in 2012 could be assigned to station C in 1965 which was located far away from station B. There is here a risk for a user to combine data with different origins. Keeping the temporal change in WMO id assignation is a solution to prevent such problem.

17.1.3 National /International Ids

National and international Ids are very useful for data access (WMO 2002 section A). The historic on Ids assignation, as the WMO Id, should be present.

17.1.4 Name

Volume A offers only French and English languages. This should be extend to allow internationalisation capacity to the future system.

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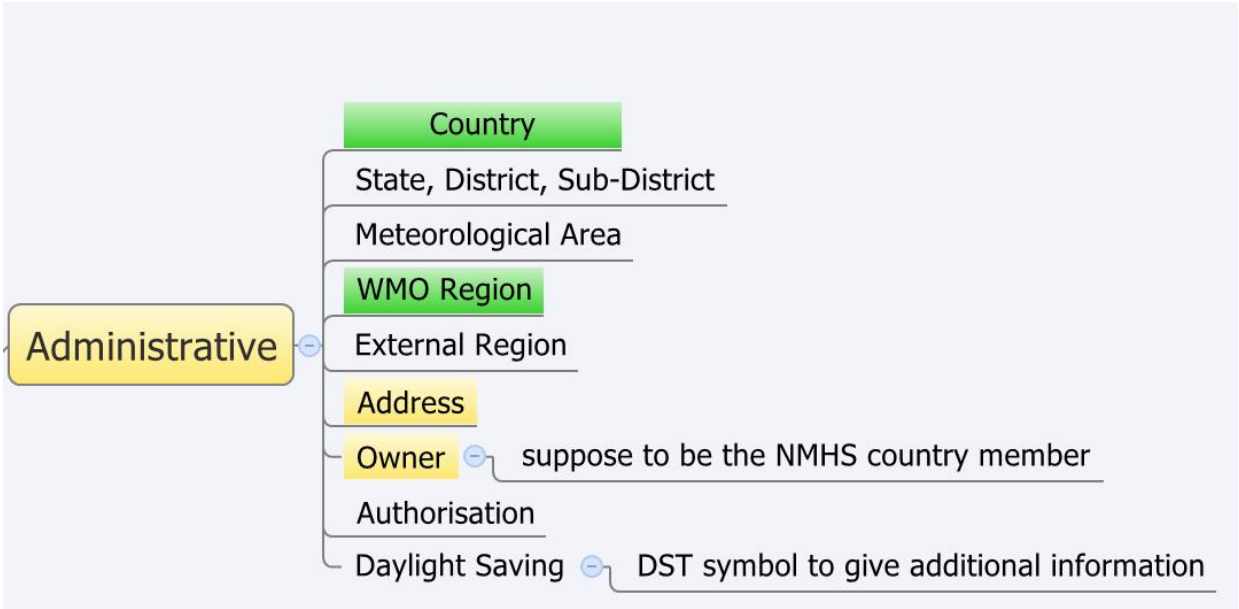
In green	The information given by Volume A is sufficient for climatological purpose

17.2 *Administrative*



17.2.1 Address and Owner

That information is not explicitly given in Volume A.

In bold red	The Volume A does not give information on this characteristic which is consider as essential for climatological purpose
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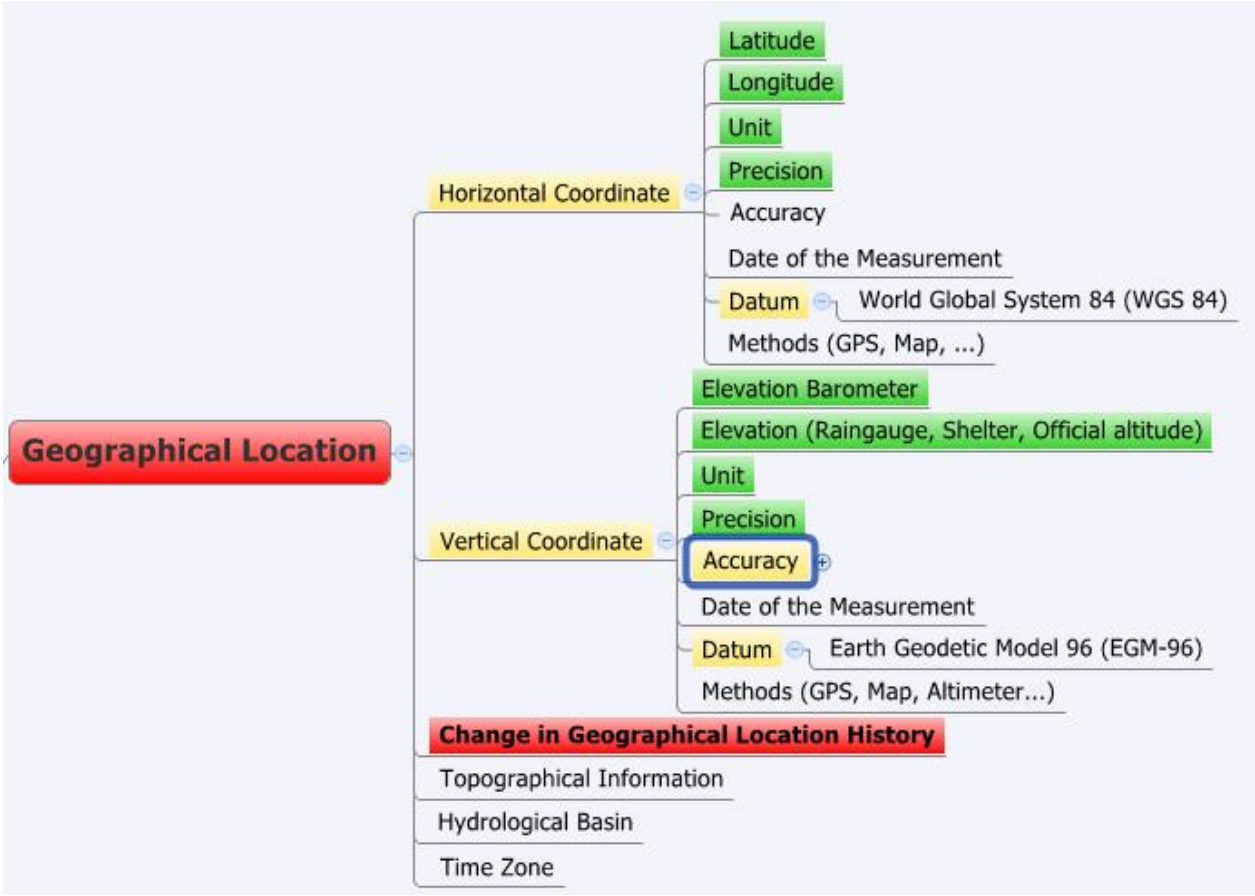
Geographical Location



17.2.2 Change in geographical Location History

Allow keeping the different locations a station has had during its history.

17.2.3 Precision & Accuracy

If the precision is known (second for horizontal coordinate and millimetre for the vertical coordinate) the accuracy of the measure, which belongs to the method used, is unknown in Volume A.

17.2.4 Datum

Not explicitly given in Volume A

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17.3 *Local Environment*

17.3.1 Change in Local Environment History

Important to add.

17.3.2 Geo Environment

See WMO 2002 section C.

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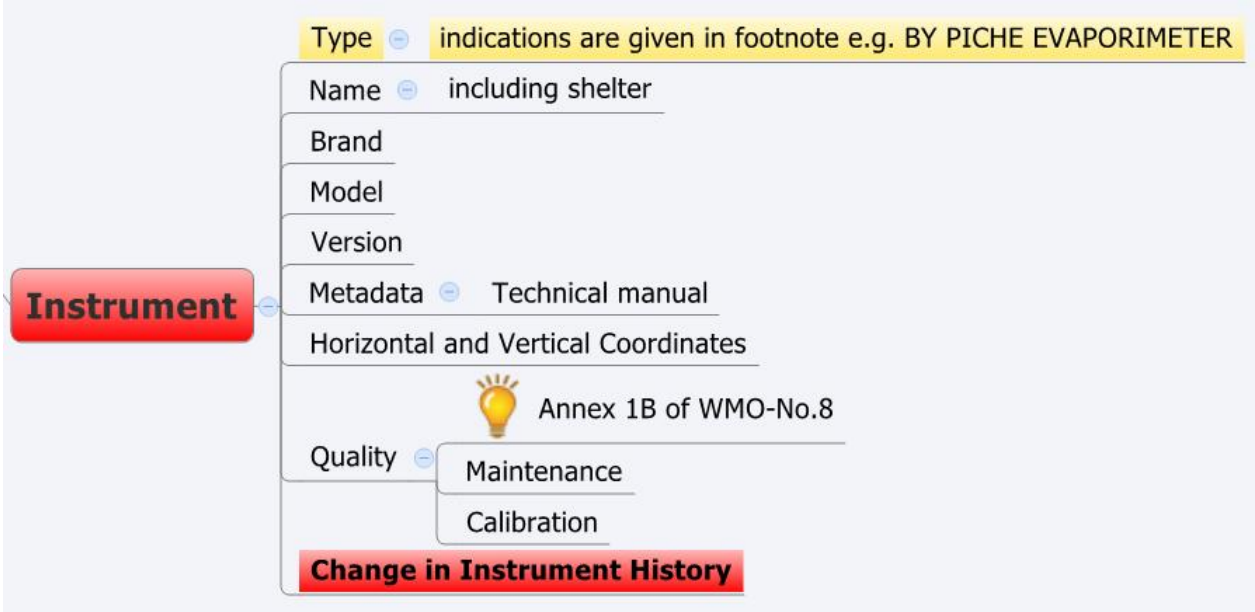
17.4 *Instrument*



17.4.1 Change in Instrument History

Allow keeping track on instrument changes

In bold red	The Volume A does not give information on this characteristic which is consider as essential for climatological purpose
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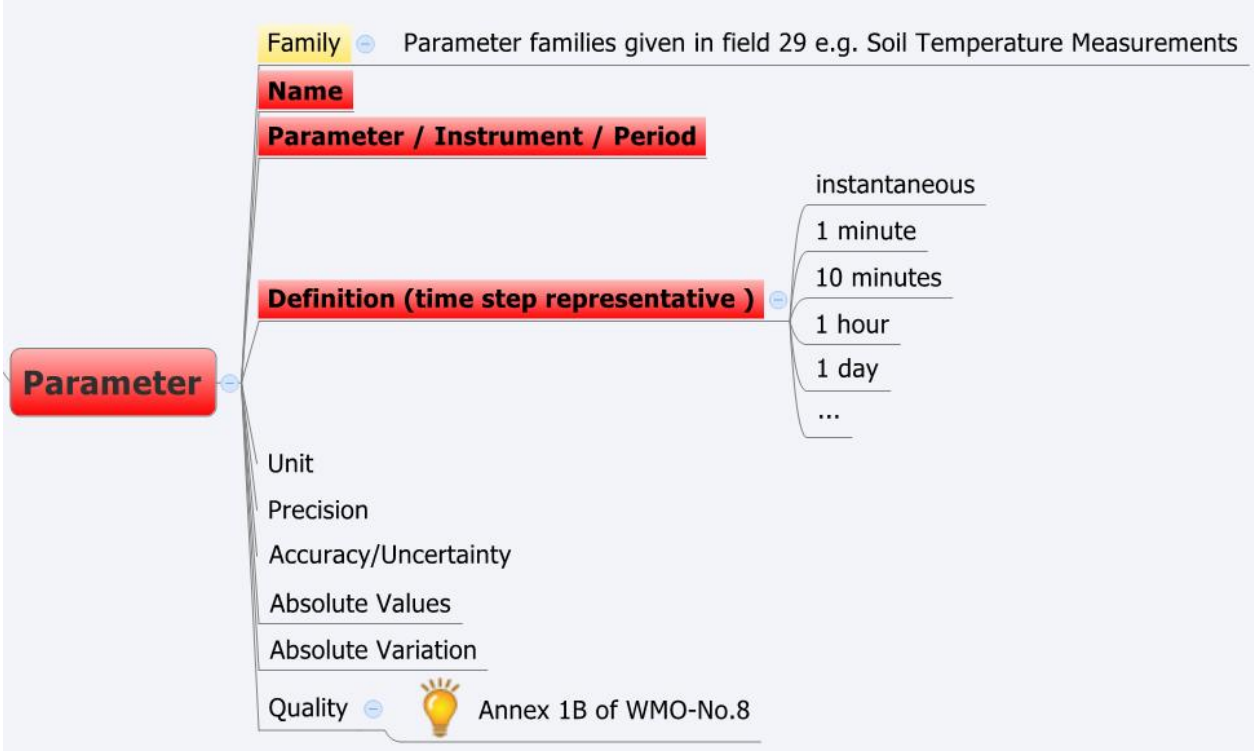
17.5 *Parameter*



17.5.1 Parameter / Instrument / Period

At the station level an instrument measures a parameter but the instrument is subject to change during the history of the station, e.g.:

- Minimum daily parameter measure in New York station with a Minimum thermometer (brand, model, version, etc.) from 1928 to 1998
- Minimum daily parameter measured in New York station with a Temperature Sensor (brand, model, version, etc.) from 1999 up to now

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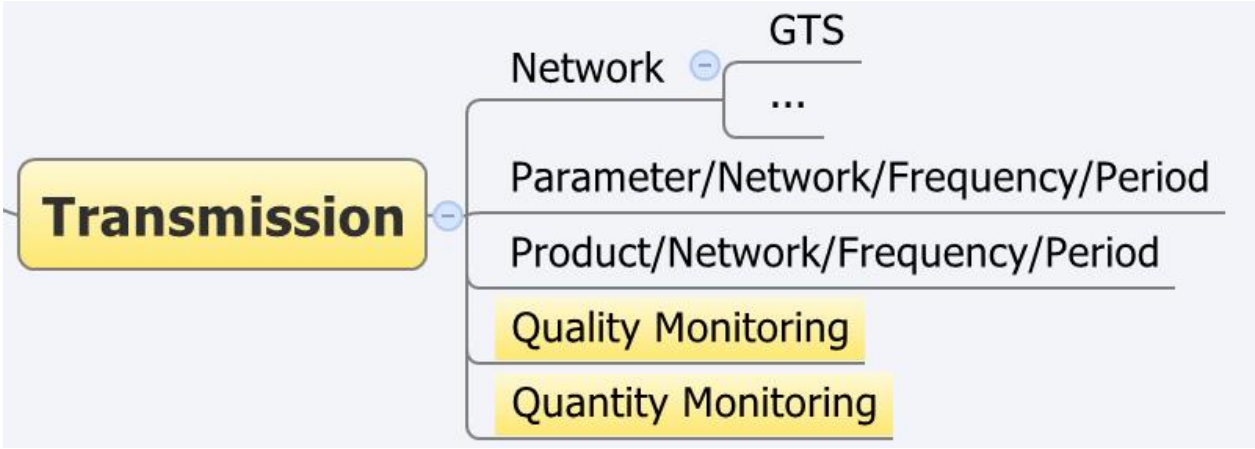
17.6

17.7 *Transmission*



17.7.1 Quality Monitoring and Quantity Monitoring

See WMO 2002 section M

17.7.2 Product/Network/Frequency/Period

See WMO 2002 section Ha

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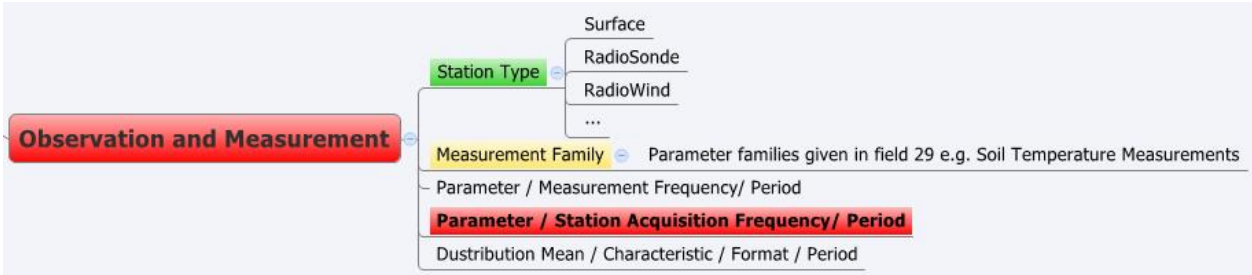
17.8 *Observation and Measurement*



17.8.1 Parameter/Station Acquisition Frequency/Period

Allow to know the theoretical contents of the station database in term of parameter values.

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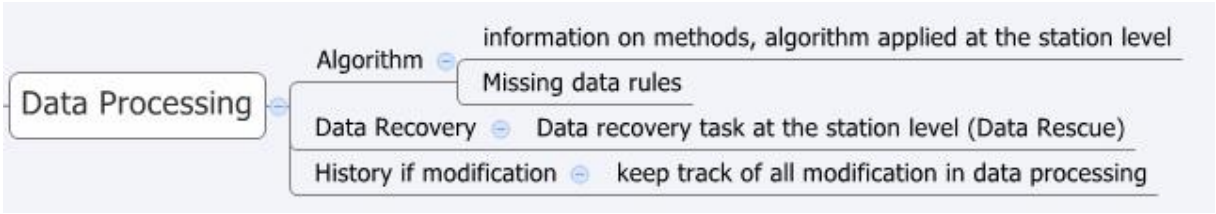
17.9 *Data Processing*



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17.10 *Mission*

17.10.1 WMO Mission

See WMO 2002 section E

17.10.2 Function

See WMO 2002 section B

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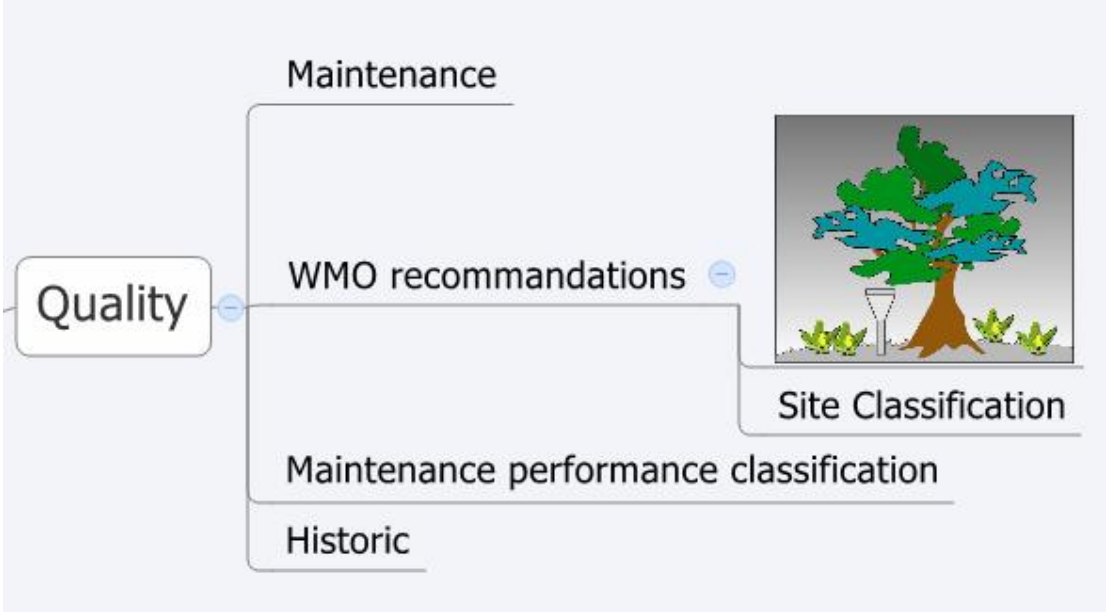
17.11 *Quality*



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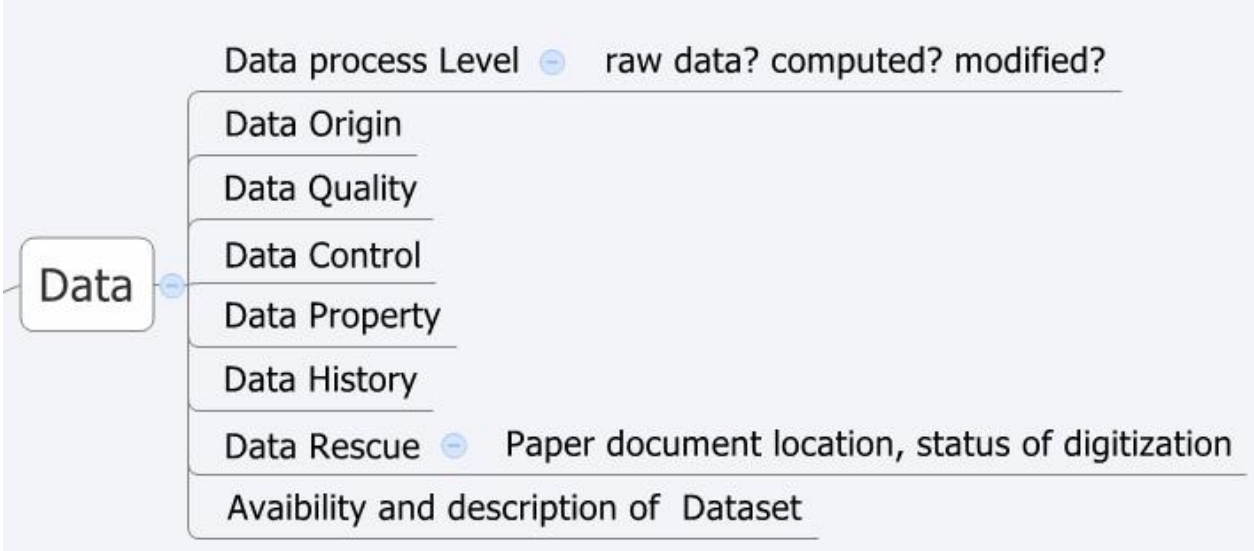
17.12 *Data information*



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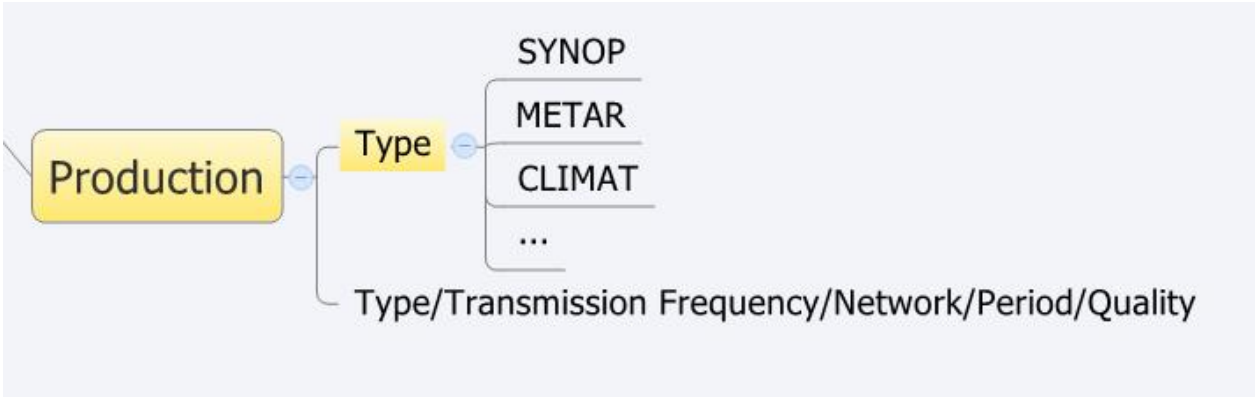
17.13 *Production*



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Annex 4

Information coming from HMEI[3] and others CDMS's suppliers or CDMS's developers

1. **CLDB from MicroStep-MIS** 48
2. **Clidata CDMS from Ataco** 48
3. **CliDE CDMS from the BoM** 50
4. **Climsoft CDMS** 50
5. **CliSys CDMS** 54
6. **Cliware CDMS from the Russian Federation** 54
7. **JCDMS CDMS** 56

CLDB from MicroStep-MIS

Information coming from Kamil Poturnaj poturnaj@microstep-mis.com, 19 April 2012

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Installation and/or training

2011	Saudia Arabia, PME database for automatic stations network
2011	Oman, Meteorological Department – central climatological database upgrade and training

3 The Association of Hydro-Meteorological Equipment Industry

2011	Malaysia, MMD - finished project central database for climatological, air pollution, marine and seismological data
2011-2012	8 central climatological/environmental databases for large automatic station networks in various countries
2011-2012	UAE NCMS - central climatological database upgrade and training

Development and/or future plan

Finished development for fully web based user interface

Near future plans / development in progress

support for open source database engine
support for WIS

Station Metadata schema

Structure of the CDMS Station Metadata Schema

Station metadata implemented according to the WCDMP No. 53 – Guidelines on climate metadata and homogenization

Application(s) on Station Metadata Schema

Station identifiers, images, and local geography and environmental data, instrumentation management and observation description, station local QC

Any other domain

Automatic coding and decoding of CLIMAT and SYNOP code in TAC as well as TDCF (BUFR, CREX) form.

Clidata CDMS from Ataco

Information coming from Pavel Svidrnoch (16/03/2012)

Installation and/or training

2010	Trinidad & Tabago, Implementation, Training
	Cyprus, Implementation (not finished due to problems on user side), Training
2011	Jamaica, Implementation, Training
	Latvia, Update, Training
2011/2012	ASECNA (Senegal, Dakar) Implementation, Training

Development and/or future plan

Station Metadata schema

Structure of the CDMS Station Metadata Schema

Application(s) on Station Metadata Schema

(Which kind of information on station metadata, in the operational production, the system offers to its users)

Any other domain

CliDE CDMS from the BoM

Information coming from Andrew Howard (16 Apr 2012)

Installation and/or training

2010-Oct	Samoa (pilot)
2011-Feb	Kiribati
2011-Mar	Tonga
2011-Mar	Vanuatu
2011-Apr	East Timor
2011-May	Solomon Islands
2011-June	Palau
2011-June	Fed States of Micronesia
2011-Jul	Tuvalu
2011-Aug	Niue
2011-Sep	PNG
2011-Oct	Cook Islands
2011-Oct	Fiji
2012-May	Nauru (planned)

Development and/or future plan

Follow up visits for further training and tech support planned for 2nd half 2012 and 2013 (PACC-SAP funding ends June 2013).

Planning timeframes are short due to project funding, however plans are being made with the assumption that the original CDMS investment will be supported in future.

Short term: (to end of PACCSAP). Fix known bugs, improve functionality for data rescue (ingestion, key entry, data gaps reporting, METAR/SPECI ingest). Secure off-site backup.

Medium Term: Further technical support for data management. Probably focus on more sophisticated product set...more bug fixes.

Long Term: Re-write to HTML5 (or whatever is current best practice), upgrade platform: Hardware, OS version, Web Server version, Database version, (PHP->Python?)

(keep CliDE relevant and maintainable using robust quality FOSS).

More products and bug fixes.

Station Metadata schema

Structure of the CDMS Station Metadata Schema

Basic Metadata:

-Status (open, closed, damaged...(user defined))

-Start/End Dates

-Primary/Secondary name

-Station operator

-Country

-Region/Catchment

-Time zone

-Latitude/Longitude

-Station height, Aero height, Seaframe height

-Alternate station IDs: Aero, IMO, Marine, WMO, Hydro, Australian, NIWA, NIWA Agent

-Land use: 0-100M, 100M-1Km, 1Km-10Km

-Surface type, soil type

-Comments

Multiple (one to many) metadata

-Equipment: Type, version, serial no, asset no, height, start date/end date, comments.

-Classification: Station type, description, start/end date, comments.

-Contacts: name, address, phone nos, fax, email, comments.

-Files: Any type of file can be attached to station: Images can be used to document site changes, instrument manuals and historical data can be saved.

-Maintenance Activity: Random maintenance such as lawn mowing and site changes can be entered as freeform text with date stamp.

-Change Audit: All changes from within system are logged with user, date/time, values changed.

Application(s) on Station Metadata Schema

(Which kind of information on station metadata, in the operational production, the system offers to its users)

All station metadata is available via web GUI interface to users with station maintenance ability. Read only view of station metadata is also available in the Quality Assurance pages. Summary and detailed station reports under development will utilise the metadata.

Any other domain

Climsoft CDMS

Information coming from Albert Mhanda 15/04/2012 (a.s.mhanda@bcs.org.uk)

Installation and/or training

2010	Climsoft Version 3 (latest version) was tested in Botswana, Sierra Leone and Uganda. Two of the Climsoft developers, Samuel Machua and Albert Mhanda were involved in the onsite testing.
2011	Following system testing in 2010, onsite implementation and training of Climsoft Version 3 was carried out in Madagascar (by Samuel Machua) and Zambia (by Albert Mhanda). The implementation in Zambia was part of the "Localisation Project" sponsored by the Met Office, UK. ComputerAid provided refurbished PCs for use at outstations. In Madagascar, the training included use of Climsoft for generating TDCF messages in CREX and BUFR. Further training on Climsoft, funded by the Met Office to strengthen capacity for the Localisation Project in Zambia, was carried out at ACMAD for three nominated officers from the Zambia Met Department.

Development and/or future plan

In terms of WIS, a preliminary demonstration project for interfacing Climsoft with WIS was carried in 2010. The main focus of the project was on developing features to enable generation of metadata output in XML from the Climsoft database, in a flexible manner according to any specified schema, particularly to meet the requirements of WIS. Output suitable for viewing could be displayed in a web browser and automatically refreshed through the use of PHP scripts. The project achieved the intended objectives.

The next step would be to add appropriate facilities for searching within a web environment and provide an easy mechanism for updating the metadata at a DCPC or NC. One of the development tools that has been considered most suitable to meet this requirement is the open

source RAMADDA, from Unidata. RAMADDA is a web-based content management and repository system, publishing platform and collaboration environment for the Earth Sciences.

Station Metadata schema

Structure of the CDMS Station Metadata Schema

Application(s) on Station Metadata Schema

(Which kind of information on station metadata, in the operational production, the system offers to its users)

Climsoft V3 has provision for storing and retrieving metadata information on station location including movement of a station from one location to another. Information on multiple opening and closing of a station at the same location can also be stored.

There is also a facility for information on the beginning and ending dates for the measurement of different elements at a station, instruments used and the height of the measuring instrument. Details of the instruments can be stored as well e.g. instrument model and manufacturer etc.

Other station information includes, station type (climate, synop, upper air etc), authority responsible for managing a station (e.g. NMHS, Ministry of Agriculture), observation schedule and physical features associated with a station.

The typical formats for station information extracted from Climsoft are csv and XML.

Any other domain

Data Inventory

Climsoft produces detailed inventory on availability of climate data at a station according to observation elements. An inventory report is generated in XML and can be viewed in a browser using a pre-designed stylesheet. This output can be included as part of metadata information for WIS. Pinpointed information is also provided on the exact data gaps for each element at any selected station.

Special Products

In addition to the standard data products e.g. daily, 10-day, long-term means and extremes, Climsoft produces outputs for special applications like RClimDex (for Climate Change Indices).

Synop messages are now generated in CREX and BUFR.

Storage of Paper Images

Latest version of Climsoft (version 3) can store images of meteorological paper records for easy retrieval e.g. during quality control.

Localisation of data entry

Following examples in Kenya and Uganda, an increasing number of NMHSs in Africa are using or planning to use Climsoft for local data capture at outstations and send digitized data to headquarters rather than sending the traditional paper returns.GDCLIM from Marocco

Information coming from

CliSys CDMS

Information coming from C.BERGERON – MeteoFrance International – cedric.bergeron@mfi.fr (19/04/2012)

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Installation and/or training

2010	Swaziland Upgrade
2010	India – Pune National Data Center
2011	India – Delhi – Disaster Recovery Center
2011	Luxembourg – Civil Aviation
2011/2012	Qatar Upgrade
2012	Indonesia
2012	Madagascar Upgrade

Development and/or future plan

Main developments in 2011:

- WIS CLISYS DCPC Compliancy With OPENWIS (Core founders: UK MetOffice, Meteo France, Australian BoM, Korean MetAgency,Meteofrance International) solution

- Open Geospatial Consortium Compliancy (GIS -> WMS, ...)

- Many user oriented functionalities to ease Climate local practices

- Regional Climate Centre Approach (Unified Platform for several countries)

- Data Rescue Component

→ **Modular CDMS solution design for LOW BUDGET**

Future Plan:

Implementation of series homogenization tools

Automatic Climate Indexes Calculation (From ETCCDI group)

Station Metadata schema

Structure of the CDMS Station Metadata Schema

Application(s) on Station Metadata Schema

- *XML Catalogue of MetadataStation*
- *Station Reporting tools*

Any other domain

- Standard Implementation: Messages for World Weather Records Generation
- Standard Implementation: Aerodrome summaries generation

Cliware CDMS from the Russian Federation

Information coming from Mr. Alexander Besprozvannykh (22/03/2012)

Installation and/or training

2010	Armenia
	Belarus
	Kazakhstan (2 – Alma-Ata, Astana)
2011	Mongolia

Development and/or future plan

The main project but not single is CLIMATE DCPC of WIS. Basic DCPC was created and now a project to add CLIMATE data to DCPC in using the CliWare CDMS.

http://portal.dcpc.meteo.ru/ – current version of DCPC

Station Metadata schema

Structure of the CDMS Station Metadata Schema

Table Passport

Application(s) on Station Metadata Schema

(Which kind of information on station metadata, in the operational production, the system offers to its users)

Any other domain

JCDMS CDMS

Information coming from Mohammad Samawi (msemawi@yahoo.com) the 11/04/2012;
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Installation and/or training

Development and/or future plan

Station Metadata schema

Structure of the CDMS Station Metadata Schema

Application(s) on Station Metadata Schema

(Which kind of information on station metadata, in the operational production, the system offers to its users)

The status of the latest news on JCDM:

(1) JCDM is still working at our NMSs; it's stable and satisfy the user requirements.
(2) JCDM is able to give product on station information.

The following screen shot shows the information that JCDM can provide.

(3) Jordan Meteorological Service in the near future is planning to upgrade the JCDM to fulfil CDMS and user requirements in many aspects.

- **Ability to manage station visit and instruments maintenance.**
- **Ingest GTS format (TEMP, SYNOP, METAR ,PILOT & CLIMAT)**
- **Web application.**
- **More products**

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