Trends and Challenges: National to International Networks

Global earth observing system of systems,

Disaster prevention and mitigation,

WMO Quality management Framework,

WMO Information System.

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1. Introduction

This keynote paper is intended to provide some information on the cross-cutting issues between the Technical Commissions of WMO to which CIMO is expected to contribute or promote in the next intersessional period.

One of the problems that face CIMO is that when supporting the work of the IMOP Programme, many of the policy decisions for the operational surface and upper networks are made in CBS and the link between the two commissions is not always strong.

So a CIMO session dealing with organising networks may seem an anomaly. However, the separation of technical experts away from network organisation is a dangerous policy, especially when the technical expertise within network management is not always adequate for dealing with the problems that arise.

Certainly, in some national meteorological services the separation between development process and operations seems to lead to a divided responsibility for the resultant quality of observations which often leaves both the customers and the technical experts confused or frustrated.

In the wider WMO context, the technical experts dealing with some observing systems, such as surface AWS issues, sit in both CBS and CIMO committees and this leads to a more unified approach. However, this is not the case for systems such as the upper air network. Thus it will be to everybody's advantage if the policy's associated with the WMO Integrated Global Observing System are initiated, so that a start is made on eliminating these divisions and a more unified approach is made to dealing with the performance of operational networks as a whole.

It is really important for CIMO:

- To be seen to be delivering measurements to the standards required.
- To be performing the intercomparison tests that are necessary for current and future networks
- To make meaningful contributions to the calibration of all ground-based observing systems, such as surface, upper air, ground based remote sensing, including weather radar and lightning detection, atmospheric radiation.

- To develop new quality evaluation procedures suited for automated observing systems whether surface or upper air or ground based remote sensing.
- To provide meaningful advice on identifying and eliminating unacceptable errors in all of these systems, e.g. on correction procedures for these systems
- To provide advice on identifying and rectifying failures in complex automated systems which often function correctly for many years, but then suddenly deteriorate.
- To promote international collaboration to update equipment in parts of the observing system that is failing through poor design or obsolescence.
- To promote calibration practices worldwide through effective Regional Instrument Centre practices
- To promote training of suitable technical staff and scientists for the future in all types of observing system
- To encourage development of observing practice worldwide including the necessary documentation so that uniform standards of measurement can be achieved.
- To develop a suitable pool of international experts who can be deployed to resolve significant observing system problems when these occur in the global networks.

It will be seen that in many of the cross-cutting issues that CIMO is asked to address, CIMO's contribution is expected, but may often not always be clearly separated from the responsibilities of CBS. For instance, with the WMO Information system, observations are expected to be made available to a very wide range of customers, but in what detail, with some climatologists requesting access to information which has traditionally been considered raw data and mainly dealt with by CIMO experts.

CIMO intends to take these cross-cutting issues seriously, with members of the Management Committee responsible for each of the main issues. However, steps will have to be taken to get the Management Committee to function more as a unit than has been possible up to now. Pressures of work in national services make it extremely difficult for good experts – who inherently are very busy – to make the time. In practice committees like this only seem to work really effectively, if they have plenty of meetings- so the Commission will have to make some judgment about the working practices and the resources made available for the work. In this context, the use of experts with more of a managerial role than the leading technical experts did not alleviate the problems, because dealing effectively with IMOP work requires technical knowledge and there is no real substitute for this knowledge.

Thus it is essential that CIMO ensures that new international experts are developed for the future and in this context it should also ensure that there is a better gender balance in its work in future.

2. Global earth Observing System Of Systems

For the Observing systems supported by the IMOP Programme, the relevant member of the management Committee, Rainer Dombrowsky [USA] responds to requests from the GEOSS Office in WMO, indicating where CIMO has been active in testing equipment to improve the stability of networks such as the upper air network or for standardising the quality of surface observations.

To some extent at the moment, it is probably safe to assume that if CIMO is performing the work required by the Global Climate Observing System (GCOS), i.e. intercomparing operational observing systems, promoting quality improvement and facilitating capacity building, then for the moment it should satisfy the initiatives required by GEOSS.

However, it should be recognised that GEOSS also requires meteorological observing systems to satisfy the requirements of other earth observation sciences, and in this context water vapour in the lower troposphere is one of the meteorological variables that affects the measurement quality of many of the satellite based techniques for these other sciences. Thus, it seems wise that CIMO aim to improve its technical expertise and its support to the measurements of water vapour, one of the variables that has been neglected to some extent in the development of operational upper air quality evaluation procedures.

Similarly, GEOSS programmes also place emphasis on mitigating the effects of natural hazards so it seems wise that CIMO should place some emphasis in supporting weather radar and lightning detection operations, and also studies to optimise the use of weather radars and lightning detection systems together with future upper air networks, rather than treating them as totally independent measurement networks.

In attempting to satisfy the requirements of climate studies, considerable efforts have been made by CIMO experts to support efforts to improve the functioning of the GCOS Upper Air network, (GUAN). These efforts have highlighted that there are rather few technical experts with the necessary experience available to work on these issues- a problem which needs to be addressed for the future. One frustration is that there are considerable differences of opinion within the climate community as to what is actually required for the future. Also there has also been a deficiency in the quality of technical advice that has often been offered to the climate scientists. CIMO needs experts that are at ease dealing with the scientific community and able to explain the practical difficulties involved in achieving what is required. Climate scientist would like no change in observing systems, but this is not possible if the equipment is to remain a reasonable price, giving the rapid change with time in the availability of specific computers and electrical components. So it is necessary to establish policies that allow for these changes without increasing the costs of operations too much.

GEOSS and GCOS requirements rely heavily on national observing policies to remain stable and deliver a very stable system. However, with the drive towards numerical weather prediction models with high spatial and temporal resolution, networks such as the conventional surface and upper air networks need changing to allow necessary data coverage to be obtained by a variety of means, not just the standard surface observations and the standard radiosonde observations which are used now. Thus, CIMO needs to make this clear to the relevant bodies and start a dialogue process that allows the necessary policies to be developed. Here technical experts and technical studies of the error characteristics and data observing capability of the various systems proposed seem essential, and within Europe it is hoped to cover this with a COST project to co-ordinate the studies.

3. Disaster prevention and mitigation

As with GEOSS, the CIMO Management Committee, through the efforts of Rainer Dombrowsky [USA] has been keeping in touch with the Programme Office at WMO for this activity. Here, it seems probable that some efforts at capacity building or technical advice may be required for specific projects which are being given the highest priority by WMO. The main areas of activity for CIMO would probably be in hazard observation, detection and monitoring, provision of hazard metadata and providing observations to support pre- and post- disaster emergency response and relief operations.

Hazards listed relevant to CIMO observing responsibilities include:
Tornado
Tropical cyclone
Lightning
Hailstorm
Strong winds
Hazards to aviation [turbulence, icing, downbursts]
Flooding- river, flash, coastal, storm surge
Freezing rain
Sandstorm
Forest fire
Smoke, dust or haze
Dense fog

Thus, lot of activities will be associated with observing and mitigating the problems associated with cyclones, hurricanes and typhoons including flooding in low-lying coastal areas. Here, CIMO would benefit from some input from the countries where the problems are most critical. The areas where it would be most beneficial to give technical advice and capacity building need to be identified, and it would be expected that this would include advice on hardening observing installations and communications to survive severe natural storms and disasters.

The scope of this activity also extends to such problems as observing in blasting sandstorms, tracking of locusts, and identifying extreme temperatures.

Thus it is requested that at the Commission meeting the countries involved will come with specific proposals for CIMO actions in the next intersessional period.

4. <u>Quality Management Framework</u>

The CIMO Guide [WMO No. 8, Sixth Edition] had a chapter, Part III-Chapter 3, on quality management issues. During the last intersessional period Ray Canterford [Australia} was active in attending crosscutting meetings associated with this area on behalf of CIMO. Furthermore, CIMO experts, Rolf Gauert (Germany), Bruce Forgan (Australia) have revised the chapter of the CIMO Guide for the seventh edition during 2006. The revised chapter includes more information about the ISO-9000 family of standards and the WMO Quality Management Framework. This latter framework gives basic recommendations that are based on the experience of many national Hydrometeorological Services. This QM framework is a guide for members,

especially those who have little formal experience in a formal Quality Management System

Thus, CIMO has indicated procedures which should lead to good quality management of observations from the IMOP Programme networks, yet as Co-Chairman of the Upper Air OPAG and it predecessors for 16 years I know that during that time, certain areas of the upper air network in the Global Observing System have had sub-standard radiosonde observations which have not been significantly improved in those 16 years. Here, I believe the Quality Management is inadequate because it does not approach the problems on an international scale or deal with the difficulties of setting up projects to rectify problems in a manner suitable to all parties.

In any case, observations are one of the areas where quality is critically important and it seems necessary that we participate with other technical commissions in developing ideas and improving advice to Members on the methods to improve and sustain observation quality.

If we look in Dr. Gaffard's keynote presentations about Upper Air measurements, it can be seen that the users in Europe are not using many of the wind profiler wind measurements, where really large sums of money have been spent to extend the observations up to about 16 Km. In this case it appears that if the system has had a failure for a short time and poor measurements have got onto the GTS then the users stop using the data for the next year even if the problem was cured in a week.

In some countries this type of failure seems to be partly the result of restricting the development time spent on some new observing systems, so that technical experts get the systems to work correctly initially, but are not allowed to develop the procedures to ameliorate the effects of system degradation which may not occur until 3 or 4 years later. This problem can be particularly pronounced if a country buys a system, but then does not have the technical expertise to deal with failure modes that inevitably occur. CIMO needs to establish better ways of dealing with issues like this and to recommend a better process for this work. Developing procedures to sustain operations is as important as initially developing or purchasing the system

With radiosondes, at least half of the world's radiosondes can measure relative humidity to a useful accuracy down to temperatures of about -70 degrees C. However, most users still only use the measurements down to temperatures of -40 degrees C. Should pressure be brought on the other radiosonde operators to improve their relative humidity measurements, since the accuracy of the other measurements falls well outside modern user requirements? How does CIMO retain its credibility in this area when scientists are criticising the wide disparity in measurement standards?

What should CIMO do when a widely used system clearly has large measurement errors, see the report on the WMO Radiosonde Training Workshop in region III in this TECO, but the relevant HMEI representative does not give advice to the users about how to eliminate this problem? Thus, Quality management for observations entails liaison with manufacturers, both in telling about problems but also receiving clear and relevant advice. This again is an area where working relationships seem

substandard and more effort is required to develop better procedures, possibly on a regional basis.

CIMO will continue to be active in this area working with other Technical Commissions to improve the procedures and guidance material. As with other issues it is important that members come to the Commission with specific proposals, if they are aware of specific deficiencies or can see ways of improving for the future.

5. WMO Information System

The WMO Information System, (WIS), is an overreaching approach to meet information exchange requirements of all WMO Programmes It is intended to help WMO to avoid data incompatibilities and problems in sharing data between various programmes. It will ensure interoperability of Information Systems between WMO Programmes and outside of the WMO community.

It is clear that the IMOP Programme falls within the remit of this system. The precise consequences for CIMO have yet to be clarified and much of the lead in dealing with the development of the system is being undertaken by CBS. CBS is pursuing a leading technical role under the coordination of the Inter Commission Coordination Group on WIS (ICG on WIS). One area where it seems sensible that CIMO provide Technical advice is to the Inter-Programme Expert Team on Metadata Implementation (IPET-MI) and CIMO needs to keep track on how this team progresses, since in many cases CIMO has specialised knowledge of the requirements for Metadata associated with specific observing systems.

Another area where CIMO will have to consider its working processes will be in the methods used to make Intercomparison data and test results readily available to the wider community, and it may be necessary to identify an expert to deal with these issues. There may also have to be some negotiations with HMEI since in some cases, limitations on full access to results is a condition imposed by HMEI members, who may be partially funding the testing.

Certainly CIMO has received recent criticism for not making its results available in the published literature. This raises the question of who will pay the publication charges which can be considerable for a large paper- and most CIMO reports are not small. Also who pays for the author's time to prepare the publication, when national management wants new projects implemented and not a large number of publications?

Comments

In preparing this paper, I have not had time to prepare a deeply researched treatise- because I have been busy on national issues and trying to deal with a large backlog of WMO work for the CIMO commission meeting + a liaison visit to China. However, I hope I have raised enough issues to provoke some new suggestions for the future and to encourage members to take an interest in these matters. Certainly, the CIMO Management Committee will welcome useful inputs in any of these areas for the future.