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INTRODUCTION

1. The Commission for Basic Systems, in accordance with the decision of the Eighth World Meteorological Congress (1979), developed a plan for monitoring the operation of the WWW which was included in the Manuals on the GOS, GDPS and GTS. The plan was reviewed by CBS-Ext.(80) with a view to increasing the overall efficiency of the monitoring activities. The revised monitoring plan was approved by the thirty-third session of the Executive Committee (presently Executive Council) and the amendments to the monitoring plan were included in these manuals.

2. In 1983 the Ninth World Meteorological Congress was held in Geneva. This Congress adopted a resolution on the World Weather Watch Plan for 1984-1987, which contained a section dealing with the monitoring of the operation of the WWW. Congress felt that all Members should be encouraged to implement the monitoring plan at their centres in order to maintain the efficient operation of the WWW. The importance of the monitoring of the operation of the WWW was re-affirmed by the consecutive sessions of the Executive Council. The Executive Council agreed that the monitoring activities should be intensified in order to increase the WWW operation.

OBJECTIVES

3. The objectives of the monitoring are to improve the performance of the WWW, in particular to increase the efficiency and effectiveness of the operation of the GOS, GDPS and GTS on a national, regional and global level. However, the three elements of the WWW, namely GOS, GDPS and GTS are closely inter-related, therefore the monitoring carried out by the GTS centres would cover almost all requirements of the monitoring for the GDPS and GOS. The monitoring items specified in the plan are as follows:

- (a) Regularity of observations,
- (b) Quality of observational data and correct coding,
- (c) Completeness and timeliness of collection of observational data at the NMC concerned,
- (d) Adherence to WMO standard codes and telecommunication procedures,
- (e) Collection of observational data at RTHs and WMCs,
- (f) Exchange of data and processed information on the GTS,
- (g) Evaluation of the observations and processed information received at NMCs, RMCs and WMCs in respect of their data needs.

4. It is clear, therefore, that the purpose of the monitoring of the operation of the WWW is to enable the rapid and effective detection of deficiencies and the initiation of remedial action, and thus to achieve the 100 percent availability of observational data and processed information as required at NMCs, RMCs, RTHs and WMCs.

REQUIREMENTS OF GDPS CENTRES FOR RECEPTION OF OBSERVATIONAL DATA

5. Weather prediction can only be obtained from precise meteorological analyses, and such analyses are made on the basis of highly reliable observational data which are received at analysis centres in time from a sufficiently dense network of observations. However, requirements concerning the accuracy of observational data, the frequency of observations and the density of the network of observations are dependent upon the different scales of meteorological phenomena to be analysed. As you well know, in the atmosphere various meteorological phenomena in different scales are co-existing; for example, one cell of thunderstorms has only several kilometres in horizontal scale and a lifetime of several hours, but a tropical cyclone has about 1000 kilometres in horizontal scale and a lifetime of 10 days or more and many thunderstorm cells appear and disappear in a tropical cyclone. Therefore, the frequency and spacing of observations should be adequate to obtain observational data which describe completely the state of and temporal spatial changes of the meteorological phenomena. If the spacing of observations is more than 100 km, the meteorological phenomena which have less than 100 km horizontal scale would hardly be detected. The classification of horizontal scales of the meteorological phenomena given in the Manual on the GOS are as follows:

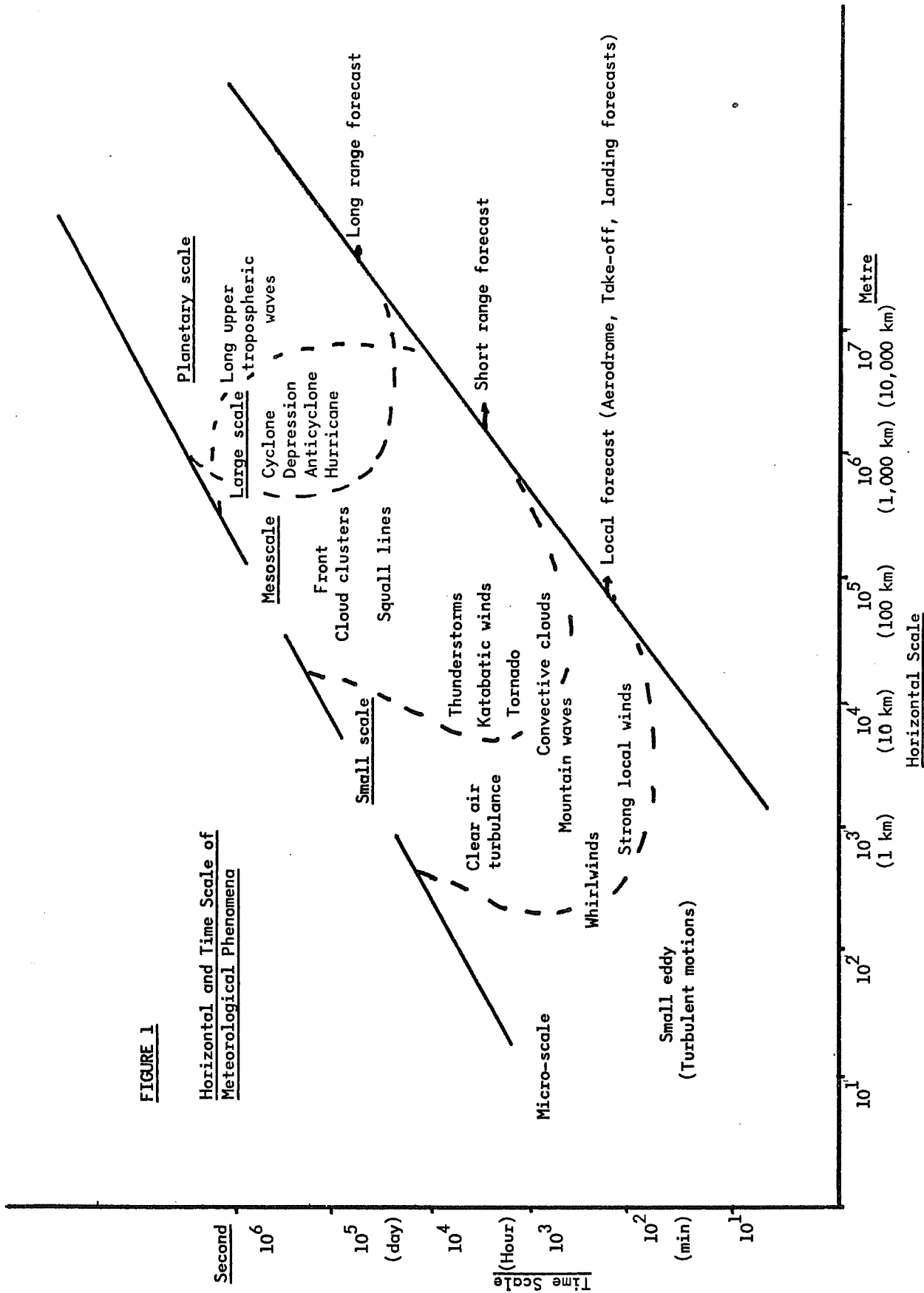
- (a) Small-scale (less than 100 km): for example, thunderstorms, local winds, tornadoes;
- (b) Mesoscale (100-1000 km): for example, fronts and cloud clusters;
- (c) Large-scale (1000-5000 km): for example, depressions and anti-cyclones;
- (d) Planetary-scale (more than 5000 km): for example, long upper-tropospheric waves.

The horizontal scale of the meteorological phenomena is closely related to the time scale of the phenomena. The bigger horizontal scale perturbation may survive the longer time period (Fig. 1). Therefore, weather forecasts for short-range require more frequent observations from the denser network in order to detect any small-scale phenomena and their development. Of course, there is a dynamic interaction between the meteorological phenomena in different scales, therefore, it may not be possible to definitely specify the requirements for any of the different scales. If the time-dependent quantity $f(t)$ does not contain frequency components of more than W Herz (cycle/sec), this quantity can be determined by observations taken at the time interval of,

$$f(t) = \frac{1}{2W} \text{ second}$$

FIGURE 1

Horizontal and Time Scale of Meteorological Phenomena



Assuming that this theory can apply to meteorological phenomena, 6-hourly observations would detect the meteorological phenomena which have the cyclic-period longer than 12 hours. According to the inter-relation between the horizontal scale and the time scale of the phenomena, 6-hourly observations would be sufficient to catch large-scale phenomena.

6. The general functions of GDPS centres as specified in the Manual on the GDPS are as follows:

- (a) WMCs shall be responsible for carrying out data-processing of large- and planetary-scale phenomena and making available their products, covering the globe or a large part of it,
- (b) RMCs shall concentrate on data-processing of large-scale and meso-scale phenomena and making available their products (including special purpose forecasts) covering specific areas,
- (c) NMCs shall be responsible for satisfying the national data-processing of Members assuring the data-processing functions requirements.

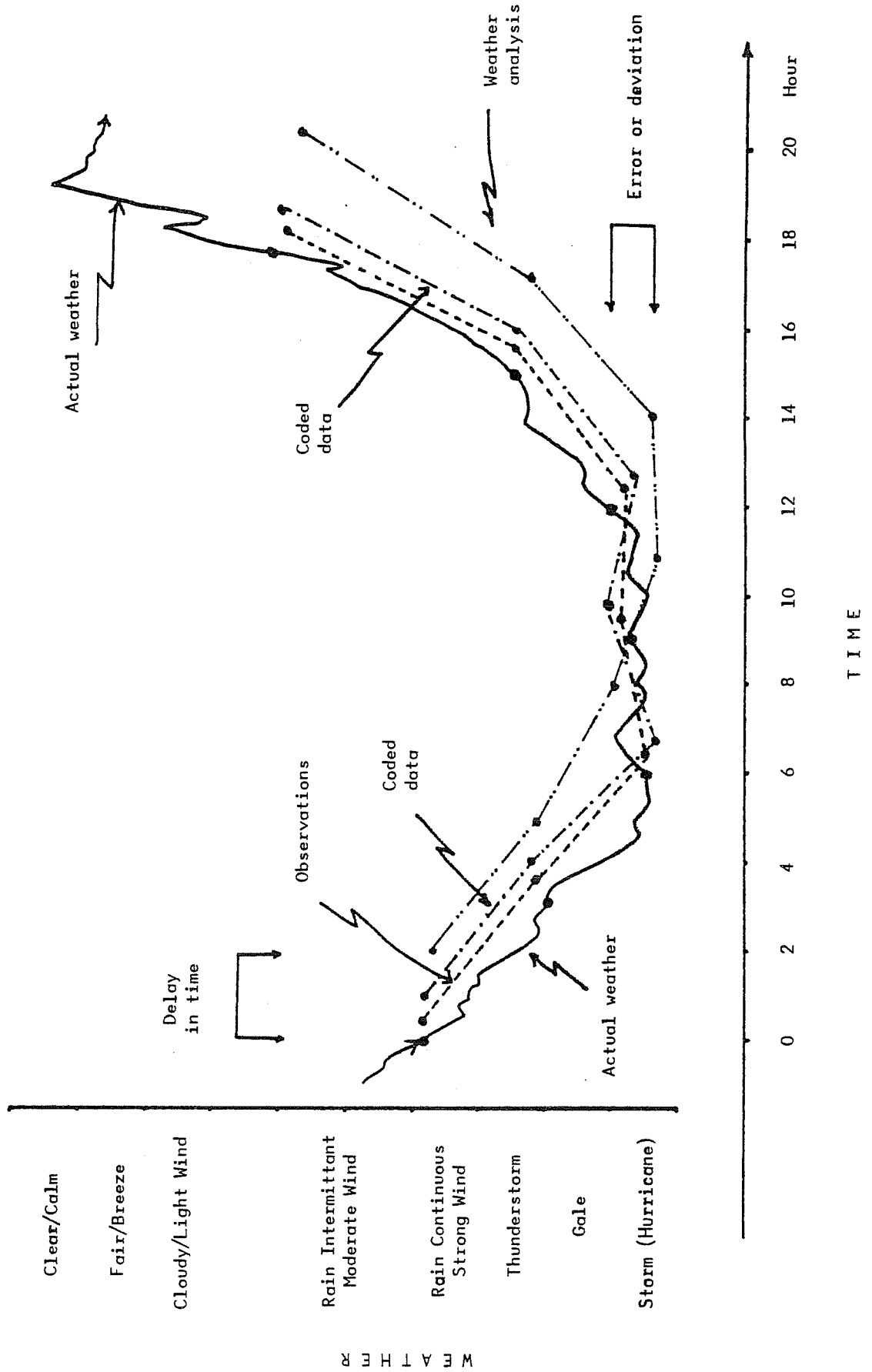
Therefore, observational data required for making analyses on the large- and planetary-scale should be available at WMCs and those required for large- and meso-scale analyses should be available at RMCs.

7. As the meteorological phenomena always fluctuates with time and space, observational data at a fixed time and point is representing prevailing meteorological conditions. Coded data may not fully give these observational data. NMCs, RMCs and WMCs only receive coded data concerning meteorological phenomena on a real-time basis. A gap between actual meteorological conditions and coded data would become very significant for making analyses and prognoses; in particular, the gap became very serious in case of meso-scale or small-scale analyses (Fig. 2). For example, for aviation forecasts or maritime forecasts, the small-scale phenomena, such as mountain waves, strong local winds, clear air turbulence, etc. would be very important. Therefore, hourly or half-hourly observations are required for these purposes.

8. Based on the above-mentioned concept, the minimum requirements for the real-time use of observational data have been specified. These requirements may be summarized as follows:

- (a) National requirements, which are defined by each Member and may vary greatly and reflect specialized needs of individual Members,
- (b) Regional requirements, the stations and observational programmes comprising the regional basic synoptic networks, which were adopted by the regional association concerned, are considered adequate for meeting these requirements; the specifications laid down for principal land stations in the WMO Technical Regulations are confirmed by the stations included in the regional synoptic network; e.g. surface = 3-hourly observations from the stations spacing at intervals not exceeding 150 km, upper-air observations = twice or four times a day from the stations spacing at intervals not exceeding 300 km, the time-limit of reception at the centres is 2 hours after observation time,

FIGURE 2 - DISCREPANCIES BETWEEN ACTUAL WEATHER AND WEATHER ANALYSIS



- (c) Global requirements - the principles for the establishment of the exchange programme for observational data on the Main Telecommunication Network (MTN) are prescribed in the Manual on the GTS. The frequency of observations and the land stations established according to these principles are considered adequate for meeting these requirements, e.g. surface - 6 hourly observations from a network of the stations with a spacing of 300 km, upper-air observations - all available, the time limit of reception at the WMCs is 4 hours of observation time.

9. The estimated volume of observational data required for the global exchange and regional exchange would be as follows:

(a)	Global exchange	:	SYNOP	10,000 reports	1,000,000 characters
		:	TEMP	1,500 reports	1,000,000 characters
		:	PILOT	2,500 reports	600,000 characters
		:	SHIP	3,500 reports	350,000 characters
		:	AIREP	2,500 reports	135,000 characters

			<u>Total</u>		<u>3,085,000 characters</u>
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(b)	Regional exchange:	SYNOP	21,000 reports	2,100,000 characters
		TEMP	1,500 reports	1,000,000 characters
		PILOT	2,500 reports	900,000 characters
		SHIP	7,000 reports	700,000 characters
		AIREP	2,500 reports	135,000 characters

			<u>Total</u>		<u>3,835,000 characters</u>
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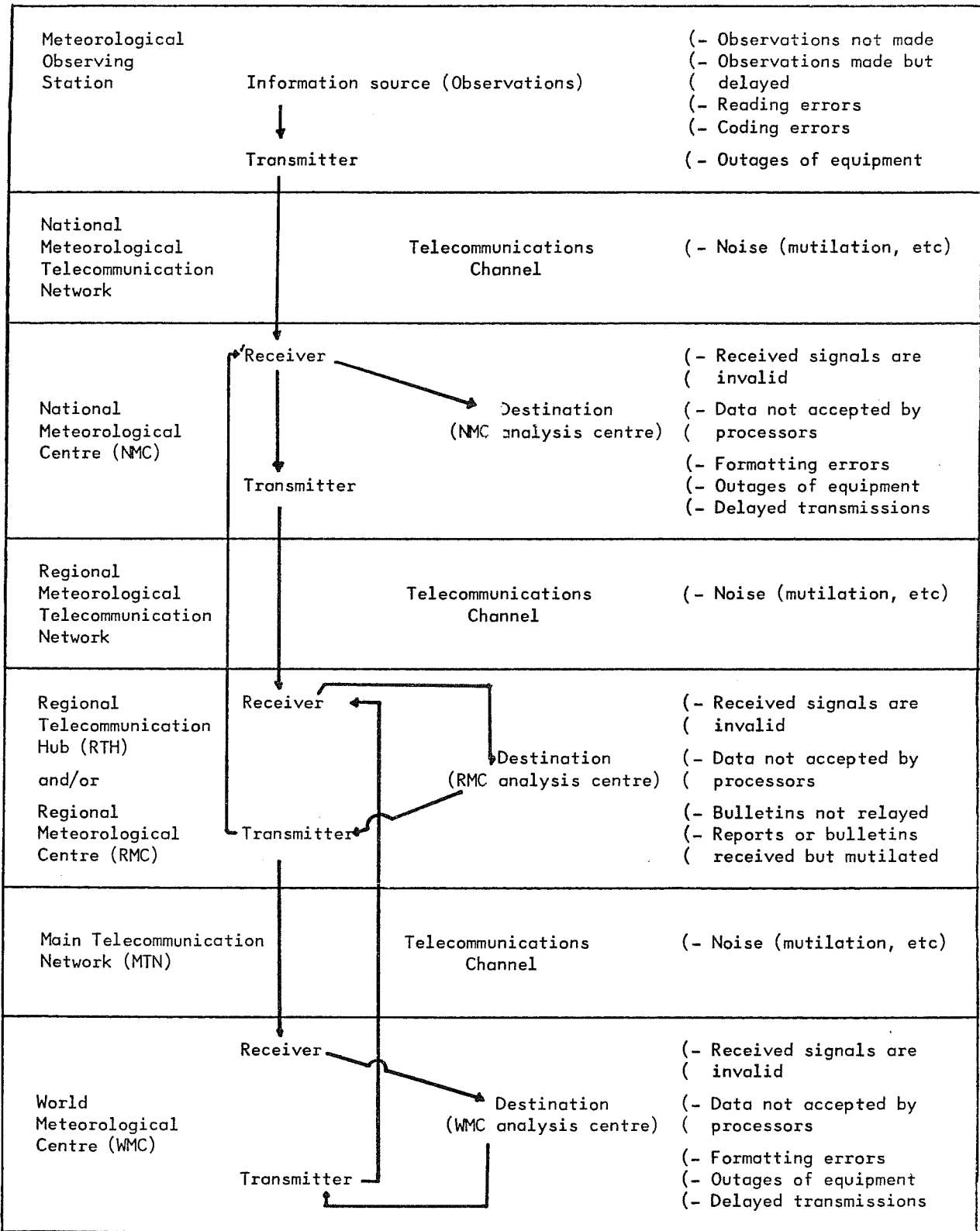
The above-mentioned figures are based on the number of stations required for global and regional exchange and also assuming that all stations are "making" and "reporting" observations as required. In addition to the observational data available from the surface based sub-system of the GOS, a quite large number of data obtained from meteorological satellites (near-polar-orbiting and geostationary) is available. The estimated amount of these satellite data would be more than 6,000,000 characters per day.

CAUSES OF DATA LOSS

10. The GDPS centres require all observational data, as mentioned above. The previous monitoring activities always showed that certain deficiencies in the operation of the GOS, GDPS and GTS existed in some parts of the world (Fig. 3). Non-availability of the required data at the GDPS centres might be caused by:

- (a) observations not made at individual observing stations;
- (b) observational reports not reaching the NMC;
- (c) bulletins not received at the associated RTH;
- (d) bulletins not relayed by RTHs;

FIGURE 3 - SCHEMATIC DIAGRAM OF COMMUNICATIONS FOR EXCHANGE OF METEOROLOGICAL INFORMATION



- (e) observational reports received at the GDPS centre but not accepted by the processing computer,
- (f) observational reports not received in time for analyses.

BASIC COMPONENTS FOR THE MONITORING OF THE OPERATION OF THE WWW

11. The monitoring of the operation of the WWW has three different aspects of its activities, namely real-time and non-real-time monitoring and follow-up action. These three different activities are as follows:

- (a) Real-time monitoring is to be carried out by every centre, in order to investigate:
 - whether or not observational reports are received by the collecting centres in time,
 - whether or not bulletins are received by the NMCs or RTHs in time,
 - whether or not information received is given in the correct code or in correct format.

Detailed procedures concerning the real-time monitoring should be developed by each centre. These procedures vary from centre to centre but are designed to check the above-mentioned three points.

(b) At present, non-real-time monitoring is a major activity which is carried out during a specific period in order to keep the operation of the WWW under review and also to identify shortcomings which may persist for rather a long period of time. Summaries and various statistics in the standard format developed by CBS should be prepared and exchanged between the centres concerned as well as the Secretariat.

(c) Follow-up action should be initiated as soon as possible after the real and non-real time monitoring has been carried out. In the real-time monitoring, remedial action will be taken to eliminate any shortcomings in the operation of the WWW at the centres concerned and/or at the point of observations. In the non-real time monitoring, follow-up action will be taken by the centres concerned and, if necessary, by assistance from the Secretariat, e.g. a meeting will be needed in order to co-ordinate the necessary remedial action amongst the centres concerned.

12. The above-mentioned monitoring components will be carried out in parallel. For example, some centres will keep records of real-time monitoring and these records will be exchanged amongst the centres concerned on a non-real time basis in order to initiate remedial actions to eliminate shortcomings which could not be eliminated by the immediate remedial action taken on a real-time basis.

13. The non-real time monitoring will be carried out periodically on an internationally co-ordinated basis. One of the main activities in this respect is an annual global monitoring which is carried out in October every year. The Secretariat will make analyses of the monitoring results provided by the centres concerned, in order to identify shortcomings in the operation of the WWW and to initiate the necessary remedial actions with Members concerned. During the other period, particular problem areas should be monitored, in respect of either selected information only or limited parts of the world. Problem areas to be monitored can be identified by the analyses of the annual global monitoring. Arrangements of this type of non-real time monitoring will be made by the Secretary-General in consultation with the appropriate centres.

14. As regards the annual global monitoring, procedures have been developed by CBS and are included in the Manuals on the GOS, GDPS and GTS. The procedures also contain the standard format in order to enable to make an easy comparison of results available from different centres. Statistics on the availability of observational data from individual observing stations should be compiled for a period of 15 days for automated centres and 5 days for manually operated centres as far as possible. The WMCs, RMCs and RTHs on the Main Telecommunication Network should monitor the availability of observational data and processed information for global exchange. Statistics of the availability of all the global exchange data are very bulky, therefore, as far as possible, the statistics should be made by computer. In this connexion, it should be mentioned that the WMO standard format for this monitoring has been used for several years already and proved sufficiently efficient to identify difficulties in the operation of the WWW.

RESPONSIBILITIES

15. The basic responsibilities for monitoring the operation of the WWW rest with Members. All Members are requested to implement the plan for monitoring the operation of the WWW, with a view to maintaining the high level of the operation of the WWW as a whole. As mentioned above, an essential part of the monitoring activities is the exchange of the monitoring results which contain statistics on the availability of meteorological information at each centre, between the centres concerned as well as the Secretariat. In this respect, all centres and the Secretariat should be known by Members concerned on the actual status of the implementation of the GOS, GDPS and GTS. The operational information in this respect should be given in the relevant WMO publications, namely Publication No. 9 - Volumes A and C as well as the Manual on the GTS, Attachment I-4 - the list of stations from which reports are to be exchanged globally and Attachments containing the list of stations from which reports are to be exchanged regionally. Any changes or deviations from the information given in these publications should be notified well in advance to the Secretariat. Amendments to these publications will be distributed among the Members periodically. This information will be included in METNO and WIFMA messages on a weekly basis and in Monthly Operational Letters on a monthly basis. Up-to-date information concerning the implementation of the WWW should be distributed among the Members accordingly. Without this information, unnecessary remedial actions might be taken by Members concerned and the Secretariat. It may happen in some cases that notifications concerning deviation from the information given in the relevant publications could not be made in time. In these cases, "NIL" should be included as appropriate. If this would not be resumed soon, the necessary information should be sent from respective centres to the RTH concerned as well as the Secretariat.

16. Each NMC should ensure that all observational reports from its territory or zone are compiled in the WMO standard format of messages and all bulletins are transmitted to the associated RTH within the specified time period after observation times. Each RTH should ensure that all bulletins received from the zone of responsibility are transmitted to the other centres concerned within the time period as specified and also all bulletins (observational data and processed information) should be distributed to the centres concerned, as required.

17. The goal of the monitoring activities is to achieve the 100% availability at all centres of meteorological information required to be received within specified time limits. Therefore, requirements of each Member should be sent to the associated RTH. The purpose of the exchange of the monitoring results is to compare these results to find out the cause of loss of meteorological information during its transmission from one centre to another. The frequency with which monitoring results should be prepared and exchanged is specified in the plan for monitoring the operation of the WWW. However, if this frequency is not practicable, the centres concerned should arrange for the exchange of results, except those which are sent to the Secretariat.

EVALUATION OF THE MONITORING RESULTS

18. Results of the internationally co-ordinated non-real time monitoring were analysed by the Secretariat with a view to initiating with Members concerned remedial action to eliminate deficiencies identified. As mentioned above, the internationally co-ordinated monitoring activities compose of two types of activities, namely annual global monitoring carried out in October every year and specific monitoring for problem areas or for exchange of specific types of information.

19. The monitoring results carried out in past years have indicated discrepancies between the availability of data at centres and information concerning the implementation of GOS and GTS given in WMO Publications. Reasons for these discrepancies were mainly due to temporary suspension of observations at some stations or the fact that Members did not communicate up-to-date information to the Secretariat. It should be noted that changes (deletion or addition) in the lists of stations from which reports are to be exchanged globally and regionally should be subject to the approval of the president of CBS. Therefore, Members should send their requests concerning changes to the Secretariat well in advance prior to the dates at which changes become effective.

Results of non-real time monitoring carried out in the past

20. The global monitoring surveys have been periodically carried out since 1977. During the period 1977 to 1980, the surveys were carried out twice a year and since 1981 the surveys have been made more than ten times. The results were analysed by the Secretariat and summarized in the Twelfth Status Report on the Implementation of the WWW. The analysis of monitoring results indicated that some deficiencies in the operation of the WWW have existed in some parts of the tropical belt and southern hemisphere (Figures 4 to 10).

FIGURE 4

DAILY AVERAGE NUMBER OF EACH TYPE OF OBSERVATIONAL DATA

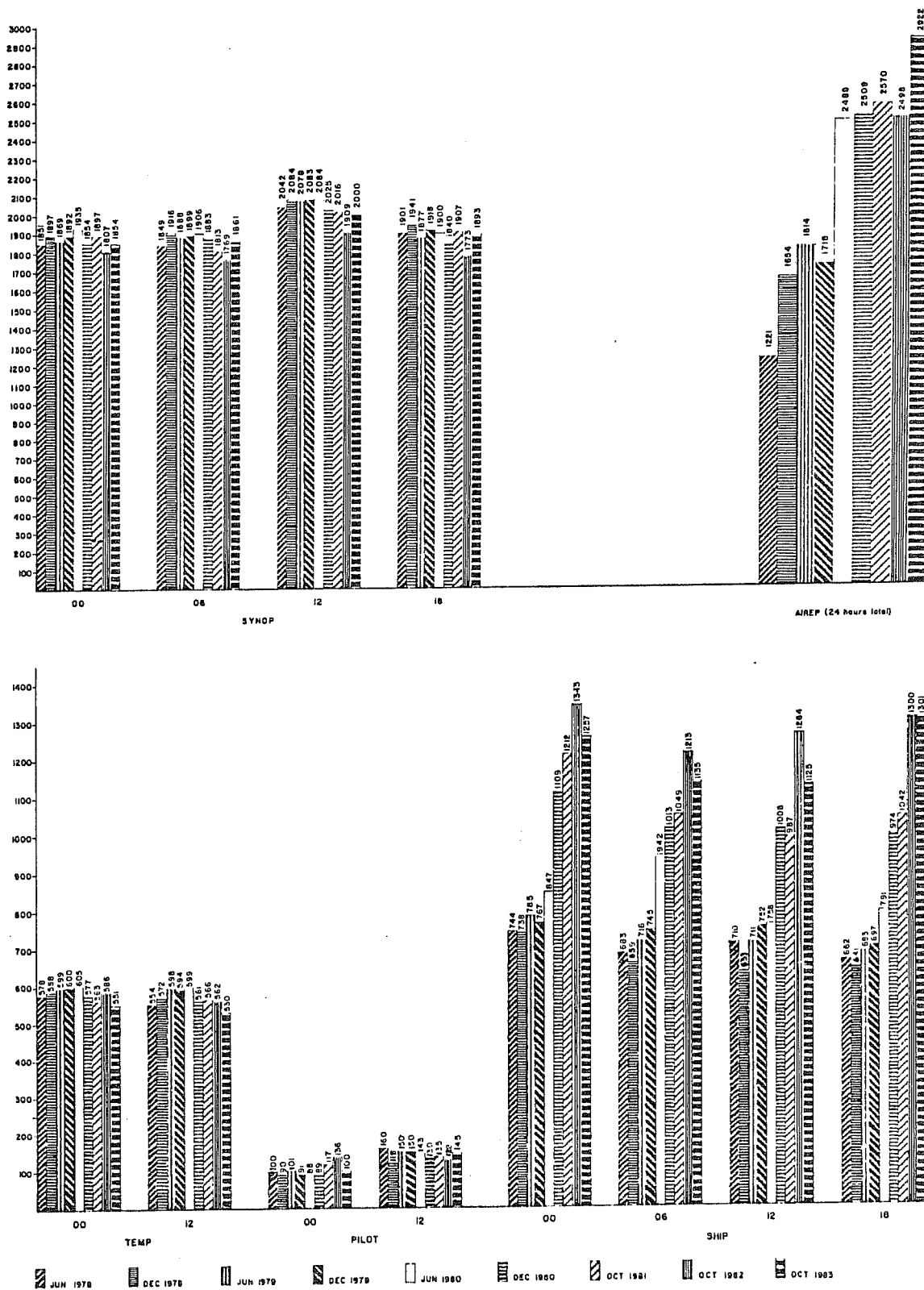
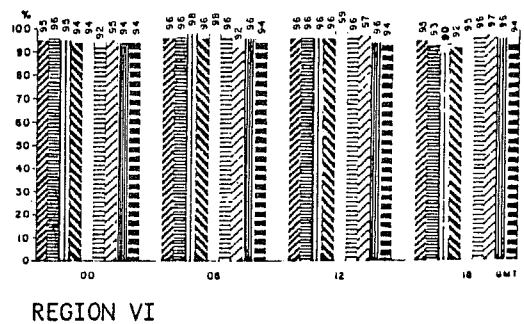
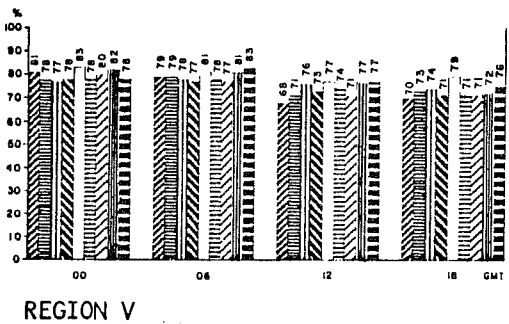
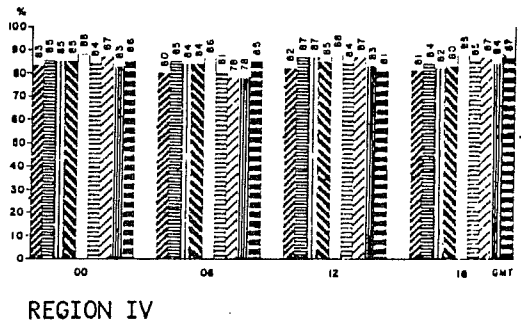
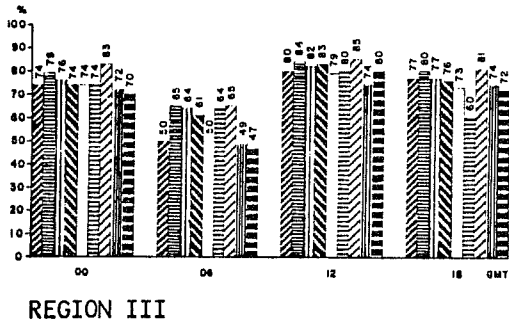
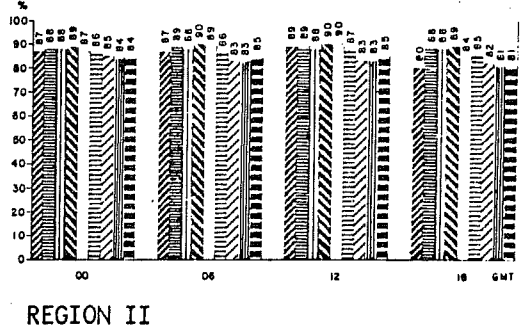
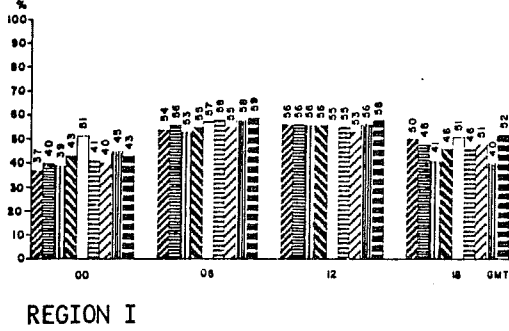


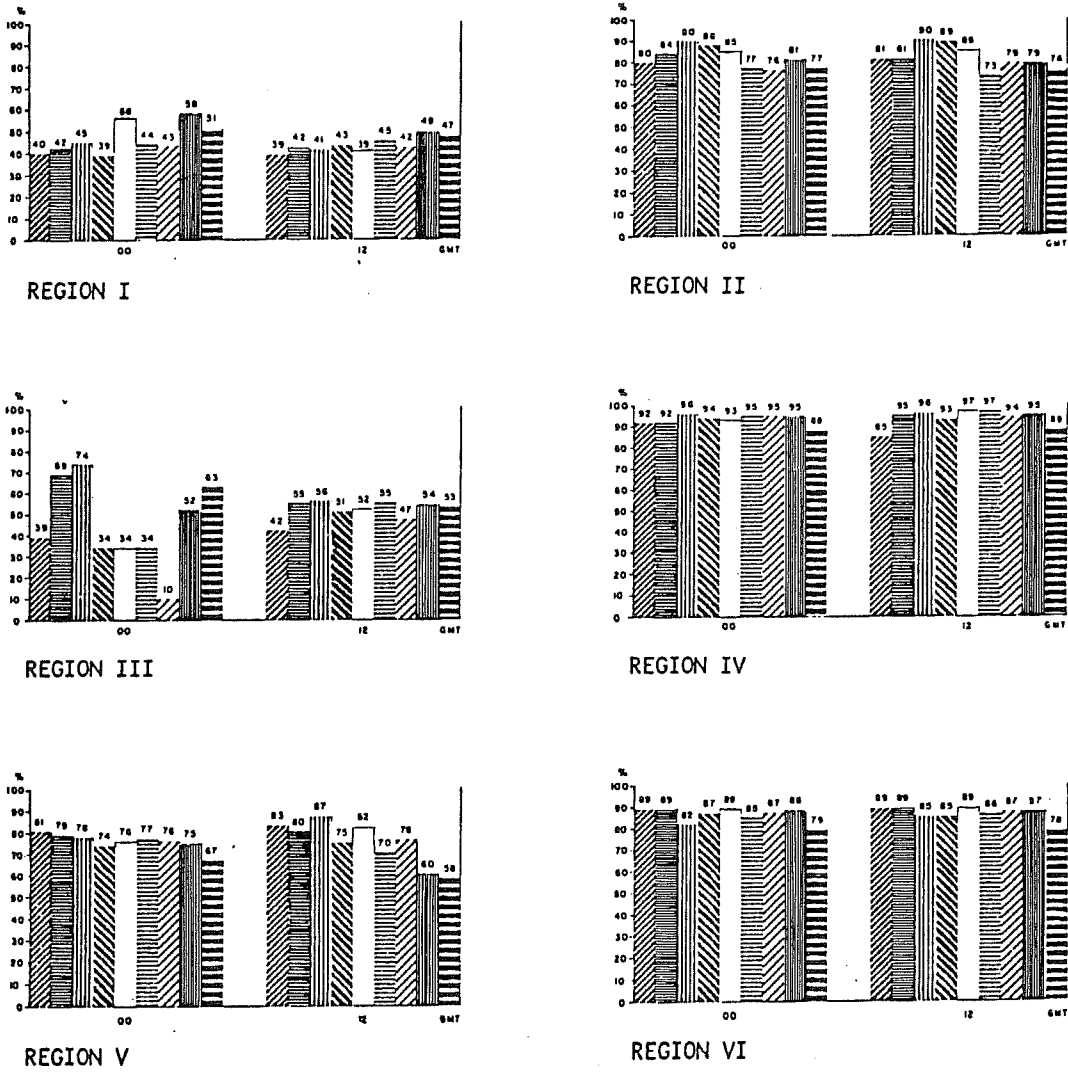
FIGURE 5
 AVAILABILITY OF SYNOP DATA FROM EACH REGION



JUN 1978
 DEC 1978
 JUN 1979
 DEC 1979
 JUN 1980
 DEC 1980
 OCT 1981
 OCT 1982
 OCT 1983

FIGURE 6

AVAILABILITY OF TEMP DATA FROM EACH REGION



JUN 1976
 DEC 1976
 JUN 1979
 DEC 1979
 JUN 1980
 DEC 1980
 OCT 1981
 OCT 1982
 OCT 1983

FIGURE 7 AVAILABILITY OF OBSERVATIONAL DATA (SYNOP) FOR 0000 GMT

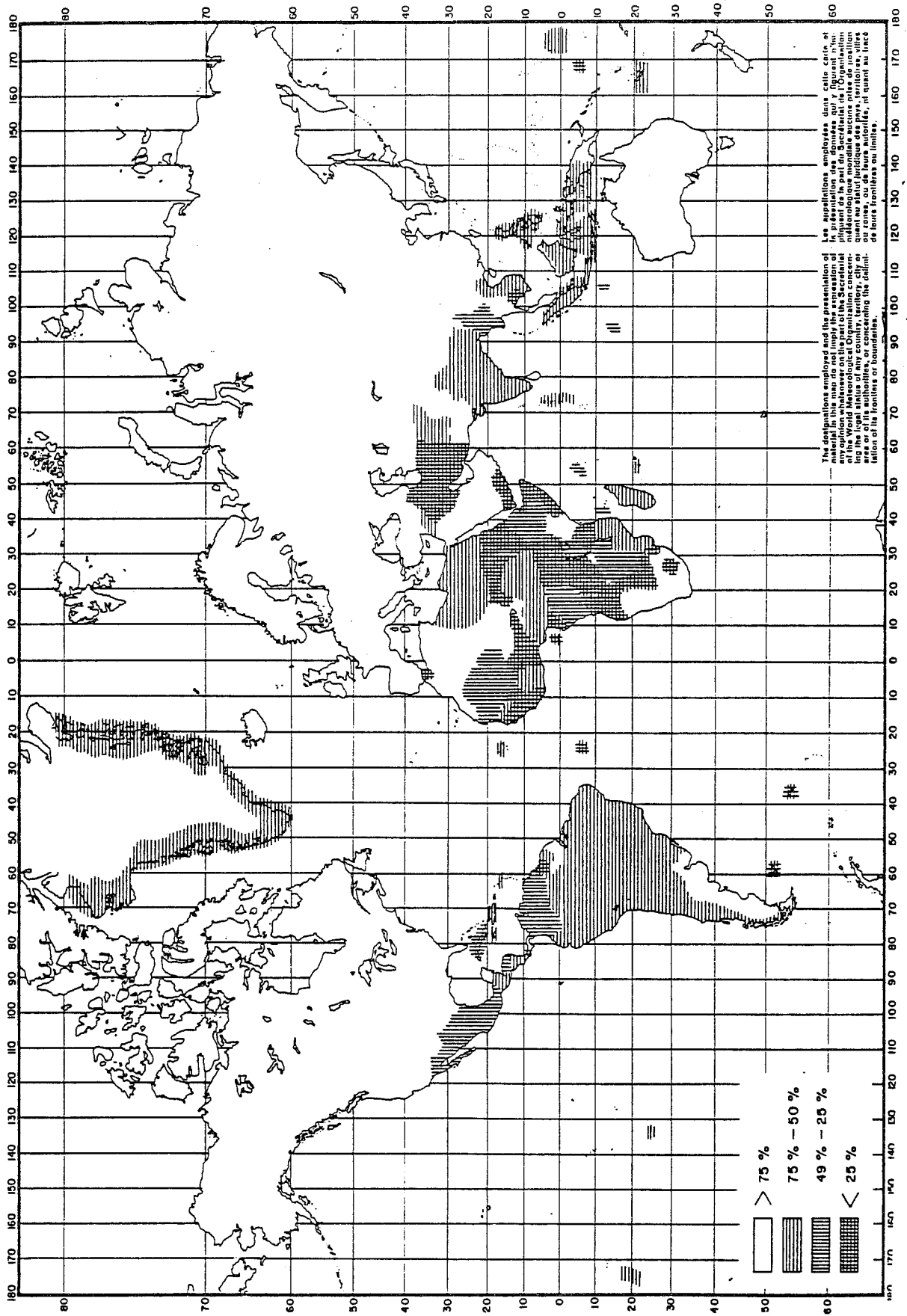
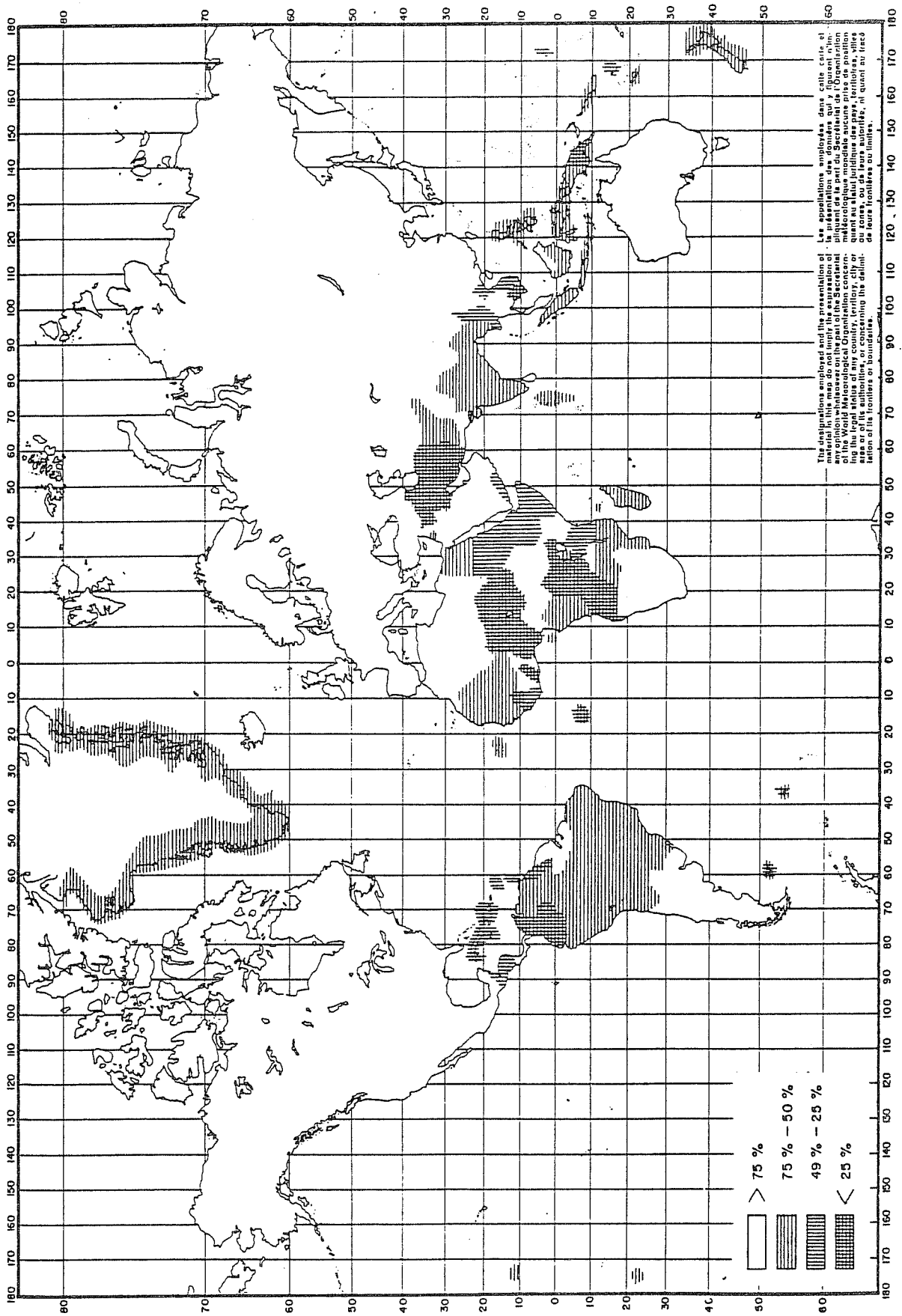


FIGURE 8
 AVAILABILITY OF OBSERVATIONAL DATA (SYNOP) FOR 1200 GMT



The designations employed and the presentation of material in this map do not imply the expression of any opinion on the part of the World Meteorological Organization concerning the legal status of any country, territory, city or village or its frontiers or boundaries, in respect of their frontiers or boundaries.

Les appellations employées dans cette carte et la présentation des données qui y figurent n'impliquent aucune prise de position quant au statut juridique des pays, territoires, villes ou villages, ni quant au tracé de leurs frontières ou limites.

FIGURE 9

AVAILABILITY OF OBSERVATIONAL DATA (TEMP) FOR 0000 GMT

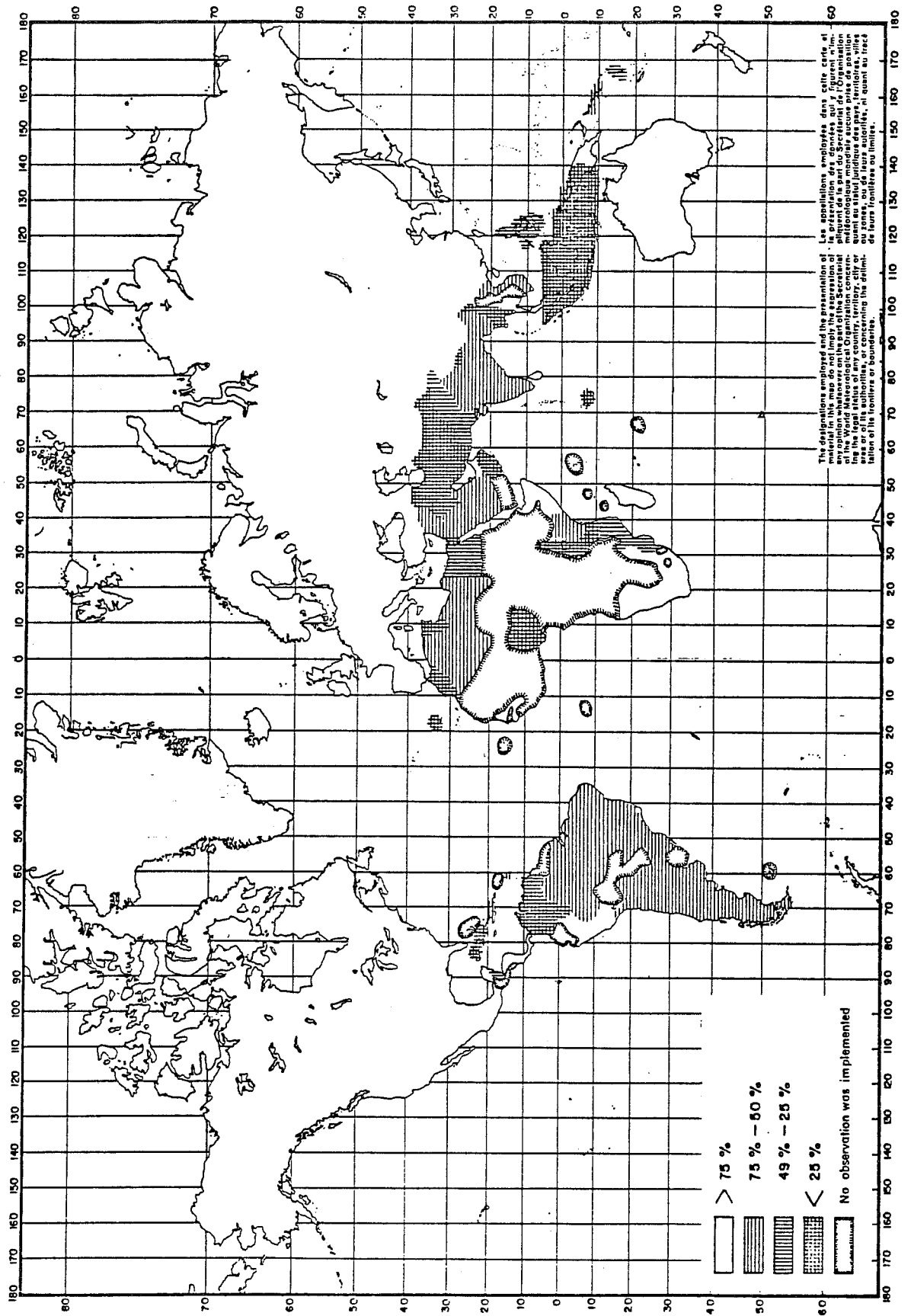
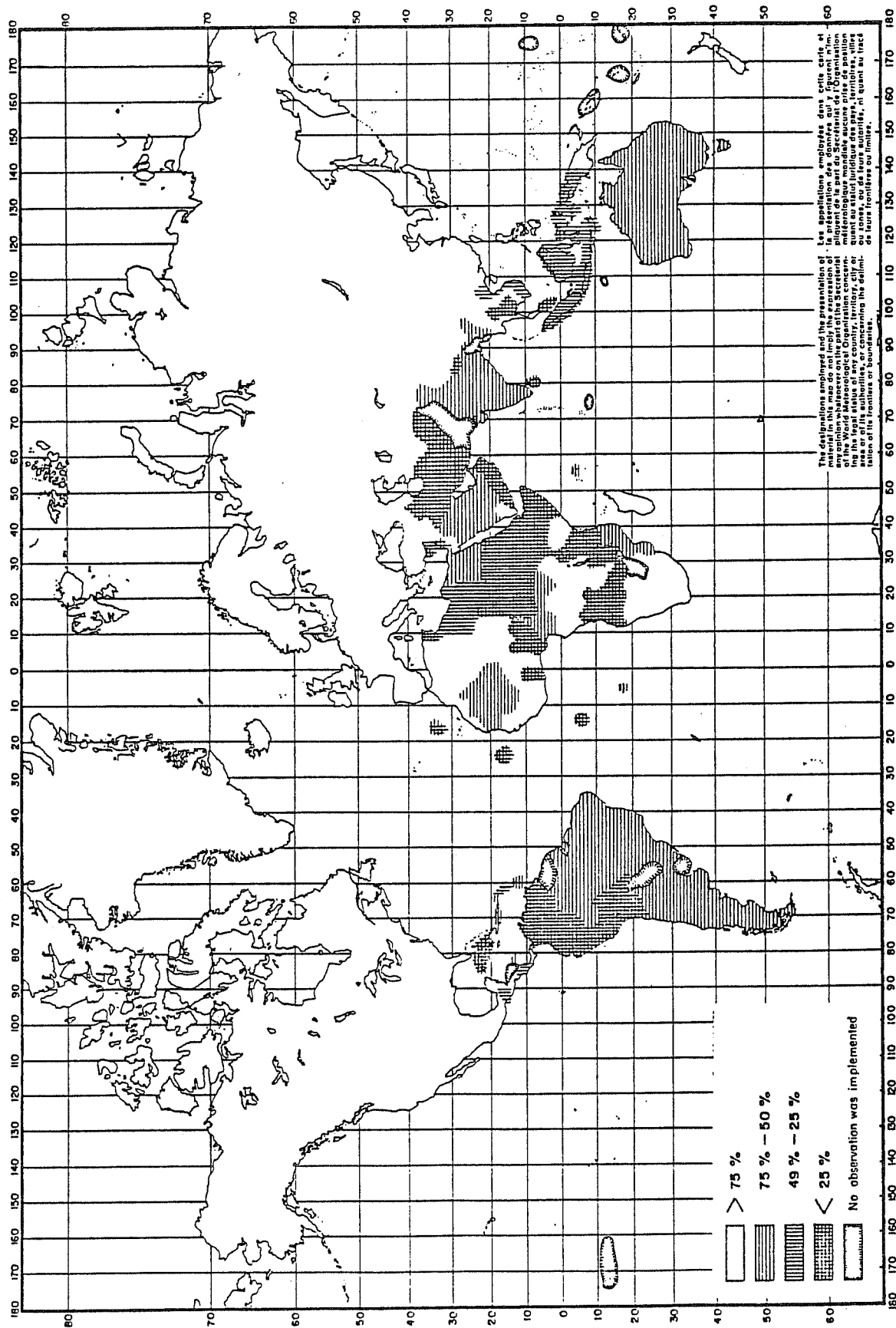


FIGURE 10

AVAILABILITY OF OBSERVATIONAL DATA (TEMP) FOR 1200 GMT



21. The global monitoring carried out in past years showed serious discrepancies in the availability of observational data at various MTN centres. In order to find out the exact causes of these discrepancies, a specific monitoring survey was carried out in March 1983. The main reasons for these discrepancies could be summarized as follows:

- (a) Some centres indicated that a certain number of reports received were not usable; these data might be recorded as "not received" by downstream centres in some cases;
- (b) Bulletins incorrectly formatted might not be relayed from one centre to another;
- (c) Some centres might not record some bulletins or reports due to their excessive delay in reception;
- (d) Omission of report-separate-signals (=) might cause difficulty to separate individual reports in sequence;
- (e) Some bulletins contained different types of observational reports or reports made at different observation times, e.g. TEMP bulletins contained PILOT reports, SHIP bulletins contained RTD SHIP reports, etc.

If all meteorological bulletins are correctly formatted before their insertion into the GTS, discrepancies in the availability at different centres would become small. Strict adherence to the GTS procedures, in particular the standard format of meteorological messages, should be made in order to ensure effective transmission and reception of bulletins over the GTS.

22. The analysis of the monitoring activities carried out since 1977 indicated that about 1500-1700 SYNOP stations and about 500-520 TEMP stations sent their observational reports regularly. The stations included in the global exchange list should be capable of making and reporting observations, however about 260-270 SYNOP stations and about 80-90 TEMP stations are silent throughout the monitoring period. These results were communicated to the Members concerned in order to initiate urgent remedial action. Information available from the Members concerned showed that these deficiencies were caused by:

- (a) Difficulties in HF propagation and the selection of suitable frequencies, in particular for night-time communications;
- (b) Difficulties in collecting directly at the NMC, within the time limit prescribed in the Manual on the GTS, all SYNOP and TEMP reports from SSB networks comprising more than ten (10) synoptic stations;
- (c) Difficulties in the maintenance of communication equipment at remote stations, in particular those located in places not easily accessible.

Outlook of the future monitoring activities

23. In the very near future, the monitoring activities will continue along the similar line in which the present activities are carried out. However, some new elements will have to be included in order to follow development in the operation of the WWW. Those which can be anticipated at present may be summarized as follows:

- (a) Monitoring activities for the exchange of CLIMAT and CLIMAT TEMP will be strengthened - the World Climate Programme became one of the major WMO programmes in accordance with the decision of Cg-IX. Since the global exchange of these bulletins on the GTS is made only once a month, the present global monitoring will not be sufficient for checking reception and transmission of these bulletins at each centre. The monitoring activities in this respect will be expanded in order to take enough examples for analysis.
- (b) Routine check on the global exchange of seismic data will be included in the monitoring activities. In accordance with the decision of EC-XXXV (1983), the global exchange of seismic data on the GTS will become effective from 1 December 1983. These data are not directly required for meteorological services, but seismological authorities in countries which might be located in another place request to receive. Therefore, telecommunication arrangements between two services concerned will have to be made in order to ensure effective and efficient exchange of seismic data. The monitoring activities in this respect will have to co-ordinate with seismological authorities in the country. Experience gained from the monitoring activities concerning the exchange of BATHY/TESAC data indicate that the most crucial points of causes of loss of data would be located on the line and centre outside the GTS. With a view to enabling us to identify exact points at which difficulties existed, the monitoring results should also be obtained from seismological authorities concerned. For this purpose, coordination between two organs should be strengthened.
- (c) Specific monitoring activities will have to be strengthened in order to identify more precisely exact areas in which difficulties existed and to be able to initiate remedial action immediately.

24. As regards (a) and (b) above, the monitoring activities will be carried out on a global basis. However, specific monitoring mentioned in (c) above will be carried out region by region in order to increase the efficient operation of the WWW, in particular GOS and GTS in each region. As mentioned above, data loss in each region was a very serious problem. If observational reports did not reach the GDPS centres and could not be used for analysis and prognosis, expenses for taking observations would be wasted. It is considered necessary, therefore, that specific monitoring surveys be carried out in order to identify exact points at which data are lost and to initiate remedial actions to overcome deficiencies. For this purpose, all centres concerned should participate in the monitoring survey.

25. The previous monitoring results identified some major causes which should be eliminated by each originating centre before insertion of bulletins into the GTS. These points are as follows:

- (a) A meteorological message should comprise a single meteorological bulletin which contains one code form only and observational reports for a particular observation time;
- (b) A one-to-one correspondence between a CLLLL number and an abbreviated heading of a meteorological message should be maintained, in accordance with the Catalogue of Meteorological Bulletins (WMO Publication No. 9, Volume C, Chapter I); in case bulletins which are not yet registered in the catalogue are transmitted on the GTS, these bulletins may not arrive at some GTS centres;
- (c) The procedure for correction should be followed correctly; It must be made clear that after the error sign - letter "E" and "space" repeated alternately three times, the last fully correct group must be repeated; it should be borne in mind that the starting line, abbreviated heading and the end of message of a meteorological message must be completely free from all telecommunication errors, these parts should be re-perforated; any form of correction, such as use of the error sign or overpunching of errors, is prohibited;
- (d) Report-separation-signals (=) at the end of an observational report should not be omitted; it should be noted that this signal should also be inserted after "NIL";
- (e) The station index numbers (IIiii) and ships' call signs should always be reported in the first position of each report; in case ships' call signs were not available, "SHIP" should be inserted at the first position of reports;
- (f) A group in the text of bulletins should be composed of 5 figures; when data are missing, the solidus (/) should be inserted to indicate missing figures;
- (g) The MiMiMjMj (AAXX) group line before a group of SYNOP reports must be on a line of its own and the group following AAXX must contain five digits (YYGGi_w);
- (h) In case meteorological messages are transmitted though the AFTN circuits before their injection into the GTS, the AFTN format of messages should be replaced by the GTS format at the injection point of the GTS;
- (i) NIL should be inserted after station index numbers in case no reports were available from particular stations in time.

These causes are mainly eliminated on the spot before injection of reports in the GTS. Specific surveys to be carried out in each region should aim at identifying exact points at which these causes frequently existed.

26. In the longer term plan for monitoring, procedures for quality control of data must be developed and activities in this respect should be included in routine monitoring works. Several GDPS centres (mainly WMCs/RMCs) have developed the procedures and criteria for accepting observational data. However, these procedures for the global use have not yet been established. Observational data may or may not contain errors which would be instrumental error, coding error, reading error and calculation error. Permissible errors of observational data could be equivalent to the accuracy of observational data. The accuracy of observational data for synoptic analysis may be as follows:

<u>Element</u>	<u>Accuracy</u>
Surface pressure	1 hps
Horizontal wind speed	1 m/sec
Air temperature	1 C
Relative humidity	5%

27. Errors involved in observational data can be detected by horizontal comparison of data taken by different observing points. However, on a routine basis, this comparison can only be made with the aid of a computer. In this connexion, it should be mentioned that various impact studies are being carried out in order to find out whether significant improvement can be achieved by introduction of new observing systems, such as satellite data, ocean buoy data, etc. These studies can also be extended in order to obtain requirements for the accuracy of observational elements. As regards upper-air data, some GDPS centres made studies concerning the impact of observing data to numerical prediction. The purpose of the quality control of data is to rectify observational data as far as possible. Further consideration will be made by CBS through its Working Group on the GDPS. The first session of the study group on monitoring procedures of the GDPS (Geneva, May 1984) adopted two recommendations, i.e. one related to statistical verification of numerical weather prediction and another the procedure for quality of observational data. The latter contains techniques to be used for monitoring the quality of observational data. These recommendations were approved by the CBS WG/GDPS and will be submitted to the CBS extraordinary session scheduled for October 1985 for its consideration.

28. Monitoring of the operation of the national meteorological telecommunication networks will be carried out in order to ensure rapid and reliable exchange of meteorological information between national meteorological centres and meteorological stations (sub-centres or observing stations). This type of monitoring activity can be made by individual countries but, in some cases, monitoring should also be made in order to maintain reliable connexion between the national meteorological centre and their associated coastal radio stations for reception of ships' weather reports. Furthermore, if necessary, circuits between the national meteorological centre and local communication station should be monitored. For example, satellite communication links should be very reliable but, in some cases, frequent interruptions have occurred. These interruptions were due to outages of links between the meteorological centre and local earth station. Each Member should make a further effort to maintain efficient operation of all circuits in its own territory.

29. In conclusion, the monitoring of the operation of the WWW will be carried out by each Member in the future. Members responsible for the operation of the WMCs and RTHs located on the Main Telecommunication Network should carry out regularly global monitoring in order to evaluate the efficient operation and also to identify critical areas in the operation. However, NMCs should carry out regular checking of the operation of the WWW in their own countries. These activities should be continued in the future.