EUCOS Operational Programme

EUCOS ANNUAL MONITORING REPORT 2003

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To: *EUCOS Members*

Summary: This document is intended to give an overview of the availability and quality of observations within the EUCOS area during 2003.

Action required: *Distribution*

Distribution: *Public*

Reference	Date	Author(s)	Content
EUCOS/REP/105	05/02/04	J A Rogers	Initial draft for comment
EUCOS/REP/105	27/02/04	J A Rogers	Version 1
EUCOS/REP/105	09/03/04	J A Rogers	Version 1.1
EUCOS/REP/105	11/03/04	J A Rogers	Version 1.2
EUCOS/REP/105	26/03/04	J A Rogers	Version 1.3

EUCOS Annual Monitoring Report 2003

Content

1. Introduction

EUCOS Operations produce daily and monthly statistics on the quality of observations in the EUCOS area of interest, received at Exeter, United Kingdom within T+120. This document gives an overview of the availability, and quality of observations within the EUCOS area, 10N-90N, 70W-40E, during the period January to December 2003.

The evaluation of data quality is based on comparison with the appropriate 6-hour global model forecast (background) field, which is generally of high quality except in data sparse areas, tropical regions and areas close to steep orography. The data is monitored on a daily basis against defined network performance requirements, and should problems be identified, fault correction procedures or network change control mechanisms are triggered.

Downloadable statistical data displays are updated daily at 10:00 UTC, archived and made available to EUCOS Members via the EUCOS-IS website **http://www.eucos.net**,.

2 EUCOS Network Performance Summary

Quarterly Operational Reports for the period are available via **http://www.eucos.net** . These documents provide a performance summary for each EUCOS component together with a list of significant problems and developments during the period. The following summary results are based on the period 1st January – 31st December 2003 (significant problems are highlighted in *italic* print).

EUCOS Component	Data Availability	Data Timeliness	Data Quality
AMDAR	On target (Data quantity)	Target exceeded	Good
ASAP	7 units on target *5 units below target*	*On average – below* target (Some ships perform well)	Improving Performance *However still below target (burst heights)*
OWS M and Ekofisk	OWS 'M' above target *Ekofisk often below target.*	OWS 'M' on target *Ekofisk slightly below target.*	OWS M Good, *Ekofisk slightly below target. (burst heights)*
Radiosonde	*Generally on target* *A few not achieving the minimum requirement (2 launches per day by HH+120)*	HH+120 target exceeded	Good
Surface Land	On target	Below HH+15 target	3- 6% of observations show a pressure bias > 1 hPa
VOS	On target Manned VOS availability less consistent *Duplication of data has been noted*	Satisfactory HH+45 just missed on occasions	Automatic VOS: Good *Manned VOS: below target*
Moored and Drifting Buoys	Drifting buoys above target *Moored buoys below target*	Moored buoys exceed the target. *Drifting buoys below target.*	Satisfactory Drifting and Moored buoys achieved the target for 92% of the period

Figure 1: EUCOS Network Performance Summary 2003

These results have highlighted a number of issues which must now be considered. These include Moored buoy and radiosonde data availability, ASAP data availability and burst height issues, and the quality of manned VOS data, particularly focusing on pressure observations.

3 E-AMDAR

The EUMETNET Aircraft Meteorological Data and Reporting Programme (E-AMDAR) is designed to provide aircraft-recorded meteorological observations which supplement a terrestrial-based upper air observing network. From 1 January 2003, E-AMDAR became a fully integrated component of the EUCOS Operational Programme. Programme management responsibilities rest with the Swedish Meteorological and Hydrological Institute (SMHI), with Technical Support supplied by the Met Office. The efficient, flexible and cost effective E-AMDAR network maintains fleet numbers of more than 500 aircraft of British Airways, Air France, KLM, Lufthansa and SAS, 80% of which are flying on European routes and 20% are operating long haul routes.

3.1 Data Availability and Coverage

During the period 1st January – 31st December 2003, a total of more than 9576861 AMDAR-reports were received from an average of 274 aircraft. This compares to the EUCOS target of 8,000,000 reports in 2003, although before accurately measuring performance against target it is necessary to take into account two special observing periods and targeted data events.

- The first EUCOS AMDAR High Frequency Trial of 2003 commenced on 5 th March 2003. The number of E-AMDAR reports received daily increased from ~23,000 to~45,000 initially, but after some reconfiguration by the E-AMDAR Team, the number was reduced to ~36,000 by 11th March. The number of aircraft profiles increased from ~740 to ~950 and the number of airports covered from 120 to 141 globally, by 11 thMarch.

- The second EUCOS AMDAR High Frequency Trial of 2003, during 18th August to1 st October 2003. 1,441,652 observations were produced, giving an average daily data volume of 32,026. Lessons learnt from the 1st HF Trial resulted in the required data increase being achieved.

- E-AMDAR involvement was requested for several targeted data events in the Atlantic-THORPEX regional Campaign (A-TReC), international field campaign, during the period 13th October until 12th December 2003.

When subtracting the additional data generated by these experiments from the total, the E-AMDAR network demonstrates a performance approximately equal to the target as illustrated by figure 2.

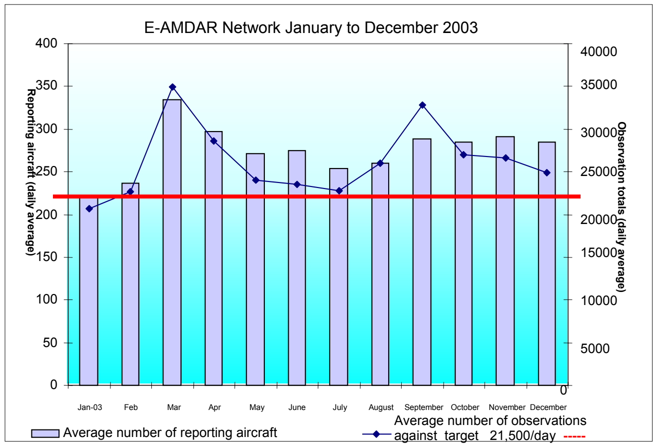

Figure 2: Illustration of the E-AMDAR network development 2003, and the marked increase in the daily number of active units and total number of observations during the AMDAR High Frequency Trials and the TReC showing the effectiveness of the optimisation system E-ADOS developed by Deutscher Wetterdienst (DWD).

3.1.1 E- AMDAR Targets

Performance is measured against the following targets.

Data	Quality	Availability of data	Timeliness of Data
Temperature	1.5°K	**21,500 Observations / day** (Based on 2003 target)	**85%** **of data received by** **Observation Time** **+ 45 minutes** 95% of data received by + 120 minutes
Wind vector	2.5 m/s		
Spec Humidity	N/A		
Performance statistics based on those already adopted by E-AMDAR			

Figure 3:E-AMDAR Performance Targets

EUCOS Objectives	2003 target	2003 Performance	2004 target	Expected 2004 Performance
Number of Airports observed daily	100	106 (Average December 2003)	110	115
Number of '3-hourly' airports	25	27 (Average December 2003)	28	28
Number of profiles within EUCOS area	560	*720*	620	*~700*
Data over EUCOS sensitive areas	15%	*18%*	19%	*20%*
WWW Contribution	5%	*8%*	7%	*9%*
Annual number of AMDAR observations	8 Million	~ 8 Million (Totals were actually ~ 9.5 million due to the EUCOS high frequency AMDAR SOPs)	9.5 Million	~ 9.7 Million (Recruitment of new airlines and further fleets development may increase totals)
Data communication savings	0%		5%	5%

Figure 4: The E-AMDAR Performance for 2003 against the EUCOS target requirement for 2003, and expected performance and targets for 2004.

3.1.2 Data Coverage

Data coverage can be quickly and easily analysed using the DWD developed AMDAR Web portal.

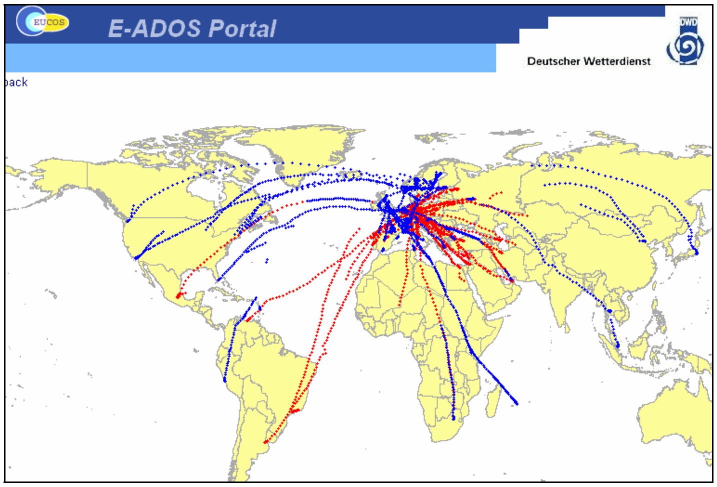

Figure 5: The EUCOS E-ADOS Web portal designed and maintained by DWD, illustrating the data coverage of BUFR & FM42 Data on 23rd February 2004, available via **http://www.eucos.net**

3.2 System Availability

The AMDAR network relies on the following three key components:

The Data Communications System
E-AMDAR reports are received via dedicated collecting centres and then fed into the GTS. Reports of long-range aircraft are also sent via Satcom. Meteorological data are readily attached to downlinked messages and can be controlled by ground command or on-board programming.

The Data Processing System
The E-AMDAR Data-Acquisition System (E-ADAS) has been developed by the Met Office. This system processes data from British Airways, KLM, Lufthansa and Scandinavian Airline Services. Air France will shortly be added to the scheme. The system has been designed to accommodate the integration of further airlines. Planned upgrades include accounting information and web-based visualisation facilities.

Optimisation Systems
Optimisation systems have been developed in co-operation with participating airlines. These use flight plan information to automatically select the most appropriate AMDAR aircraft to provide data, which meets the specified EUCOS requirement.

These have proved to be very reliable with only a small number of outages during 2003.

3.3 Timeliness

Although dependent on the fleet, the average reporting frequency during cruise level is expected to be one report per 10 minutes. During climb and descent the reporting frequency increases to provide one report every 50 hPa at higher levels, and up to one report every 10 hPa in the lower atmosphere. This causes a significant increase of reports during these phases of flight and more reports from short-haul aircraft than from long-range aircraft.

E-AMDAR data timeliness target has been exceeded throughout the reporting period.

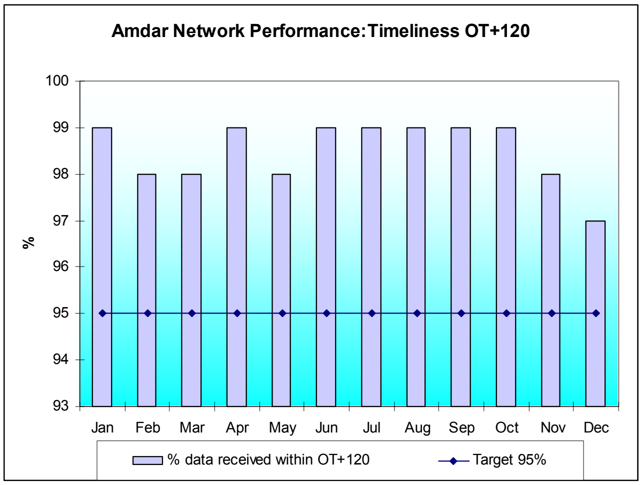

Figure 5 : E-AMDAR Operational Performance: Timeliness OT+120, January - December 2003

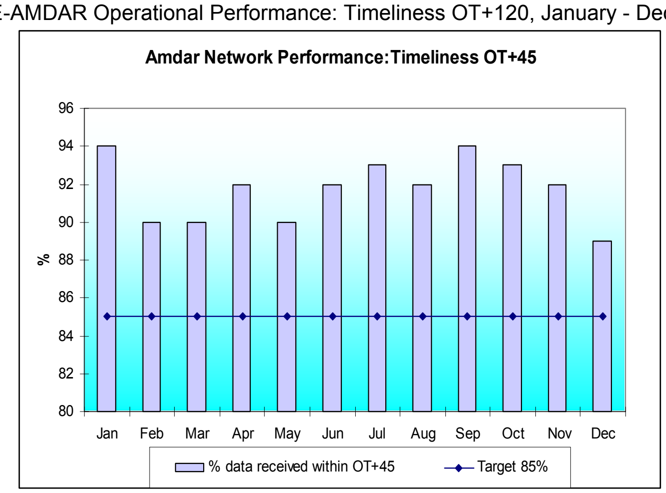

Figure 6 : E-AMDAR Operational Performance: Timeliness OT+45, January - December 2003

3.4 Data Quality

The E-AMDAR Quality Evaluation Centre at KNMI, manages and operates a continuous quality-control system for AMDAR data. It provides daily, quality evaluation reports for data timeliness, mean and gross errors for temperature, wind direction and speed by comparison to the HIRLAM-31-level model every three hours. Daily summaries, quarterly reports and monthly mean data statistics are made available via the E-AMDAR QEvC information site. Comparison checks are also made by the EUCOS Operations staff during daily routine monitoring.

During the period January to December 2003, there were no significant anomalies of temperature, wind speed or wind direction. This has been achieved by ensuring that inaccurate aircraft are deactivated until corrective action has been taken by the airline.

3.5 Conclusion

Significant high quality meteorological data is obtained from large areas of the world by the collection of data from aircraft fitted with appropriate software packages. It is clear from the above performance summary that AMDAR has exceeded timeliness and availability targets. However, whilst the network will be configured to generate soundings over airports with a maximum frequency of one profile every 3-hours from each location, inefficiencies within the optimisation systems are expected to result in greater numbers of profiles over some airports.

Future developments should include the inclusion of at least one more airline into the optimisation systems, recruitment of night-time operators (UPS and other parcel carriers have been identified), and the introduction of software that will lead to a reduction in communication costs. It is also hoped that progress can be made with the measurement of humidity.

It should be noted that the E-AMDAR Programme is dependent on the economical status within the airlines.

4 Radiosoundings ASAP

The EUMETNET Automatic Shipboard Aerological Programme (E-ASAP) is a fully integrated component of the EUCOS Operational Programme. Programme management responsibilities rest with the Deutscher Wetterdienst (DWD).

The ASAP system is capable of radiosonde ascents from commercial ships, and consists of equipment for balloon launching and electronic equipment to process the data from the radiosonde, and finally to transmit the TEMP SHIP bulletin for insertion on the GTS. Additional equipment such as antennas, storage of helium, sondes, balloons, etc. is considered part of the unit, which may be transferred from one ship to another.

At present, soundings from commercial vessels are the primary source for profiles over the oceanic areas of interest for short-range GNWP over Europe.

The objective of the E-ASAP programme is to optimise the efficiency of existing ASAP units and to operate new units on lines of interest through sensitive areas between the Channel and Newfoundland Grand Banks, west of the Iberian peninsula and in the Mediterranean as necessary to complement the territorial segment in this area.

The oceanic upper-air system of EUCOS includes joint funding of the operations of OWS Mike in the Norwegian Sea and the Ekofisk oilrig station in the North Sea.

4.1 Data Availability and Coverage

During the period 1st January – 31st December 2003, a total of more than 2700 soundings were received from an average of 11 ASAP units, by OT+120. This compares to the reduced EUCOS target 300 soundings/unit/year, during the period. The number of soundings per month remained below the reduced target of 300 soundings/unit/year until the last quarter, when several vessels switched to a more intense observing programme with 4 or 3 soundings per day in support of the NA-TReC from 1st October 2003 – 12th December 2003.

Sample monitoring of receipt differences between Offenbach and Exeter continues. Only occasional differences have been noted and satisfactory explanations have been found.

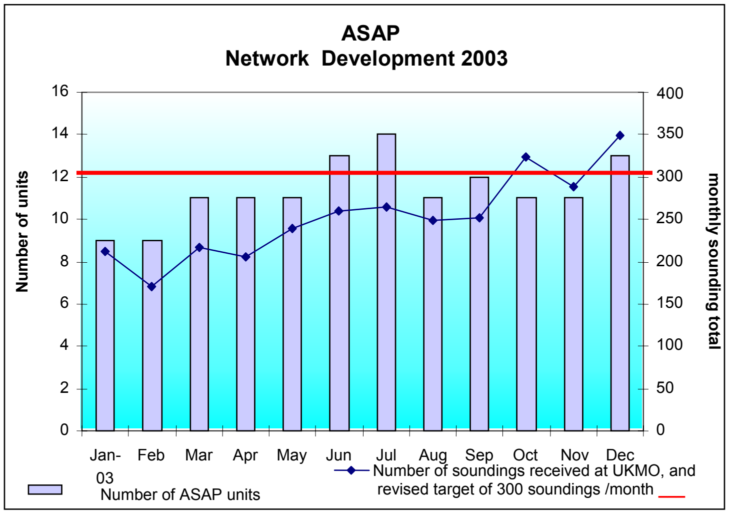

Figure 7: E-ASAP network development, which illustrates the network achievement against the revised target of 300 soundings /month and also the marked increase in the total number of observations during TReC

4.1.1 E-ASAP Targets

Performance is measured against the following targets.

Data Element	Quality	Availability of data	Timeliness Of data
Temperature	1.0°K	**300 soundings per year / ship** (currently equates to 9 soundings per day from 11 ships)	85% of soundings (Parts A,B,C and D) received by Observation time +120 minutes
Wind vector	2.5 m/s		
Spec Humidity	10%		
O-M 100hPa Geopotential Ht difference	**65 m**		
% Achieving 100hPa	**90%**		
% Achieving 50hPa	**75%**		

Figure 8:E-ASAP Performance Targets

4.1.2 Data Coverage

The operational programme of the Atlantic E-ASAP allows soundings at 00 UTC and 12 UTC when between 8 W and 50 W, and soundings at 06 UTC and 18 UTC, when west of 50 W and north of 35 N. The American land based stations generally take soundings at 00 UTC and 12 UTC only, and it is considered an advantage to have ASAPs take soundings at 06UTC and 18 UTC, when close to areas with 00 UTC and 12 UTC soundings only.

The operational programme of the Mediterranean was in operation from January to June 2003. Launching policy for the Mediterranean, stops launches when the ship is closer than 75 nm from a land-based TEMP-station as radiosondes are launched at 06 UTC and 18 UTC, otherwise soundings were made at 00 UTC and 12 UTC.

Taking into account the very high data sensitivity in the area off Newfoundland and in the St. Lawrence Bay area the UK unit, the Can Mar Pride switches to sounding at 06 UTC and 18 UTC, when west of 50 degrees west, close to Newfoundland and during the route to Montreal. When eastbound, she switches to 00 UTC and 12 UTC soundings, when east of 50 degrees west. This also applies to routes reaching Cape Race and Belle Isle.

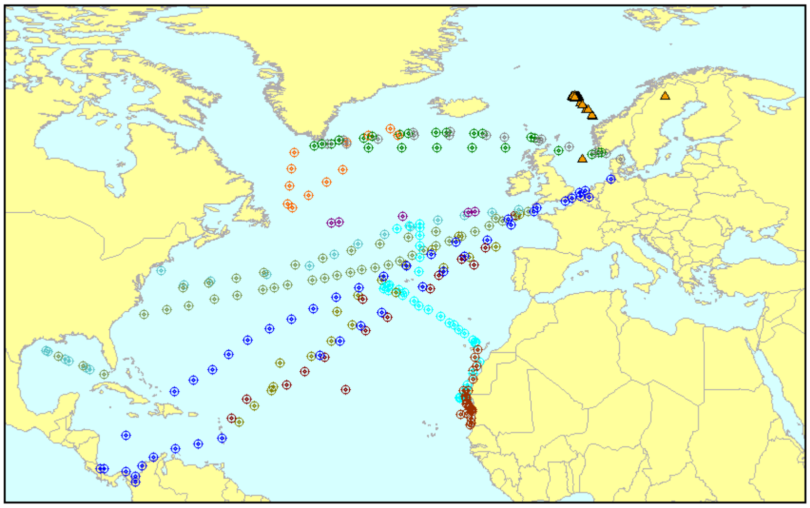

Figure 9: The EUCOS E-ASAP Web portal designed and maintained by DWD, available via **http://www.eucos.net**
Note:This map does not illustrate coverage over the Mediterranean, which stopped after the E-ASAP unit on board the Peljasper was removed during July 2003

4.2 System Availability

The ASAP ships and routes within the EUCOS area during 2003, are listed in Annex 1.

E-ASAP units are equipped with a Vaisala DigiCORA III sounding unit. Wind finding is by Loran-C and GPS-processor. Position errors are avoided by using an automated position setting such that the operator only has to accept the given position.

Communication is automated and no operator intervention is needed under normal operating conditions. Inmarsat-C communications are used, with Thrane&Thrane equipment. The TEMP SHIP bulletins are communicated as soon they are ready, i.e. the parts A and B are transmitted soon after the sonde has passed the 100 hPa level. The transmission does not await the burst of the balloon and the processing of parts C and D.

The communication is based on Code 41, which means that the meteorological service in the country where the Land Earth Station (LES) is situated is charged for the communication from the ship to the LES and the landline to the GTS insertion point. Both systems are set up to request confirmation of reception of data by the LES.

4.2.1 E-ASAP

The E-ASAP ships operating within the EUCOS area between January 1st and December 2003 were:

Peljasper	(Call sign SWJS)	Sealand Achiever	(Call sign WPKD)
Sealand Performance	(Call sign KRPD)		

4.2.2 National ASAP units

The National ASAP ships operating within the EUCOS area between January 1st and December 2003 were:

Hornbay	(Call sign ELML7)	Arina Arctica	(Call sign OVYA2)
Naja Arctica	(Call sign OXVH2)	Nuka Arctica	(Call sign OXYH2)
Irena Arctica	(Call sign OXTS2)	Fort Desaix	(Call sign FNPH)
Douce France	(Call sign FNRS)	Fort Saint Louis	(Call sign FQFL)
Fort Saint Pierre	(Call sign FQFM)	CanMar Pride	(Call sign ZCBP6)
Esperanza del Mar	(Call sign EBUQ)	Skogafoss	(Call sign V2XM).
Sealand Motivator	(Call sign WAAH)	Sealand Developer	(Call sign KHRH)

4.3 Timeliness

After an initial seasonal deterioration, timeliness steadily improved until the end of August, which was followed by a general decline throughout the final quarter.

The ASAP Network achieved the EUCOS timeliness target of 85% of soundings (Parts A,B,C and D) received by OT + 120 for 33% of the period, illustrated in figure 10.

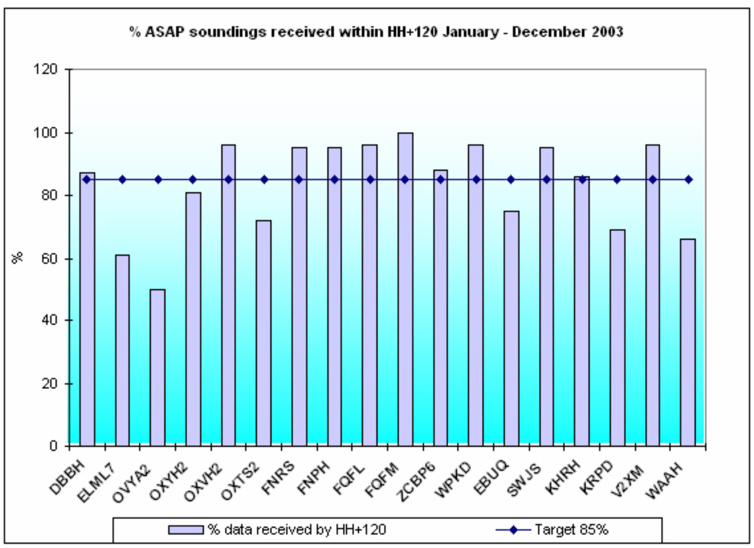

Figure10: ASAP timeliness against a target of 85% data received within observation time HH+120

4.4 Data Quality

The National units steadily improved throughout the second and third quarter followed by a decline. The E-ASAP unit network performance has been consistently stronger than the National ASAP units, which after a seasonal dip in the first quarter, steadily improved throughout 2003.

4.4.1 Burst heights

EUMETNET has defined a target of 90% of soundings reaching 100hPa and 75% reaching 50hPa, consistent with that of the WMO ASAP Panel. Figures 11 and 12 illustrate the number of ASAP soundings achieving 100hPa and 50hPa height against 90% and 75% targets respectively, within the ASAP Network. Detailed graphical representations of the individual ASAP unit performance are listed in Annex 2.

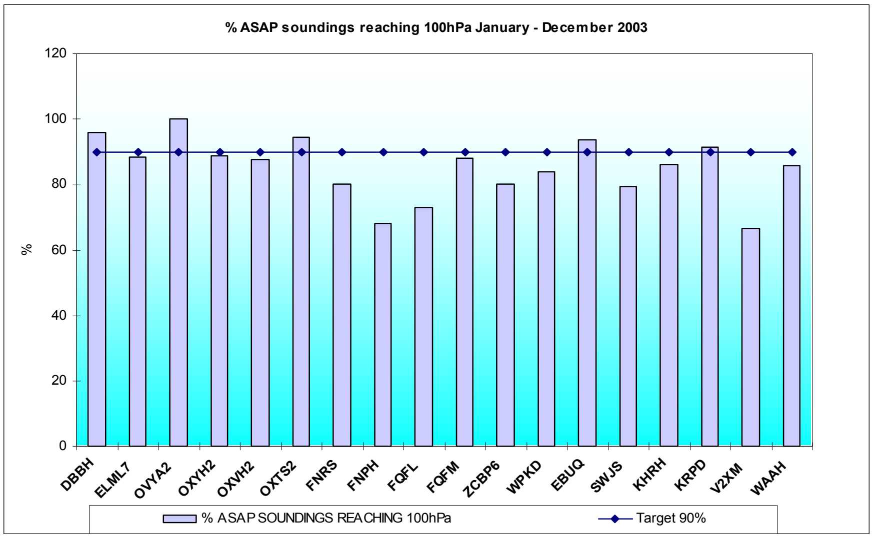

Figure 11: The number of ASAP soundings achieving 100hPa against a 90% target

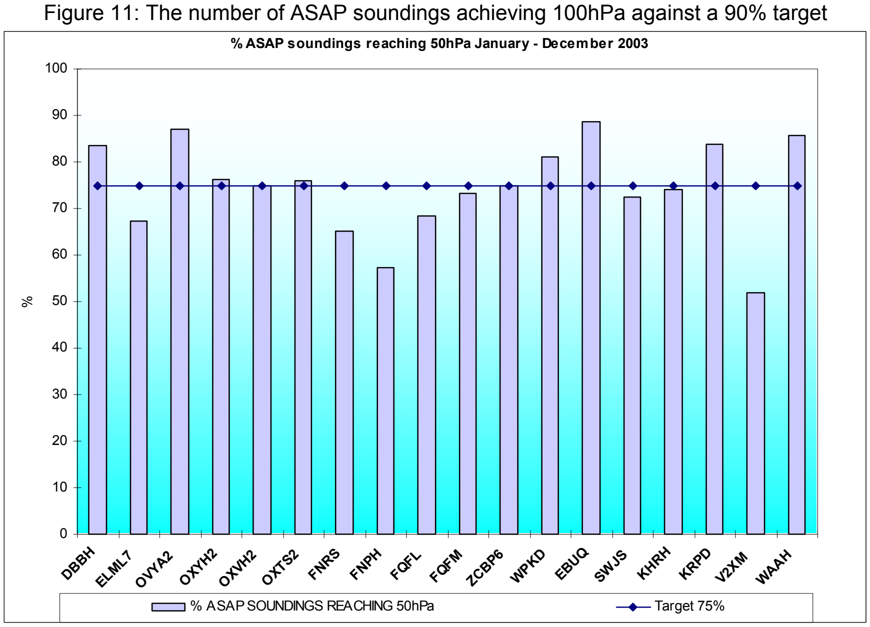

Figure 12: The number of ASAP soundings achieving 50hPa against a 75% target

4.4.2 E-ASAP Units

The Peljasper (Call sign SWJS) was sold, during 2003, to another shipping company operating outside the area of interest for EUCOS, and the ASAP equipment was installed on the Sealand Performance (Call sign KRPD) in early August 2003. This unit uses the old ver. 1.26 DigiCORA III software. Availability was hampered by constant communication failures, which persisted during the last quarter. Monitoring continues and Vaisala engineers are investigating this fault.

In preparation for the NA-TReC, the Sealand Achiever (Call sign WPKD), carried out a TOST-test of 3 hourly soundings during July 2003. The test was successful concerning both feasibility of carrying out 3-hourly observations and the transmission of the data. This unit is supported by NOAA/Office of Global Programs for the launch of soundings in the Gulf of Mexico.

4.4.3 National ASAP Units

The INM Spanish ASAP unit, the Esperanza del Mar (Call sign EBUQ) and the DMI ASAP units currently on board, Arina Arctica, (Call sign OVYA2) and Irena Arctica (Call sign OXTS2) have shown good performance throughout 2003.

The DWD ASAP unit, the Hornbay (Call sign ELML7), has shown good performance throughout 2003. However, during some months reduced efficiency was caused by LES Satellite Area overlaps, in the eastern Atlantic Ocean. The 3rd refurbished DWD ASAP unit was installed on the Sealand Motivator (Call sign WAAH) during December 2003. However, delays caused by major repairs, modifications and shortage of time prevented the Motivator participating in the NA-TReC. She will operate on the Charleston route, exactly as the Achiever and the Developer.

The UK ASAP unit, CanMar Pride (Call sign ZCBP6), had variable performance during 2003. RS80-15G sondes are used, but the RS92 type will be introduced from July 2004, should the final testing prove successful. Plans for 2004 include an upgrade to a Viaisala MW21 system. Many of the soundings have not appeared in the statistics due to early launch times. This has now been remedied. There is still a problem of slow and erratic rates of ascent, and several times in December, the pre-flight ground control corrections have been outside tolerance. Monitoring continues.

The Icelandic/Swedish ASAP unit, the Skogafoss (Call sign V2XM) deteriorated during 2003, due to equipment failure, which caused a reduction in efficiency. The ASAP Programme Manager visited this unit late in the reporting period and recommended refurbishment.

The French vessels Fort Royal(Call sign FNOR), Fort Fleur D' Epee(Call sign FNOU), Fort Desaix (Call sign FNPH) and Douce France (Call sign FNRS) were decommissioned in 2003. The MeteoFrance ASAP units were installed on Fort Saint Louis (Call sign FQFL) and Fort Saint Pierre (Call sign FQFM), which commenced radiosounding activity July 2003. These units have shown an improvement in performance during 2003.

4.5 Network Developments of 2003

- Canada now considers that ASAPs within their territory as part of their network. ASAP units may now make launches within Canadian territorial waters without violating any rules. The launches at 00 UTC and 12UTC have to be frequency tuned, when close to land stations. However, the EUCOS Scientific Advisory Team (E-SAT) has advised the ASAP soundings should be taken at 06 UTC and 18 UTC, which is currently being followed by the E-ASAP and the Danish ASAP units.

- The Factory Acceptance Test of the 1st refurbished UK Met Office unit was carried out and software changes were agreed upon at Vaisala in the final quarter.

- During the NA-TReC the Sealand Achiever, the Sealand Performance, Hornbay, the Sealand Developer and the CanMar Pride, switched to a more intense observing programme of 4 or 3 soundings per day during the operational stage of NATreC from 1st October 2003 – 12th December 2003. This increased data coverage significantly.

- Three MW15s donated by the UK Met Office were received by Vaisala for upgrading.

- The helium supply on the Atlantic E-ASAP now takes place at Bremerhaven.

4.6 Ocean Platforms

The Norwegian ship Ocean Weather Ship MIKE (Call sign LDWR) is supported and joint funded by the EUMETNET Countries. This platform shows an excellent performance with respect to timeliness, quality and to the number of soundings received.

The Oil-Platform Ekofisk (WMO-ID 01400, Call sign ENEK) in the Central North Sea is an ASAP-unit operated by the Norwegian Meteorological Institute, on behalf of the seven countries bordering the North Sea. Soundings are scheduled daily at 00 UTC and 12 UTC, but they are launched by staff of the oil company according to availability. Occasionally this is not achieved mainly due to a reduction of crew of the platform.

4.6.1 Data Availability

During the period 1st January – 31st December 2003, a total of more than 1296 soundings were received from Ocean Weather Ship MIKE, and 651 soundings were received from Oil-Platform Ekofisk, by OT+120. This compares to the EUCOS target of 5.4 soundings/day, during the period. This compares to the EUCOS availability target of 1314 and 657 respectively.

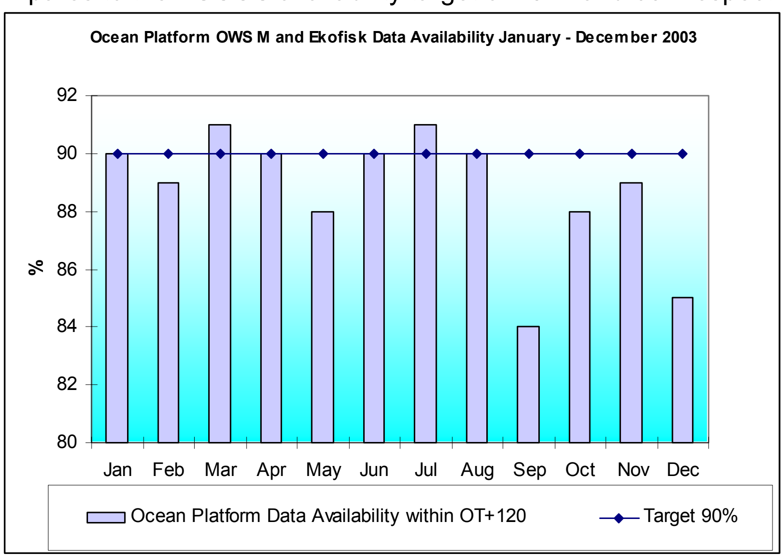

Figure 13:Ocean Platforms Ocean Weather Ship Mike and Oil Ekofisk:Data availability January – December 2003

4.6.2 Ocean Platform Targets

Performance is measured against the following targets:

Data	Accuracy	Availability of data	Timeliness Of data
Temperature	1.0°K	90% of anticipated data (Equates to 5.4 soundings per day.)	95% of available data (Parts A,B, C and D)# by Observation time +120 minutes
Wind vector	2.5 m/s		
Spec Humidity	10%		
O-M 100hPa Geopotential Ht difference	65 m		
% Achieving 100hPa	95%		
% Achieving 50hPa	90%		

Figure 14:Ocean Platform Performance Targets

4.6.3 Timeliness

Norwegian ship Ocean Weather Ship MIKE consistently achieved the timeliness target of 95% of soundings (Parts A,B,C and D) received by OT + 120. Oil-Platform Ekofisk was below target throughout most of the period, illustrated in figure 15.

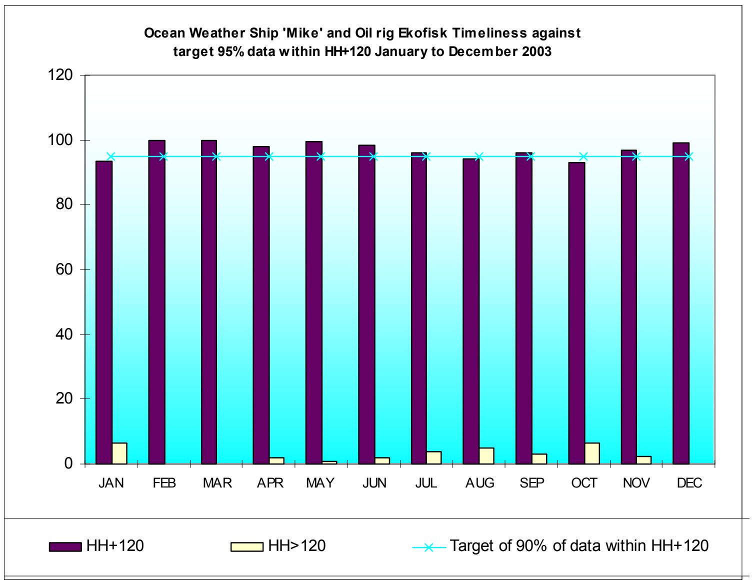

Figure 15: Ocean Platforms:Timeliness of receipt against 95% availability within HH+120

4.6.3 Ocean Platform Quality

Excellent performance shows OWS MIKE with 98% of soundings made achieving a data quality reported of geopotential at 100 hPa, and 94% data quality reported geopotential at 50 hPa. Likewise, Oil rig Ekofisk with 89% soundings made achieving data quality reported geopotential at 100 hPa, however only 74% of data quality reported geopotential at 50 hPa.

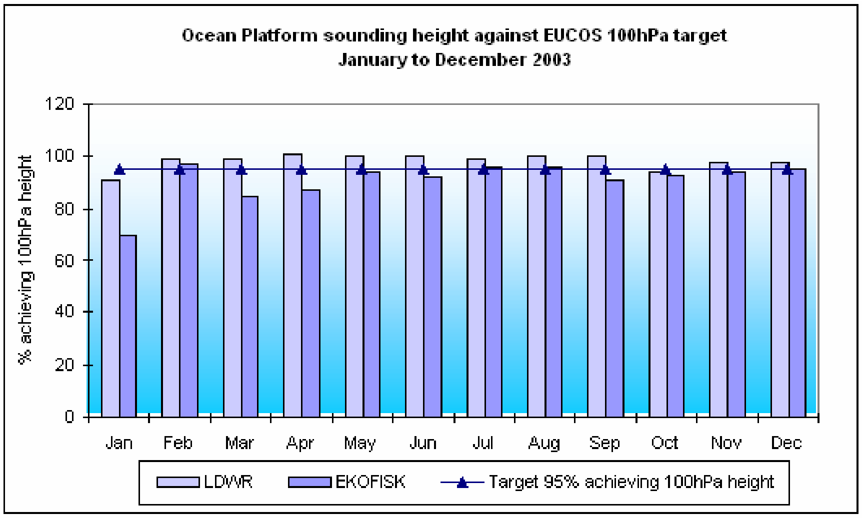

Figure 16: Ocean Platforms Ocean Weather Ship Mike and Oil Ekofisk achieving 100hPa against a 95% target

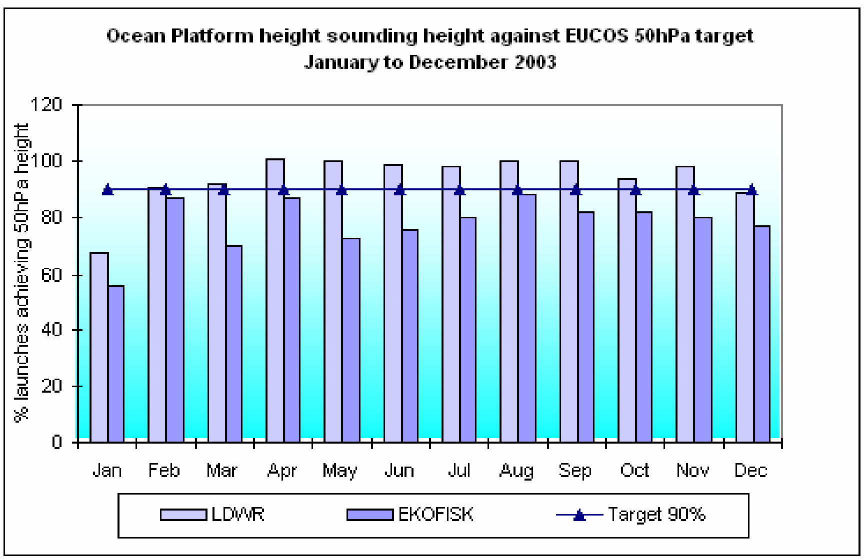

Figure 17: Ocean Platforms Ocean Weather Ship Mike and Oil Ekofisk achieving 50hPa against a 90% target

4.7 Conclusion

ASAP units are the primary source for profiles over the oceanic areas of interest and provide a significant quantity of easily targeted meteorological data for GNWP. It is clear from the above performance summary that the E-ASAP unit and ocean platform network performance has been consistently stronger than the National ASAP units throughout the period. Performance below the EUCOS targets is due to a number of different factors including inexperienced operators and data transmission problems. Although complex, the E-ASAP Programme endeavours to continue this steady improvement.

5 Radiosoundings TEMP

Results from the EUCOS studies programme have led to a EUCOS radiosonde network comprising of 46 stations, which should be complemented by approximately 750 AMDAR profiles per day by 2006. During the period 1st January – 31st December 2003, a total of more than 35624 reports were received from the selected sites, within HH+120. This compares to the EUCOS target of 97 soundings per day received from the selected stations, providing no fewer than 2 reports each per day. Although before accurately measuring performance against targets, it is necessary to take in to account that 9 EUCOS sites frequently launch >2 radiosondes /day, 5 EUCOS sites frequently launch <2 radiosondes/ day.

As the EUCOS programme progresses, it will be necessary to review the upper air design. This work will be carried out as an element of the EUCOS studies programme.

5.1 Data Availability and Coverage

The data availability target was met during the last quarter when a consumable support programme enabled underperforming sites to support the NA-TReC from 1st October 2003 – 12th December 2003.

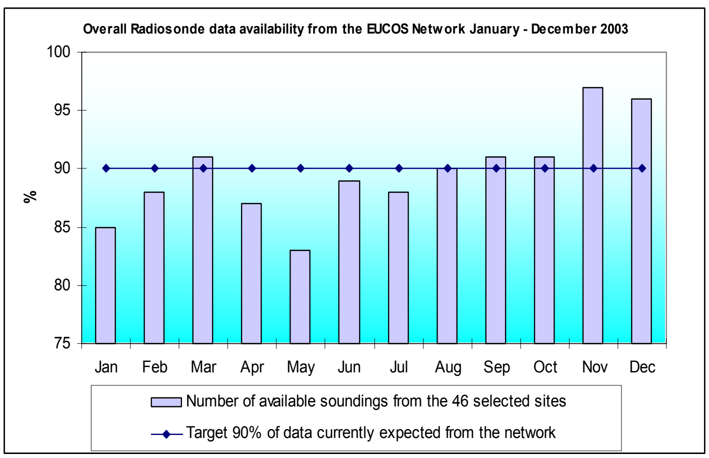

Figure 18: Radiosonde: Data availability January – December 2003, (1) 9 EUCOS sites frequently launch >2 radiosondes /day, (2) 5 EUCOS sites frequently launch <2 radiosondes/ day. Note: During the NA-TReC targeting increased availability during November and December 2003.

5.1.1 Radiosonde Targets

Performance is measured against the following targets:

Data	Quality	Availability of data	Timeliness Of data
Temperature	1.0°K	90% of the data currently expected from the network (Currently 97 Soundings per day - each station to provide no fewer than 2 soundings / day)	**95%** of soundings (Parts A,B C and D)# received by Observation time +120 minutes
Wind vector	2.5 m/s		
Spec Humidity	10%		
O-M 100hPa Geopotential Ht difference	**65 m**		
% Achieving 100hPa	**95%**		
% Achieving 50hPa	**90%**		

Figure 19: Radiosonde Performance Targets

5.1.2 Data Coverage

During 2003, a total of 35624 soundings were received by HH+120, from the 46 EUCOS designated stations. This compares to the EUCOS target of 97 soundings per day.

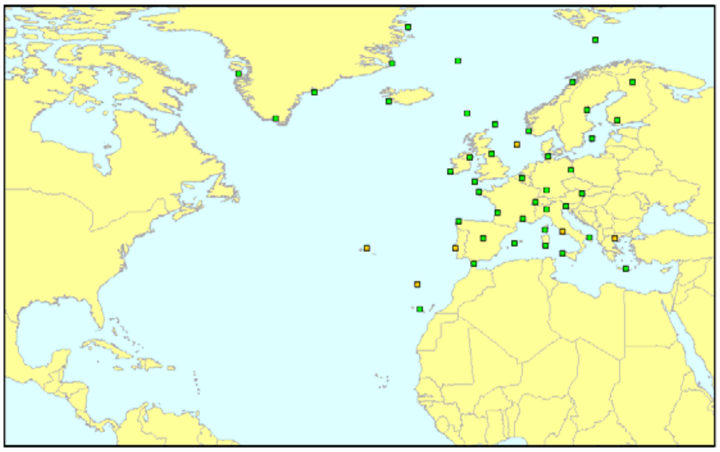

Figure 20: The EUCOS radiosonde network comprising of 46 stations, available at http://www.dwd.de/en/Technik/Projekte/EASAP

5.2 System Availability

Radiosoundings provide upper air observations of temperature, humidity and pressure.
The ground station prepares and launches radiosondes, and weather balloons. The radiosonde signals are received at the ground station where they are processed into meteorological messages.

All 46 EUCOS stations listed in Annex 3, also provide wind measurements using either GPS, Loran-C or radar. With the exception of Payerne (Switzerland) which deploys its own Swiss SRS radiosonde, all EUCOS stations in 2003 used Vaisala radiosondes of either type “RS80” (in use since about 1990) or the newer “RS90” which first came into operational use in about 1998.
The Swiss (SRS) radiosonde uses a thermocouple, carbon hygristor and hypsometer for measuring temperature, humidity and pressure respectively. Both types of Vaisala radiosonde use capacitive sensors, but the smaller size of the RS90 pressure and temperature sensors make them more responsive than those of the older RS80s. The temperature and humidity sensors of both Vaisala radiosondes are fitted to sensor booms that extends outwards and above the radiosonde housing. The boom samples undisturbed air during the ascent, providing one measurement of each variable per second. The RS90 humidity measurements are made alternately by two pulse heated polymer sensors instead of using a single sensor as in the RS80. This method enables water or ice contamination, deposited on one sensor to be removed by heating, while the other sensor makes its measurement.

The RS80 has gradually been replaced by the RS90 radiosonde at about 40% of the EUCOS sites within the last 2 or 3 years. However, Met Services in the UK, Norway, Spain Sweden and Portugal continue to use the RS80.

Currently, 12 of the stations within the EUCOS Network are unmanned “autosondes”, all using RS80 radiosondes.

A new Vaisala radiosonde (RS92) using similar sensors to those of the RS90, but with digital data transmission, automated calibration checks and improved pulse heating techniques, commenced operation at three Autosondes in Germany in January 2004 .Stuttgart (10739) and Essen (10410) are currently the only EUCOS station using the RS92.

Royal Meteorological Institute of Belgium site at Uccle (06447) performed soundings at 00 UTC and 12 UTC, until 01 November 2003. Ozone soundings continue to be performed 3 times per week at 12UTC, and Uccle will continue to take part in future specific measuring campaigns. In line with the changes in observing schedules at this site, EUCOS agreed that the alternative site of Essen, which launches daily at 00 UTC and 12 UTC would be included within the EUCOS network.

5.3 Timeliness

The Radiosonde EUCOS timeliness target of HH+120 has been met throughout the reporting period.

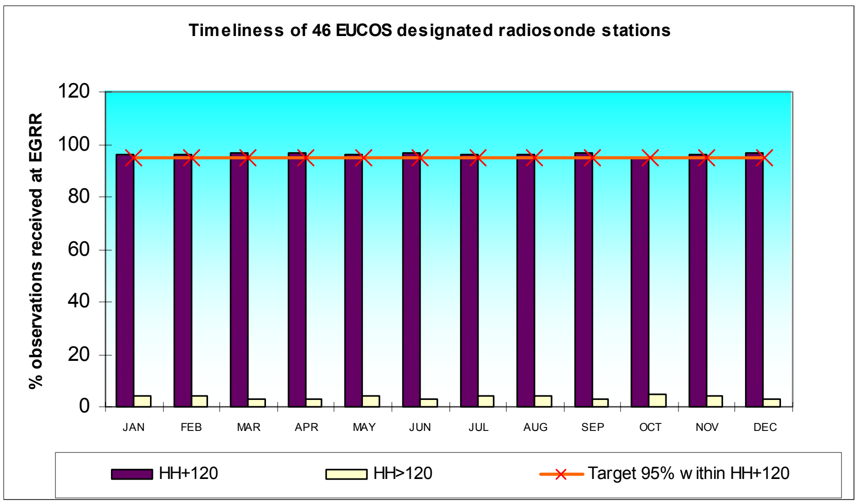

Figure 21:Timeliness of the 46 EUCOS designated radiosonde stations:Target of 95% of all data available by HH+120. Note: Timeliness used for EUCOS sonde statistics is measured by subtracting the nominal ascent time from the time of receipt. 'nominal ascent time' is defined as a multiple of 3 hours (HH) such that the launch time lies between HH -2 and HH +1. For example, any launch between 10Z and 13Z would have a nominal time of 12Z.

5.4 Data Quality

The 100 hPa geopotential height and 50-100 hPa "thickness" are evaluated within the groundstation computer from the radiosonde pressure, temperature and humidity measurements using the hydrostatic equation. These integrated height measurements are used to define the measurement accuracy by comparing with the model field assessment for the station location. Differences in calibration and characteristics of the pressure and temperature sensors of the RS80 and RS90 radiosondes are not large enough to have a significant effect on their relative height measurements from surface to 50 hPa. Although the European Network is mostly in transition from switching from RS80 to RS90-type radiosondes, the monthly and quarterly average Observation-Model height statistics are typically very similar for the two Vaisala radiosondes.

The reliability of the radiosondes used throughout the EUCOS Network is such that generally only small anomalies in performance can be seen. These may for example be caused by station practice, radiosonde batch variation or differences in software version or control parameters used. The comparisons of the mean quarterly height from the model enable a check on an individual station's performance. Height errors are caused primarily by temperature errors. Good quality observations would be expected to have biases between +/- 25m with standard deviations less than 30m. (An average temperature error of 0.4ºC from surface to 100 hPa results in an error of about 25m in the 100 hPa height).

The biases measured from the Met Office and ECMWF models vary slightly in magnitude, but an investigation is useful when both models indicate similar anomalies.

Annex 4 shows quarterly comparisons of mean quarterly 100 hPa heights for each of the 46 EUCOS stations against the Met Office and ECMWF models for 00 UTC and 12 UTC observations respectively. For each station, the green biases are from the Met Office Model and the red biases are from the ECMWF Model.

The comparisons show that generally the EUCOS radiosonde observations are of good quality. Most stations have standard deviations of their differences which are within the acceptable tolerance, but the following stations either have mean biases or standard deviations from both models slightly greater than the tolerances quoted above and would benefit from further investigation to check whether there are any anomalies in practice or software: -

STATION	WMO No.	SONDE	COMMENT
LAJES SANTA RITA PORTUGAL	08508	RS80 GPS	Mean 12 UTC 100 hPa ht outside +/-25m from both models for Q4
LISBON PORTUGAL	08579	RS80 GPS	Mean 12 UTC 100 hPa ht outside +/-25m from both models for Q4
LA CORUNA SPAIN	08001	RS90 LORAN	Mean SD at 00 UTC >30m from both models for Q4

Figure 22:Stations with mean biases or standard deviations from both models slightly greater than the EUCOS tolerances.

Five radiosonde stations have consistently failed to achieve the EUCOS minimum requirement of two soundings per day (to be made available by HH+120).

The following actions have been taken in an effort to overcome the problems:

- IM Portugal has been supplied with balloons, the cost of which has been deducted from the compensation IM Portugal expect from EUCOS. These have been received although other technical difficulties have now been reported. The Portuguese radiosounding stations are operating a reduced observation programme of one launch per day at 12 UTC. EUCOS staff continue to discuss this matter with IM Portugal.
- EUCOS staff have discussed the matter of data timeliness with HNMS and the problem has been resolved. Monitoring continues.

Participant	Station	Fault Description	Reason	Fault Report Number
IM Portugal	Lajes (08508)	Less than 2 soundings / day.	Shortage of consumables. Pre and post NA-TReC	2
	Lisbon (08579)			1
	Funchal (08522)			4
	Lisbon (08579)	Mean 12UTC 100hPa ht outside +/- 25m from both models	Data has been provided by EUCOS. IM-P investigation and monitoring continue	27
	Lajes (08508)			31
	Funchal (08522)	Less than 2 soundings / day.	Shortage of consumables. Post NA-TReC	71
HNMS	Thessalonika (16622)	Data frequently received after HH+120.	Launches were starting at HH -45min and thus the end of the sounding was out of time for receipt within HH+120 HNMS instructed the observers to start the launch earlier. Monitoring continues. The pre OLYMPICS during August caused some disruption to the operational schedule at HNMS.	3
	Heraklion (16754)	Less than 2 soundings / day.	Shortage of consumables	11

Figure 23: The five radiosonde stations, which have consistently failed to achieve the EUCOS minimum requirement of two soundings per day (to be made available by HH+120).

5.4.1 Reported Height Performance

EUCOS has defined a target of 95% of soundings reaching 100hPa and 90% reaching 50hPa. Both targets have been exceeded throughout the period.

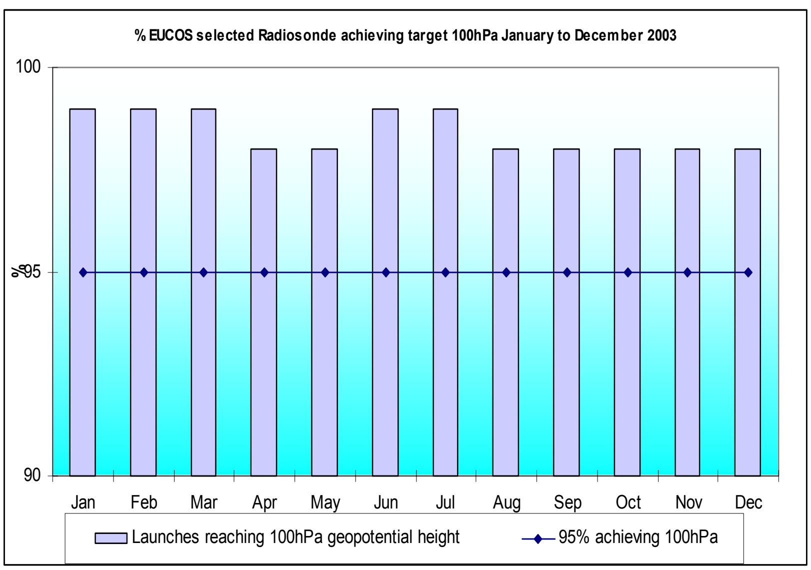

Figure 24: Illustrates the % TEMP messages achieving 100hPa against the 95% target

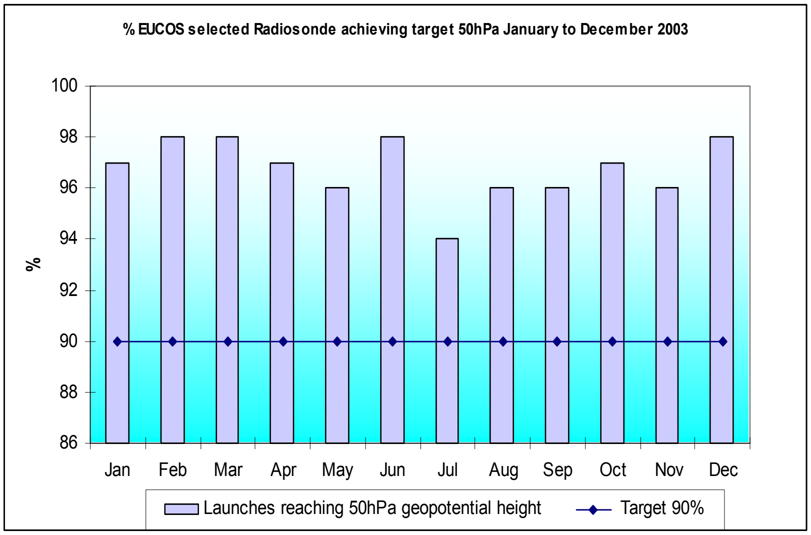

Figure 25:Illustrates the % TEMP messages achieving 50hPa against the 90% target.

5.5 Conclusion

Only small anomalies in performance can be seen within the EUCOS Upper Air Network and investigations into the similar anomalies of biases measured in the UK Met Office and ECMWF models continue.

The support effort to overcome the availability problems caused by the five underperforming radiosonde stations continues.

6 The Surface Marine Programme

The EUMETNET Surface Marine Programme element of EUCOS is designed to include all surface marine observations from Voluntary Observing Ships (VOS), moored buoys and drifting buoys operated by EUMETNET members and future partners. From 1st April 2003, E-SURFMAR became a component of the EUCOS Operational Programme. It has been initially defined as an Optional Programme with duration of 4 years divided into two stages of two years each. At its end, the programme should include surface marine observations from Voluntary Observing Ships (VOS), moored buoys and drifting buoys operated by EUMETNET members and possible partners. Programme Management responsibilities lie with Meteo-France.

Presently, European data buoys are managed by the European Group on Ocean Stations (EGOS). A transfer of responsibilities from EGOS to EUCOS will be studied and proposed, for this component of the system. EGOS members are deploying close to fifty drifting buoys each year and operate a network of offshore moored buoys.

An inventory of the ships operated by EUMETNET member's shows that 50% of the observations within E-SURFMAR are by ships operated by non-EUMETNET WMO members. The VOS advisory group will help with the programme management of this component of the programme.

6.1 Data coverage

The density of observations is higher along the main shipping routes (e.g. towards the Mediterranean Sea and along the western coasts of Europe and Africa. Data sparse areas appear in northern regions such as Labrador Sea and Norwegian Sea as well as in the south of the area and in some corners such as Bay of Biscay and some parts of the Mediterranean Sea. As an illustration, figure 20 shows the distribution of all surface marine observations carried out at main synoptic hours over one month.

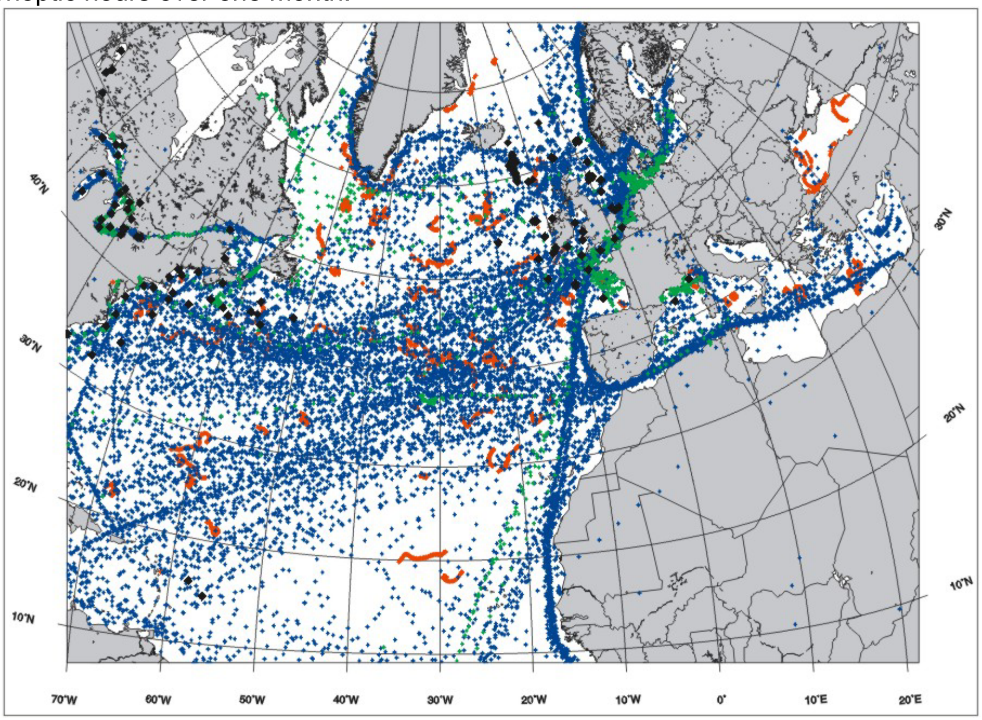

Figure 26 – Surface Marine observations at main synoptic hours in June 2003
VOS ships (blue dots), AWS ships (green) moored buoys (black) and drifting buoys (red)

6.2 System Availability

Drifting buoys report their data through the Argos system. For North American users, raw Argos data are received and processed in Largo, USA. The remainder are received and processed in Toulouse, France. Data are converted into WMO FM-18 BUOY reports, which are sent onto the GTS by the two processing centres. Since the end of June 2003, data from drifting buoys are also converted in BUFR code and transmitted onto the GTS in parallel. Both Argos centres can act as back up for a centre.

A few drifting buoys continue to use independent receiving stations such as Sondre Stromfjord, in Greenland, which has reduced the transmission delays in the past. The quality of buoy data reported by independent receiving stations is generally weaker, and this practice generates duplicates. Future improvements of the Argos system, intend to lead to the gradual abandonment of these stations.

Most of the drifting buoys report hourly data. For technical reasons, a few buoys report the same observation through two messages having a different time (plus or minus a few minutes).

70 drifting buoys, including 20 for the EUCOS OSE, were deployed by (or for) EGOS members in 2003. By December 31st, 58 EGOS-EUCOS drifting buoys were operational in the North Atlantic (i.e. reporting reliable air pressure measurements at least). In addition to EGOS drifting buoys, 26 drifting additional buoys, mainly operated by Navoceano (US Naval Oceanographic service), measuring air pressure, sea temperature and wind data into the EUCOS area of interest.

The EUCOS buoy deployments were as follows:

Summer Observing System Experiment: 62551, 62552, 62553, 62554, 62555, 62801, 62802, 62803, 62804, 62805

Winter Observing System Experiment: 44742, 44743, 44745, 44746, 44747, 44760, 44761, 44762, 44765, 44766

Moored buoys report their data through geo-stationary satellites (GOES and Meteosat). European operators receive their data through Darmstadt. Raw buoy data are sent onto the GTS into specific bulletins and then routed to the meteorological services (UKMO and Meteo-France) where they are processed and sent back onto the GTS in FM-13 SHIP code. Most of the moored buoy reports hourly data.

Twelve EGOS moored buoys were included in the initial interim design of the EUCOS surface marine programme.

VOS Ships Most of the Automated Weather Systems (AWS) aboard ship use either Meteosat (DWD) or Inmarsat-C (Météo-France) to report their data. Additional parameters such as present and past weather, cloud, sea state, etc, can be entered by ship's officers and the data are coded into FM-13 SHIP messages before transmission. The transmission onto the GTS is assumed by Darmstadt (Meteosat) and a few Inmarsat receiving stations accepting "code 41" messages. German AWS reports hourly data. French VOS generally report 3-hourly synoptic data.

A few systems use Argos to report their data, which is the case for the French hourly reporting MINOS system. The procedure is the same as drifting buoys; however, FM-13 SHIP code is used to report the data.

Most VOS ships are not equipped with automated systems and report their data through Inmarsat (FM-13 SHIP code 41 message). Observations are rarely reported more than every 6 hours on these ships.

6.3 Surface Marine Targets

Performance is measured against the following targets:

Moored buoys

Data	Quality	Availability of data	Timeliness Of data
Pressure	1.0 hPa	90% of the expected reports (260 observations / day based on the 12 selected stations)	**85% of available data received by HH + 15 minutes** **95% of available data received by HH + 120 minutes**
Temperature	**1.0°K**		
Spec Humidity	15%		
Wind vector	**2.5 m/s**		
Sea Surface Temp	1.0°K		

Figure 27:Moored Buoy Performance Targets

Drifting Buoys

Data	Accuracy (Initial EUCOS level)	Availability of data (Initial EUCOS level)	Timeliness Of data (Initial EUCOS level)
Pressure	1.0 hPa	24 observations per buoy / day	85% of available data received by Observation Time + 120 minutes
Temperature	2.0°K		
Sea Surface Temp	1.0°K		

Figure 28:Drifting Buoy Performance Targets

VOS

Data	Accuracy (Initial EUCOS level)	Availability of data (Initial EUCOS level)	Timeliness Of data (Initial EUCOS level)
Pressure	1.0 hPa	1,130 observations per day (Based on current performance)	85% of available data received by HH + 45 minutes 95% of available data received by HH + 120 minutes
Temperature	2.0°K		
Spec Humidity	15%		
Wind vector	5 m/s		
Sea Surface Temp	1.0°K		

Figure 29:VOS Performance Targets

Drifting Buoys : The EUCOS availability target of 850 observations per day was achieved throughout the period. However, the number of reliable hourly observations per day from EGOS drifting buoys varied from 883 in February to a maximum of 1084 in June.

The performance of drifting buoys was variable and did not to achieve the EUCOS timeliness target of 85% of available data received by OT+120, throughout of 2003.

Moored Buoys: The EUCOS availability target of 260 observations per day was not achieved throughout the period. The number of reliable hourly observations per day from the 12 selected moored buoys varied from 250 (June) to 294 (December). Due to mooring breakage at K5 (WMO 64045) and RARH (WMO 62106), the network was incomplete. They will be replaced at the earliest opportunity. Two buoys are available at Pembroke for this operation.K7 (WMO 64046) reported no wind speed data since February 24th, 2003. The two anemometers of this buoy are out of order and will be replaced as soon as possible

The Moored buoy network did not achieve the EUCOS timeliness target of 85% of available data received by OT+15, and 95% of available data received by OT+120, throughout of 2003

Automatic VOS ships: The EUCOS availability target of 160 observations per day was achieved throughout the period.

Manned VOS ships: The EUCOS availability target of 550 observations per day was achieved for 83% of the period.

The VOS network achieved the EUCOS timeliness target of 85% of available data received by OT+45 for 75% of the period, and the timeliness target of 95% of available data received by OT+120 was achieved throughout.

6.4 Data Quality

Drifting Buoys : The EUCOS quality target of percentage gross error bias (O-B)+/-> 1hPa (<1%) was achieved throughout the period. The RMS of differences (O-B)<1.2hPa was achieved for 83% of the period.

Moored Buoys: The EUCOS quality target of percentage gross error bias (O-B)+/-> 1hPa (<0.5%) was achieved for 91% of the period. The RMS of differences (O-B)<1hPa was achieved throughout.

Automatic VOS ships: The EUCOS quality target of percentage gross error bias (O-B)+/-> 1hPa (<0.5%) was achieved for 91% of the period. The RMS of differences (O-B)<1.2hPa was achieved for 83% of the period.

Manned VOS ships: The EUCOS quality target of percentage gross error bias (O-B)+/-> 1hPa (<1%) was achieved for 58% of the period. The RMS of differences (O-B)<1.5hPa was not achieved in the period

Annex 6 provides a detailed representation of data availability, data quality and timeliness of the E-SURFMAR network.

7 Surface observations

The Surface Network has been integrated within EUCOS. The initial surface network design, currently under review, aims to contribute to the reduction in network operating costs, improve data quality, network reliability, and data timeliness.

The Surface stations that were initially included within the EUCOS surface network do not include a number of the GCOS and RBCN stations listed for Members. The importance of smaller scale features with notable topographic forcing has been incorporated into the design.

7.1 Data Availability and Coverage

The EUCOS availability target of 860 observations per day was achieved throughout the period.

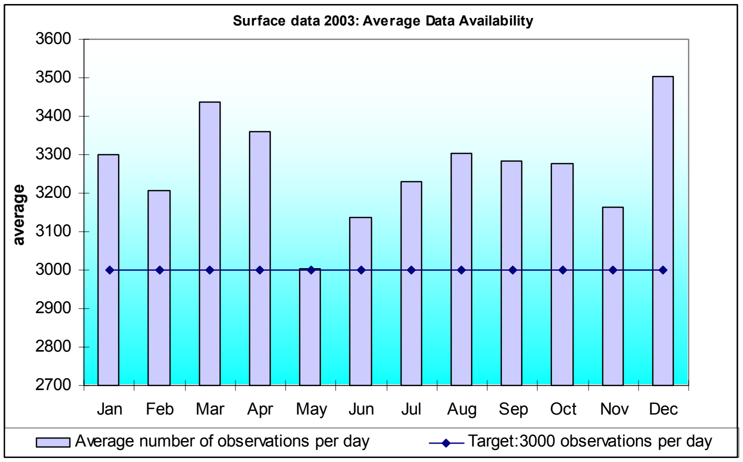

Figure 30: Surface: Average data availability 2003, target 3000 observations per day

7.1.1 Surface Targets

Performance is measured against the following targets:

Data	Quality	Availability of data	Timeliness Of data
Pressure	1.0 hPa	90% of expected observations (To be calculated based on the initial design)	85% received by HH + 15 minutes 95% received by HH + 120 minutes
Temperature	1.0°K		
Spec Humidity	10%		
Wind vector	2.5 m/s		
Precipitation rate	1.0 mm/h		

Figure 31: Surface Performance Targets

7.1.2 Data Coverage

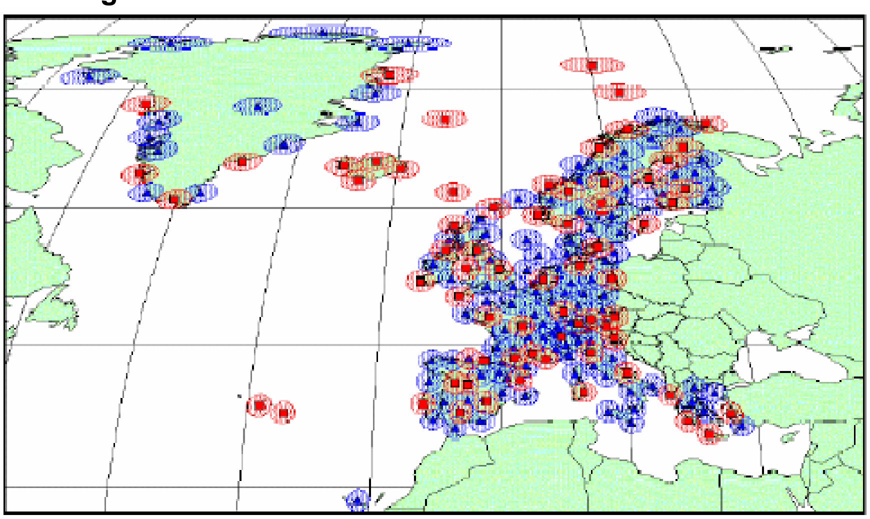

Figure 32: Surface Coverage 2003

i) All GCOS stations were first included (shown by red squares in the figure above). These are seen to be well distributed throughout Europe with little overlap based on the 250km requirement (illustrated by the shaded area around each station).

ii) Next, the most appropriate stations were selected to complete a uniform network with 250km spacing (shown as blue triangles in the figure above). Priority has been given to stations co-located with EUCOS upper air sites.
iii) Lastly, additional surface stations were selected around the Alps and Pyrenees (also plotted as blue triangles).

7.3 Timeliness

The Surface network failed to achieve the EUCOS timeliness target of 85% of available data received by HH+15, during most of 2003. However, the EUCOS timeliness target of 95% of available data received by HH+120, was achieved throughout.

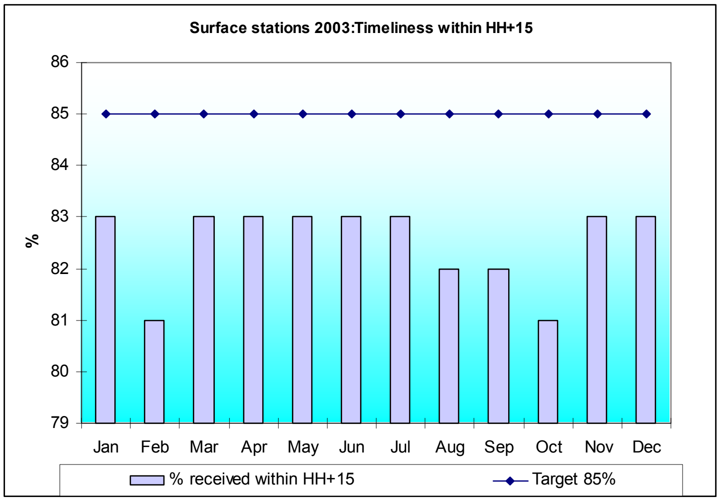

Figure 33 :Surface: data timeliness Target 85% received within HH+15

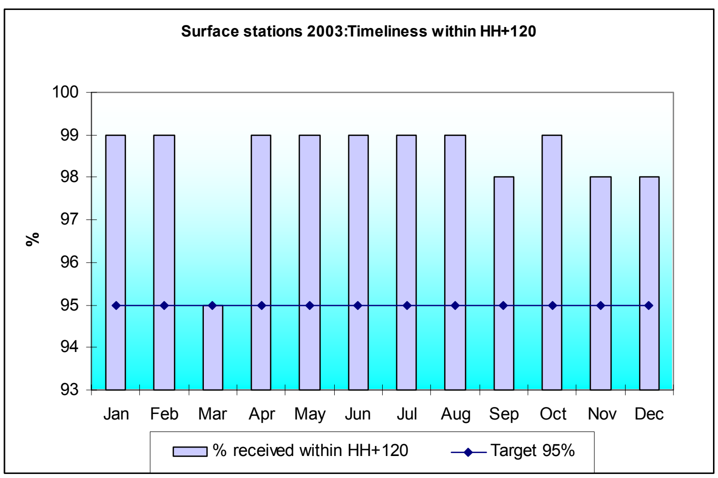

Figure 34 : Surface: data timeliness target 95% received within HH+120

7.4 Data Quality

Comprehensive data quality monitoring will commence once the surface network review has been completed. This will initially focus on accuracy of pressure measurements and will be based on monitoring tools, which have been already developed. Initial results indicate a high quality network (3-6% of observations show a pressure bias >1hPa)

8 Conclusion

The observational data in the EUCOS area continues to be of high quality with respect to availability, quality and timeliness.

• **E-AMDAR Programme**
The data quality of E-AMDAR reports is very good and there are no significant anomalies observed. The fleet of E-AMDAR equipped aircraft continues to increase and is being operated in an efficient manner. The data availability remains good in the EUCOS area although increased coverage is required in data sparse regions in required (especially those over remote parts of the North Atlantic). The number of profiles available each day remains steady at approximately 700. The large majority of which are made available over Europe. Long haul routes provide data over Siberia, Greenland, Canada, Australia, the Atlantic and the Pacific.

• E-ASAP Programme

E-ASAP performance is steadily improving thanks to the hard work of those managers responsible for the network. Data availability has improved but differences in the number of TEMPS received by ECMWF, DWD and the Met Office (particularly for ships ELML7 and V2XM) needs further investigation. Performance is noted to vary between ASAP units.

• Performing above the target of 90% reaching 100hPa are OWS 'M'/ LDWR, OVYA2, OXTS2, EBUQ and KRPD.

• Performing below target the 100hPa target are Oil rig Ekofisk, FNRS, FNPH, FQFL, FQFM, ELML7, OXVH2, OXYH2, ZCBP6, V2XM, WPKD, KHRH, WAAH and SWJS.

• Performing above the target of 75% reaching 50hPa are OWS 'M'/ LDWR OVYA2, OXTS2, OXYH2, ZCBP6, WPKD, KRPD, WAAH and SWJS.

• Performing below target the 50hPa target are Oil rig Ekofisk, FNRS, FNPH, FQFL, FQFM, ELML7, V2XM SWJS and KHRH.

•EUCOS Radiosonde network The EUCOS radiosonde network is operating at a high level with respect to data availability, timeliness and data quality. It is noted that there are particular issues of availability at Azores, Lisbon, Madeira, and actions have been taken in an effort to over come the problems. A timeliness issue with data from Heraklion has been identified and performance in the second half of the period Lajes, Visby and Lisbon are thought to be performing outside data quality tolerance when compared with the Met Office and ECMWF model (Mean 12 UTC 100 hPa ht outside +/-25m from both models). Monitoring continues.

• E-SURFMAR Programme: VOS The expected number of observations per day was achieved throughout the period. The error bias (O-B)+/-> 1hPa (<0.5%) ranged from 0.1% to 1.2% for manned and automatic VOS. Automatic VOS are performing better than Manned VOS. Methods for improving data quality for the latter enquire investigation.

• E-SURFMAR Programme: **Drifting Buoys**
70 drifting buoys, including 20 for the EUCOS OSE, were deployed by (or for) EGOS members in 2003. At December 31st, 58 EGOS-EUCOS drifting buoys were operational in the North Atlantic (i.e. reporting reliable air pressure measurements at least). At the same time, 26 drifting additional buoys, belonging to US agencies, were in operation in the EUCOS area of interest. Performance has been good but timeliness has deteriorated during the period.

• E-SURFMAR Programme: **Moored Buoys** Twelve moored buoys are included in the interim design of the EUCOS moored buoy network. Performance has been good throughout the period although a decline in data availability during June has been noted due to K5 (WMO 64045) and RARH (WMO 62106) not operating. No wind speed was reported from K7 moored buoy (WMO 64046) for most of the period.

• EUCOS Surface Network Performance targets have been identified and the initial Network Design is currently under review. The initial design has achieved excellent results throughout the period for timeliness and data availability.

9 Acknowledgements

E-AMADAR Programme Manager
E-AMDAR Technical Co-ordinator, UK Met Office
E-ASAP Programme Manager
E-SURMAR Programme Manager
EUMETNET Radiosonde, UK Met Office
Data Storage & Access, Software Development UK Met Office
E-ASAP data visualisation, Software Development, DWD
AMDAR WMO Panel

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Annex 1 **ASAP routes January – December 2003**

Member	Call sign	Name	ASAP routes January - December 2003	Wind finding
Germany	DBBH*	Meteor	Research vessel, area depending on experiments, operating mostly outside the EUCOS Area in the South Atlantic.	GPS
	DBLK*	Polarstern	Research vessel, operates during the respective hemispheric summers in the Arctic and Antarctic areas of the Atlantic. Operated by German Alfred-Wegrner_Institute (AWI) Polar Research Institute, no genuine ASAP-unit, reporting on informal basis, usually at 1200UTC, but additional soundings are made if needed for helicopter operational forecasts.	
	ELML7	Hornbay	Operates in the North Atlantic between German, Dutch and French harbours and Venezuela.	
	KHRH	Sealand Developer	Commenced opertions on the North Atlantic - Gulf of Mexico, Charleston route on 30/05/03 The deck officers were trained in taking soundings on the route to Charleston 31 May to 12 June. They will launch in the Gulf of Mexico during the hurricane period.	
	WAAH	Sealand Motivator	The 3rd refurbished DWD ASAP installed on the Sealand Motivator 16/12/03. She will operate on the Charleston route.	
Denmark	OVYA2 OXVH2 OXYH2 OXTS2	Arina Arctica Naja Arctica Nuka Arctica Irena Arctica	The two Danish ASAP units are hosted by ships Nuka Arctica (OXYH2), Arina Arctica(OVYA2), Irena Arctica (OXTS2) and Naja Arctika (OXVH2). Two ships operate between north Denmark and north bound along the west coast of Greenland, sharing the operation of the ASAP unit.	LORAN-C/GPS
France	FNRS FNPH	Douce France Fort Desaix	The two French units on board Fort Desaix (FNPH) and Douce France (FNRS), operate from Brittany to the West Indies, crossing the sensitive area between the Azores islands and the Bay of Biscay.	GPS
	FQFL FQFM	Fort Saint Louis Fort Saint Pierre	Fort Saint Louis (FQFL) and Fort Saint Pierre (FQFM) replaced Fort Desaix (FNPH) and Douce France (FNRS) in late 2003, on the route between Europe to Montreal	
United Kingdom	ZCBP6	CanMar Pride	The UK unit, operates between Thamesport and Montreal as part of the vessel's route Thamesport-Montreal. The Owners of the CanMar Pride have confirmed changes to their Trans-Atlantic container services. New tonnage delivered in June 2003 will operate on the Thamesport - Montreal route displacing the CanMar Pride, which will be switched to the Hamburg/Antwerp - Montreal route during August 2003	GPS
Spain	EBUQ	Esperanza del Mar	The Spanish Hospital Ship, operates between the Mauritanian coast and the Canary Islands.	GPS
Iceland/ Sweden	V2XM	Skogafoss	Operates between Reykjavik, Iceland and Norfolk, Virginia.	LORAN-C/GPS
E-ASAP	WPKD	Sealand Achiever	Operated on the Charleston route calling at Houston. KHRH and WPKD operate within the same container service, and are separated by one week in time. The crew launch balloons from 10 degrees west up to 60 deg. West and north of 30 deg. North.	
	KRPD	Sealand Performance	The equipment from the Peljasper was installed on the Sealand Performance (KRPD) August 2003, and she will operate on the Med-Gulf route (As far east as Malta, Newark to Houston, back to the US east coast, and across the Atlantic to the med)	
	SWJS	Peljasper	Operated in the Mediterranean from December 2000 until 1 June 2003.	

* Although this ASAP unit is not within the ASAP Programme its performance is monitored when it enters the EUCOS area of interest.

Annex 2

1 The Performance of E-ASAP units

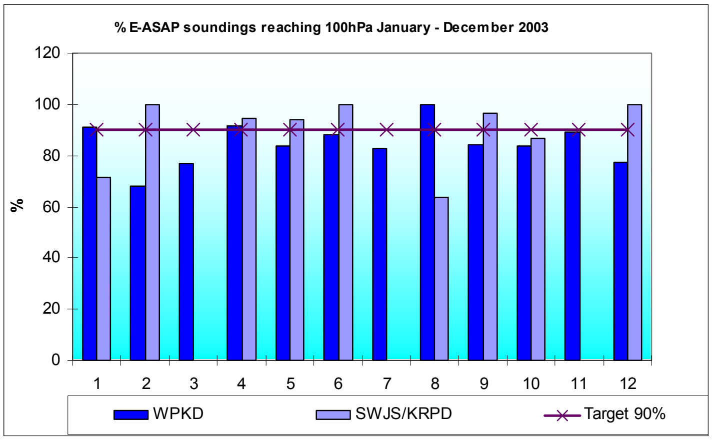


Figure 1: The number of E-ASAP soundings achieving 100hPa against a 90% target

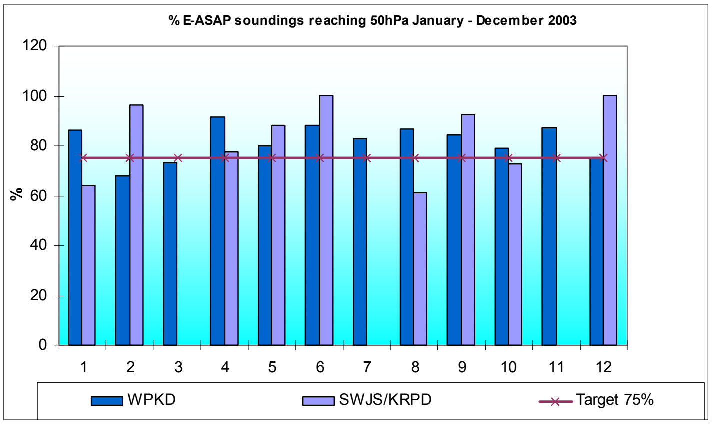


Figure 2: The number of E-ASAP soundings achieving 50hPa against a 75% target

2 The DWD ASAP Performance against targets

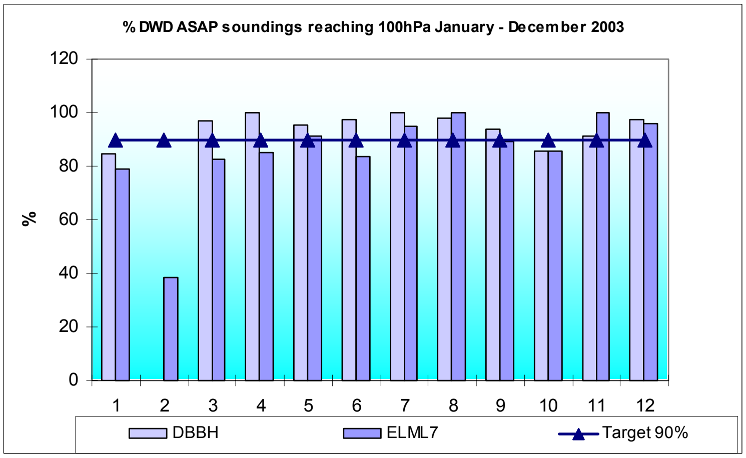


Figure 3a: The number of DWD ASAP soundings achieving 100hPa against a 90% target

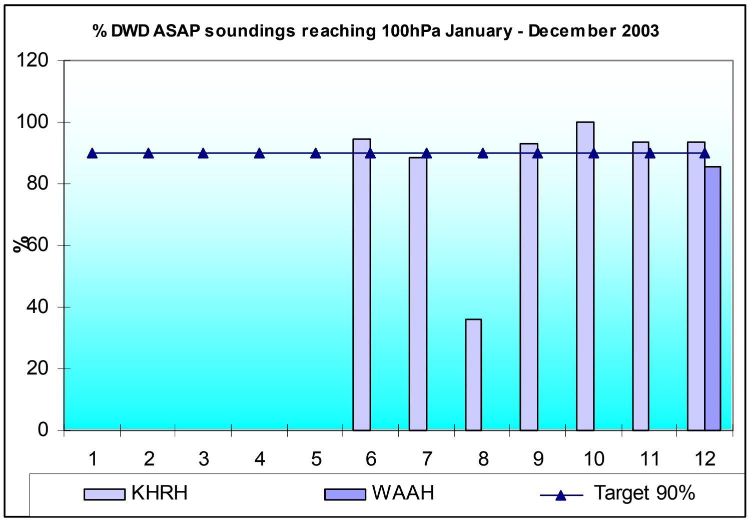


Figure 3b: The number of DWD ASAP soundings achieving 100hPa against a 90% target

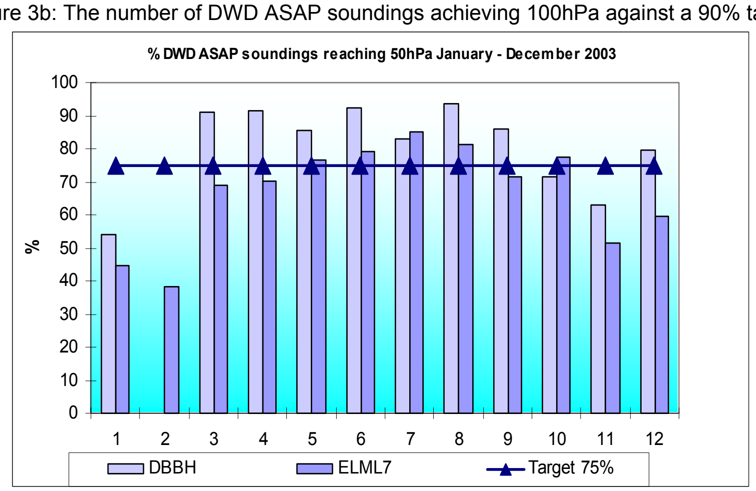


Figure 4a: The number of DWD ASAP soundings achieving 50hPa against a 75% target

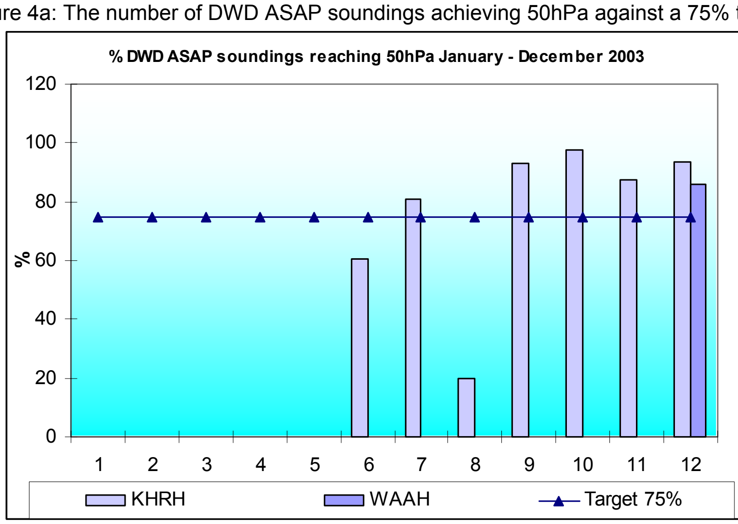


Figure 4b: The number of DWD ASAP soundings achieving 50hPa against a 75% target

3 The UK Met Office ASAP Performance against target

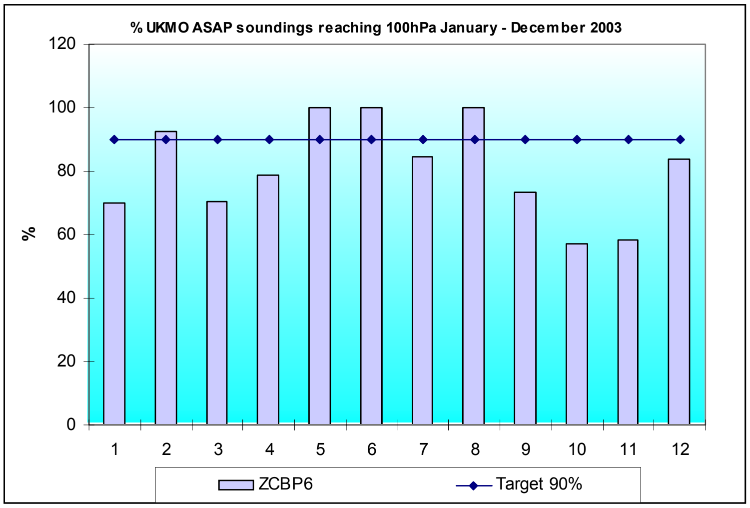


Figure 5: The number of UKMO ASAP soundings achieving 100hPa against a 90% target

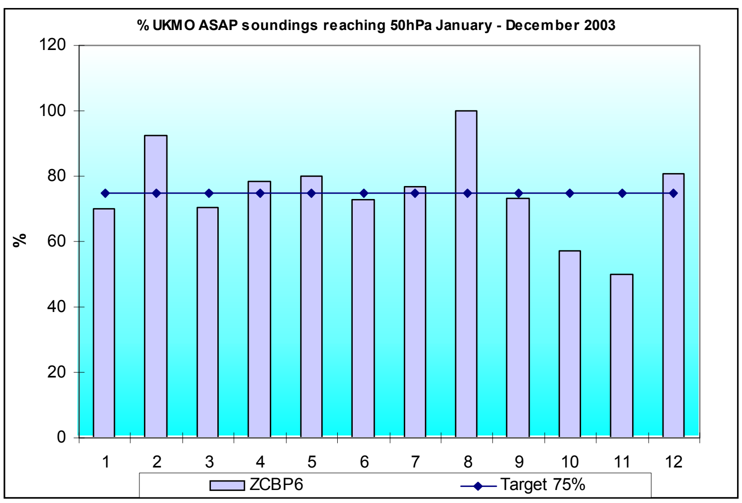


Figure 6: The number of UKMO ASAP soundings achieving 50hPa against a 75% target

4 The MeteoFrance ASAP Performance against targets

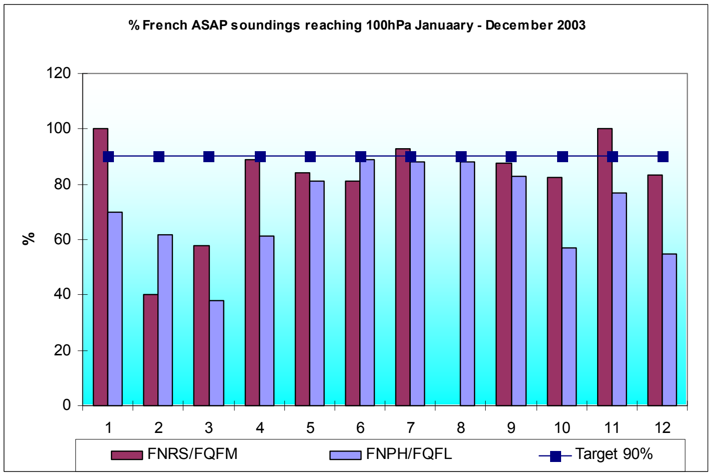


Figure 7: The number of MeteoFrance ASAP soundings achieving 100hPa against a 90% target

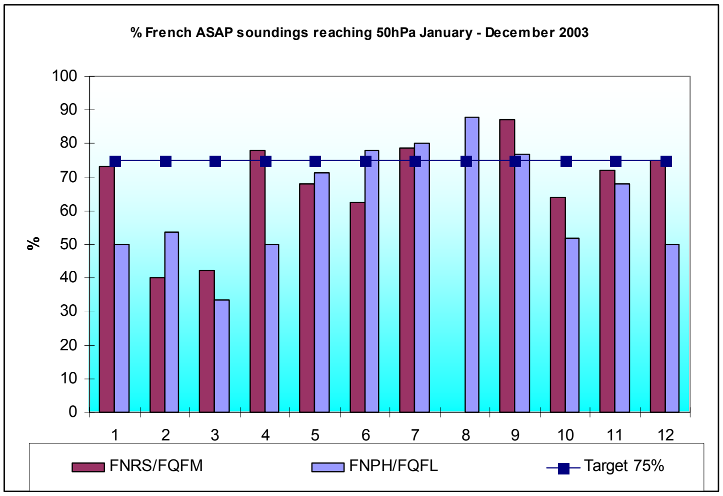


Figure 8: The number of MeteoFrance ASAP soundings achieving 50hPa against a 75% target

5 The DMI ASAP Performance against targets

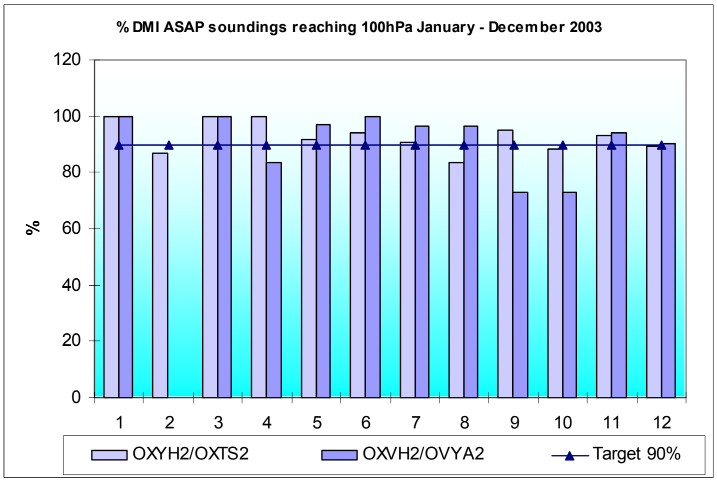


Figure 9: The number of DMI ASAP soundings achieving 100hPa against a 90% target

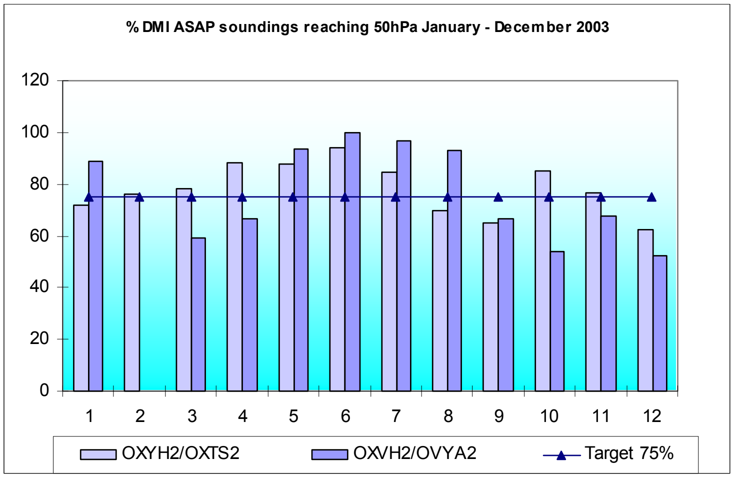


Figure 10: The number of DMI ASAP soundings achieving 50hPa against a 75% target

6 The INM Spain ASAP Performance against targets

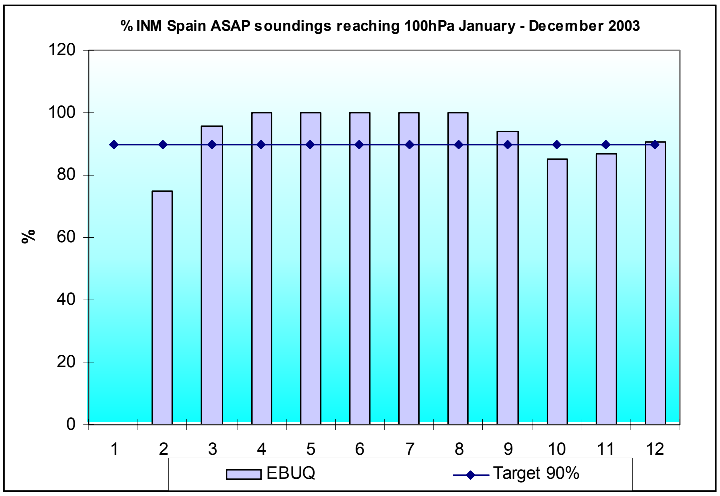


Figure 11: The number of INM Spain ASAP soundings achieving 100hPa against a 90% target

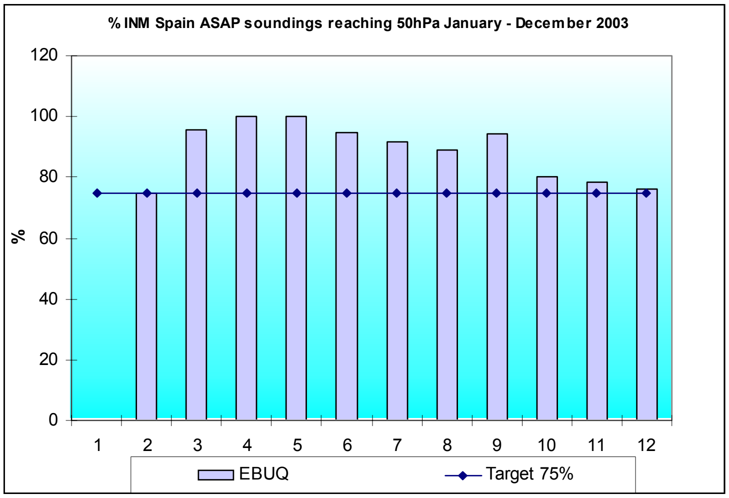


Figure 12: The number of INM Spain ASAP soundings achieving 50hPa against a 75% target

7 The Icelandic/Swedish ASAP Performance against targets

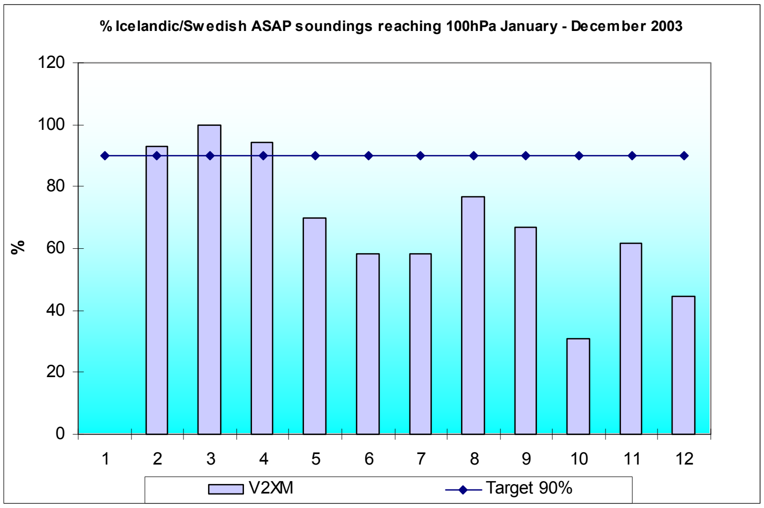


Figure 13: The number of Icelandic/Swedish ASAP soundings achieving 100hPa against a 90% target

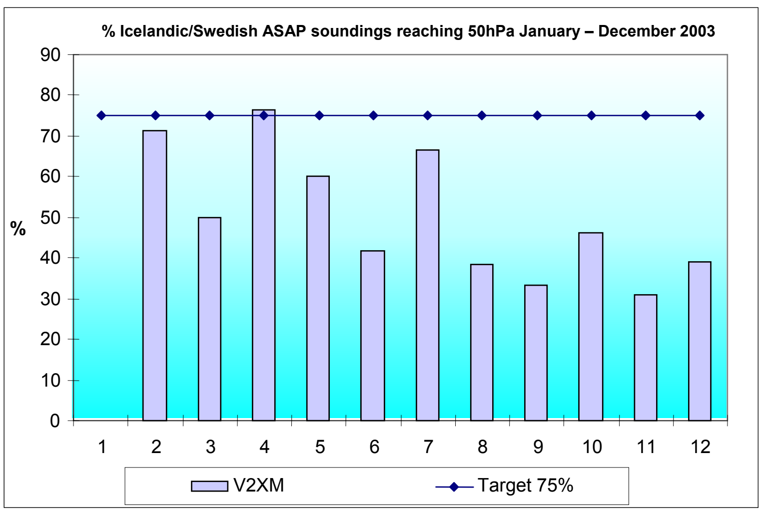


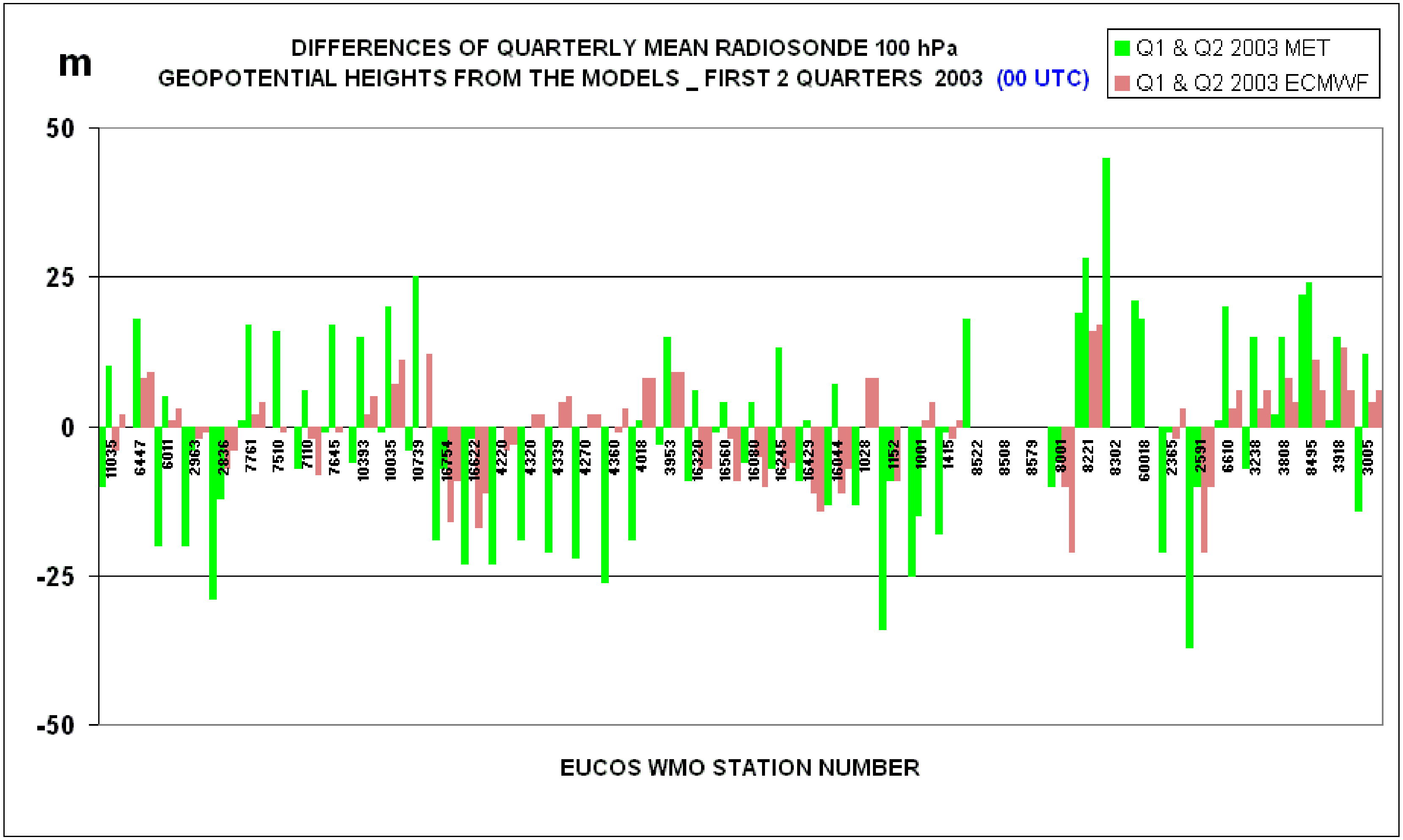
Figure 14: The number of Icelandic/Swedish ASAP soundings achieving 50hPa against a 90% target

Annex 3 The EUCOS 46 selected Radiosonde sites; sonde type and wind finding system

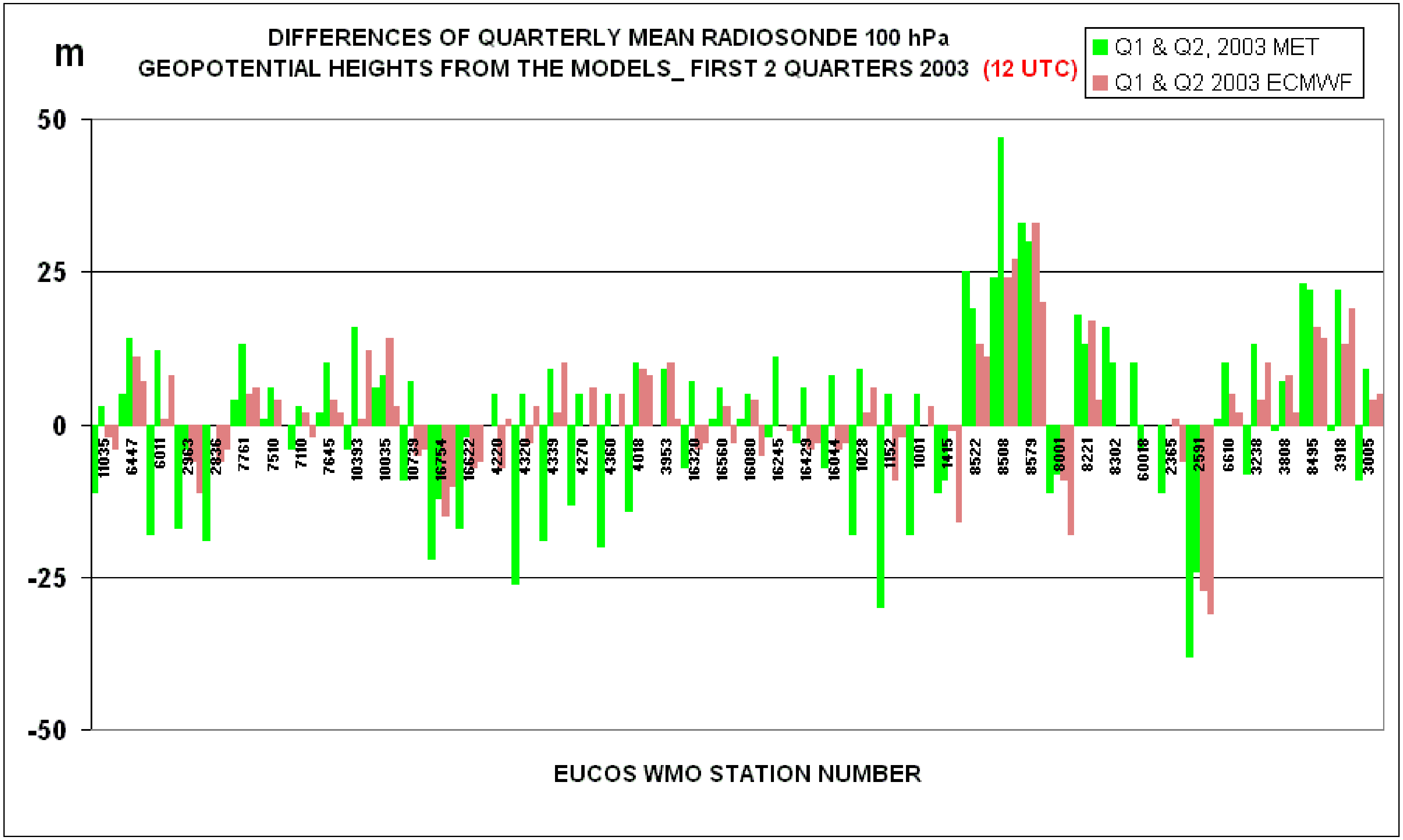
MEMBER	OCE	BORD	GUAN	WMO No.	STATION NAME	SONDE TYPE	WINDFINDING
Austria				11035	WIEN	RS90	RADAR
Denmark	Y			06011	THORSAVN	RS80/RS90	LORAN
Finland			Y	02963	JOKIOINEN	RS80 AUTO	LORAN
Finland				02836	SODANKYLA	RS90	LORAN
France				07761	AJACCIO	RS90	LORAN
France				07510	BORDEAUX	RS80 AUTO	LORAN
France				07110	BREST	RS90	LORAN
France				07645	NIMES-COURBESSAC	RS90	LORAN
Germany				10393	LINDENBERG	RS80	RADAR
Germany				10410	ESSEN	RS92 AUTO	GPS
Germany				10035	SCHLESWIG	RS80	RADAR
Germany			Y	10739	STUTTGART	RS92 AUTO	GPS
Greece		Y		16754	HERAKLION	RS90	LORAN
Greece				16622	THESSALONIK	RS90	LORAN
Greenland	Y			04220	AASIAAT	RS90	GPS
Greenland	Y			04320	DANMARKSHAVN	RS90	LORAN
Greenland	Y			04339	ITTOQQORTOORMIIT	RS90	LORAN
Greenland	Y			04270	NARSARSUAQ	RS90	GPS
Greenland	Y			04360	TASIILAQ	RS90	LORAN
Iceland	Y		Y	04018	KEFLAVIK	RS80	GPS/LORAN
Ireland		Y	Y	03953	VALENTIA	RS80	LORAN
Italy				16320	BRINDISI	RS90	LORAN
Italy		Y		16560	CAGLIARI	RS90	LORAN
Italy				16080	MILANO	RS90	LORAN
Italy			Y	16245	PRACTICA DI MARE	RS90	GPS
Italy		Y		16429	TRAPANI-BIRGI	RS90	LORAN
Italy				16044	UDINE	RS90	LORAN
Norway	Y			01028	BJORNOYA	RS90	LORAN
Norway		Y		01152	BODO-VI	RS80 AUTO	LORAN
Norway			Y	01001	JAN MAYEN	RS80	LORAN
Norway				01415	STAVANGER	RS80 AUTO	LORAN
Portugal	Y			08522	FUNCHAL	RS80	GPS
Portugal	Y		Y	08508	LAJES SANTA RITA	RS80	GPS
Portugal		Y		08579	LISBOA - GAGO	RS80	GPS
Spain		Y		08001	LA CORUNA	RS90	LORAN
Spain				08221	MADRID BARAJAS	RS80 AUTO	GPS
Spain				08302	PALMA	RS80 AUTO	GPS
Spain	Y			60018	TENERIFE - GUIMAR	RS80 AUTO	GPS
Sweden				02365	TIMRA - MIDLANDA (SUNDSVALL)	RS80 AUTO	LORAN
Sweden				02591	VISBY	RS80 AUTO	LORAN
Switzerland				06610	PAYERNE	SRS	RADAR
UK		Y	Y	03238	ALBEMARLE	RS80 AUTO	LORAN
UK		Y	Y	03808	CAMBORNE	RS80	LORAN
UK				08495	GIBRALTAR	RS80	GPS
UK				03918	CASTOR BAY	RS80 AUTO	LORAN
UK	Y		Y	03005	LERWICK	RS80	LORAN

OCE refers to station on Atlantic Islands, BORD to stations on the Atlantic and Mediterranean borders and GUAN to stations for GCOS.

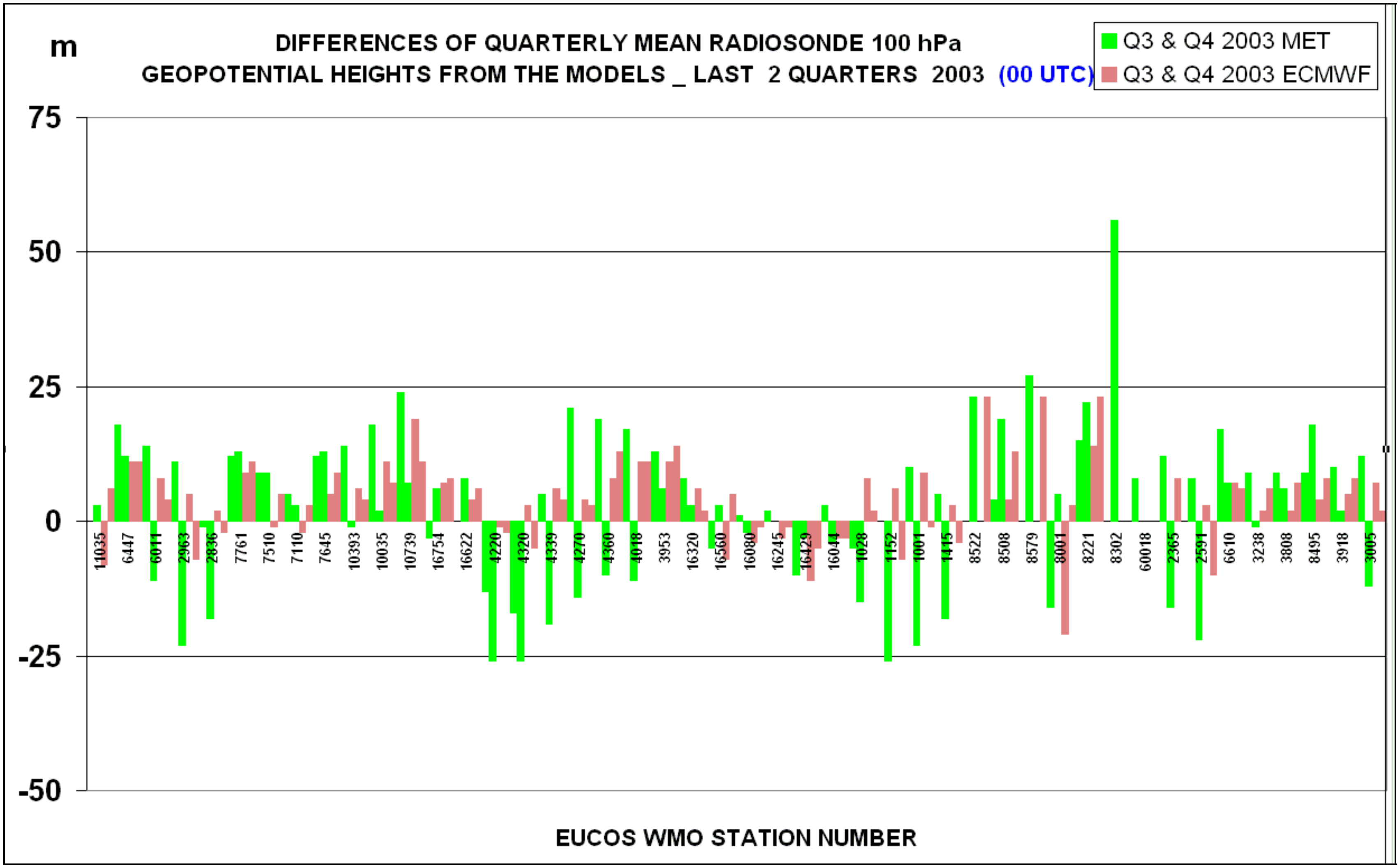
Annex 4



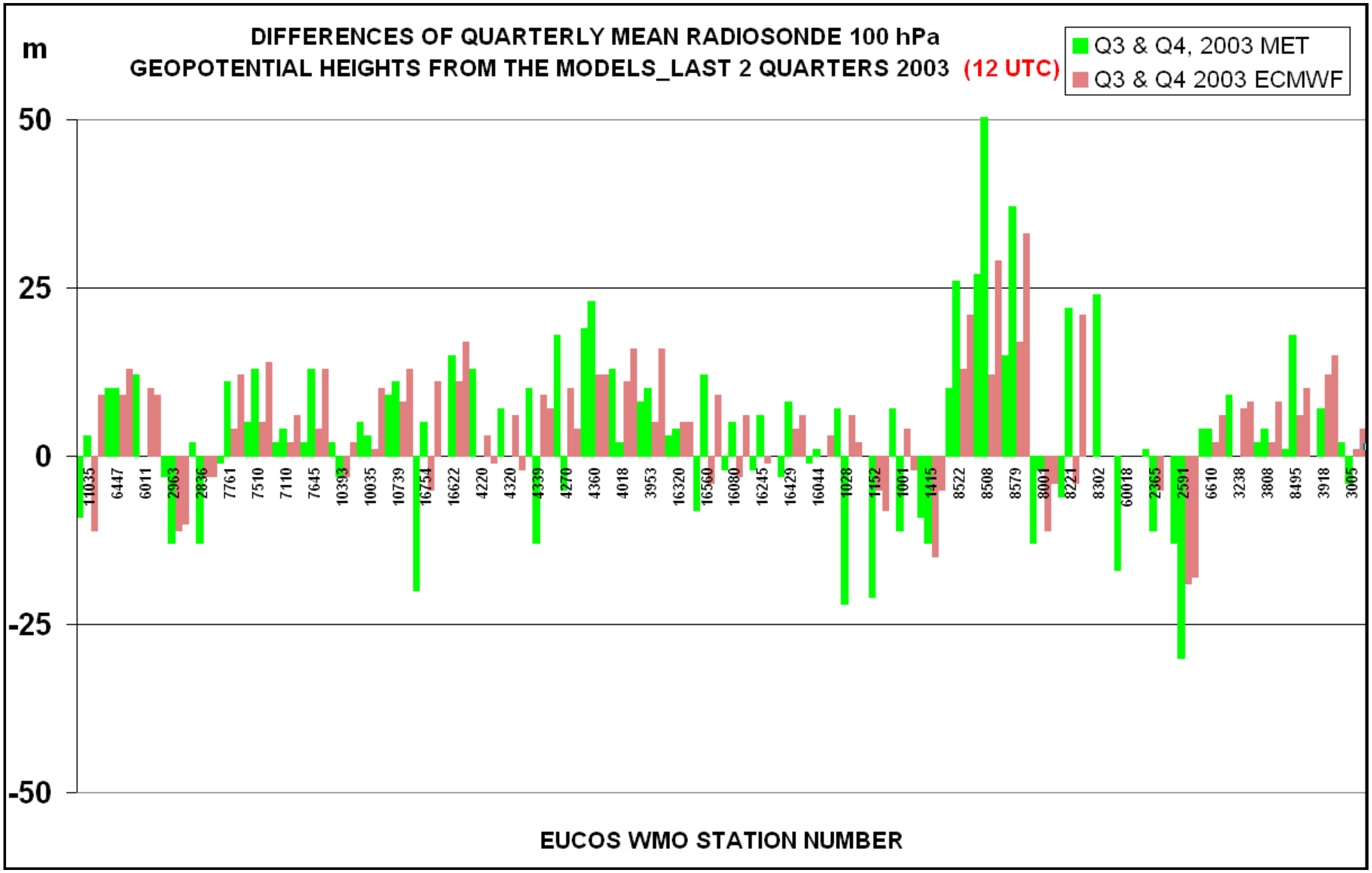
1: Differences of quarterly mean radiosonde 100hPa geopotential heights from the model 2003 (00UTC)



2: Differences of quarterly mean radiosonde 100hPa geopotential heights from the model 2003 (12UTC)



3: Differences of quarterly mean radiosonde 100hPa geopotential heights from the model 2003 (00UTC)



4: Differences of quarterly mean radiosonde 100hPa geopotential heights from the model 2003 (12UTC)

Annex 5

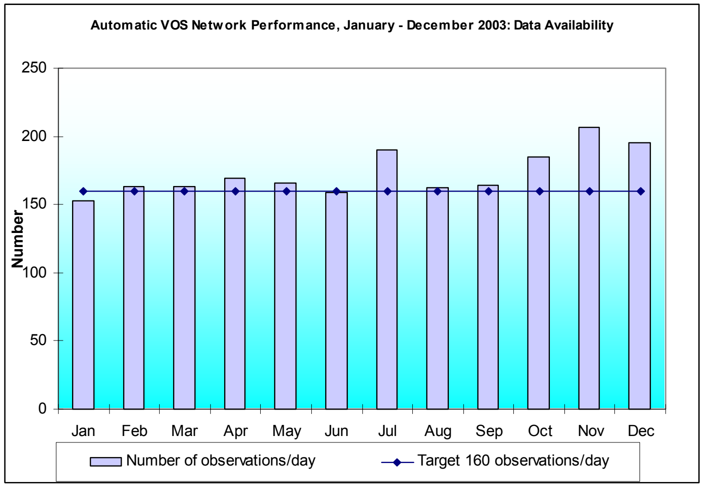


Figure 1 :Automatic VOS Network Performance January – December 2003: Average daily data availability: 3 hourly reports per day

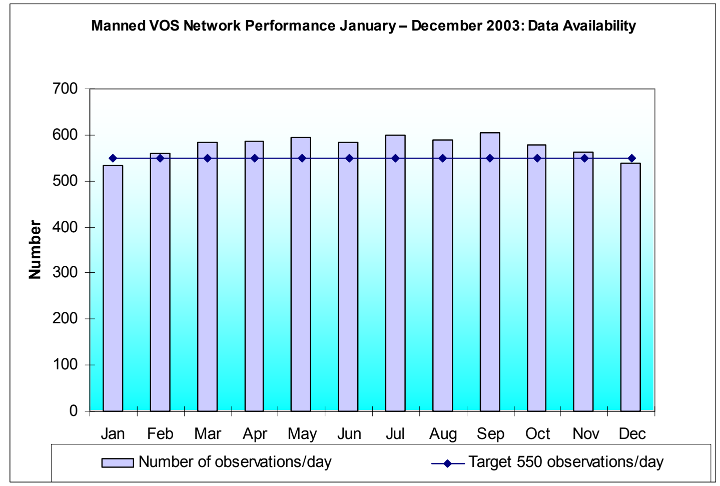


Figure 2 :Manned VOS Network Performance January – December 2003: Average daily data availability: 6 hourly reports per day

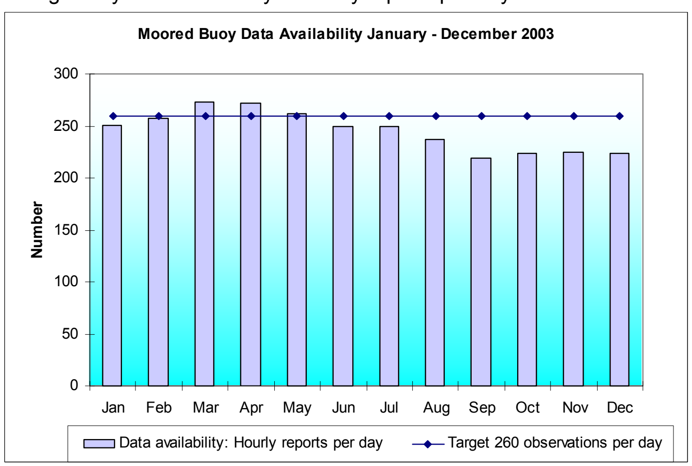


Figure 3: Moored buoy Network Performance January – December 2003: Data availability

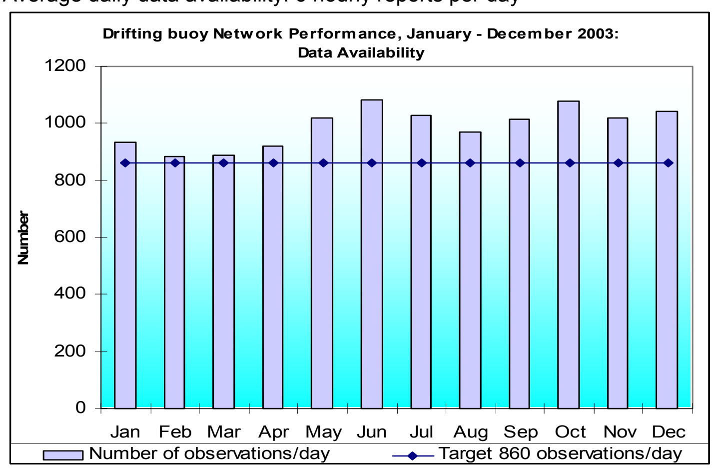


Figure 4: Drifting buoy Network Performance January – December 2003: Data availability

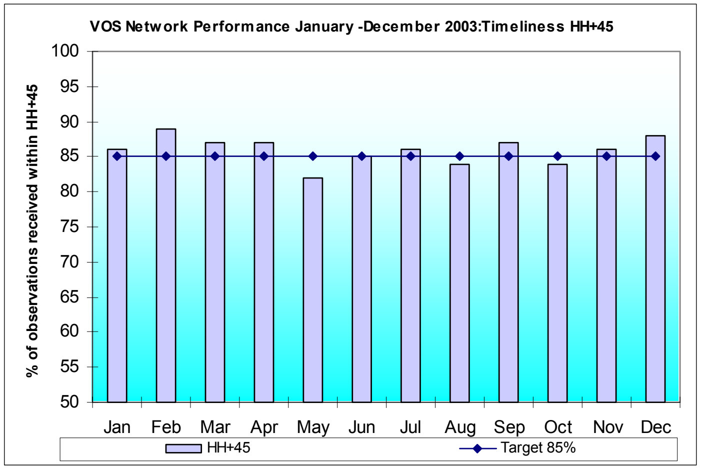


Figure 5 :VOS Network Performance January – December 2003 Timeliness within HH+45

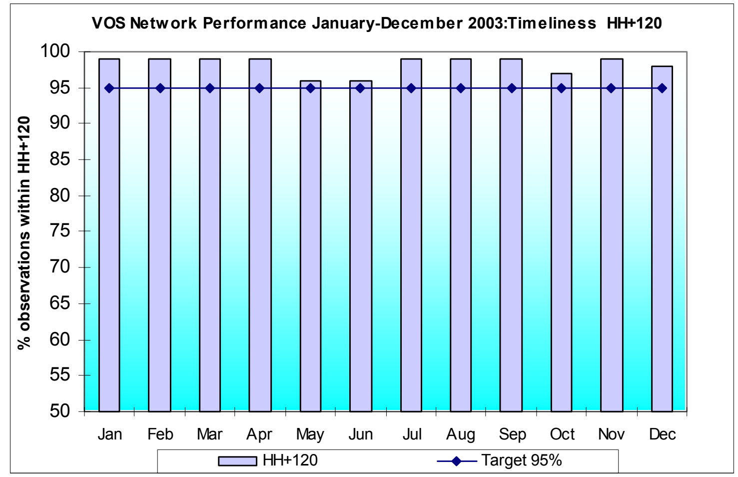


Figure 6 :VOS Network Performance January – December 2003 Timeliness within HH+120

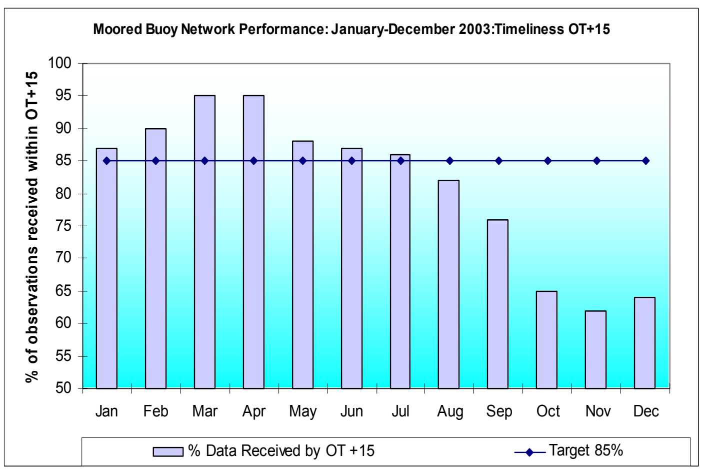


Figure 7: Moored buoy Network Performance January – December 2003: Timeliness (OT+15)

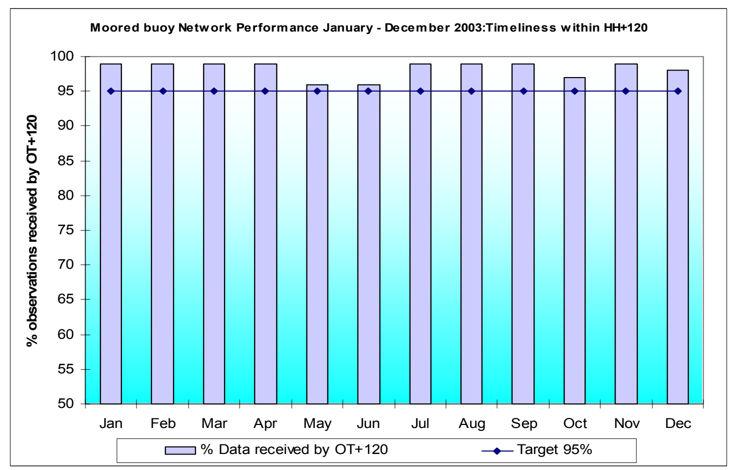


Figure 8: Moored buoy Network Performance January – December 2003: Timeliness (OT+120)

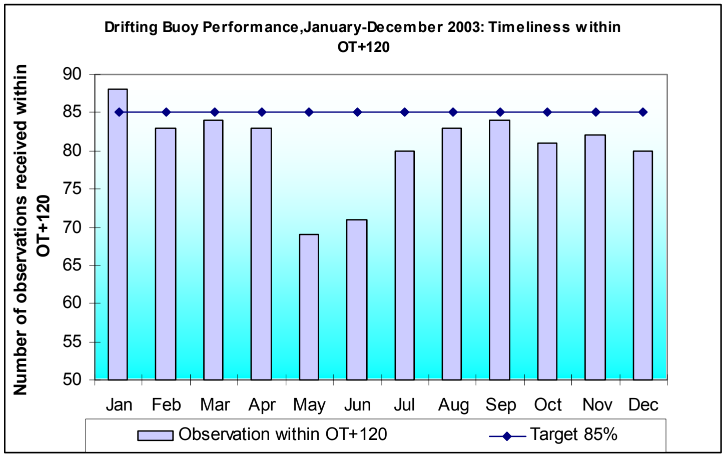


Figure 9: Drifting buoy Network Performance January – December 2003: Timeliness (OT+120)

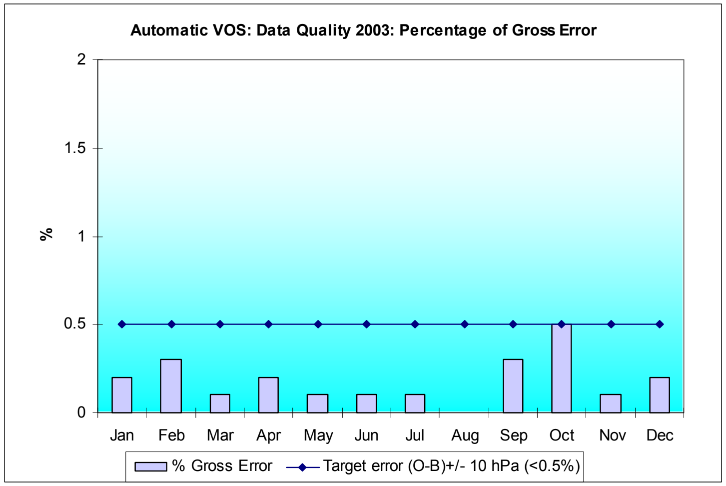


Figure 10: Automatic VOS Network Performance 2003, Quality,2003 Percentage of Gross Error against Target (O-B) +/-> 1hPa (<0.5%)

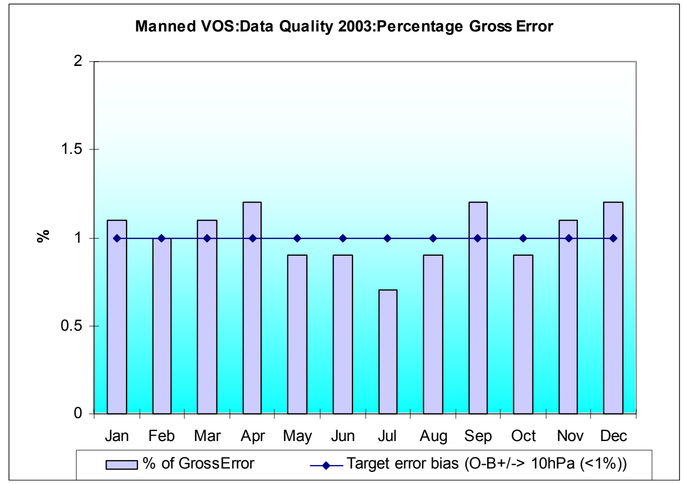


Figure 11: Manned VOS Network Performance 2003, Quality,2003 Percentage of Gross Error against Target (O-B) +/-> 1hPa (<1%)

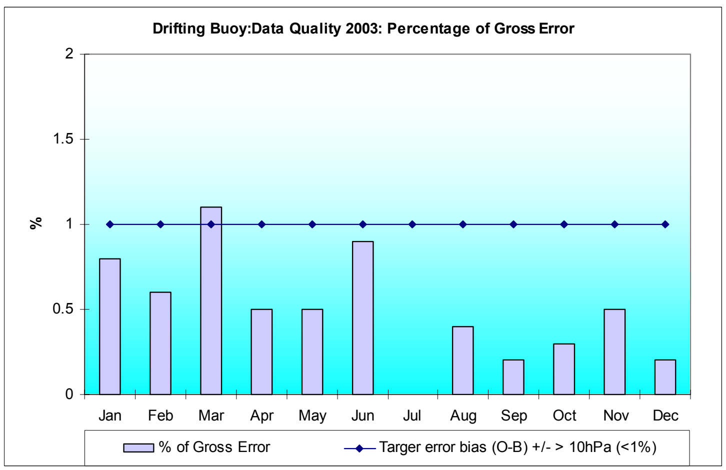


Figure 12: Drifting buoys Network Performance 2003, Quality, 2003 Percentage of Gross Error against Target error bias(O-B) +/-> 1hPa (<1%)

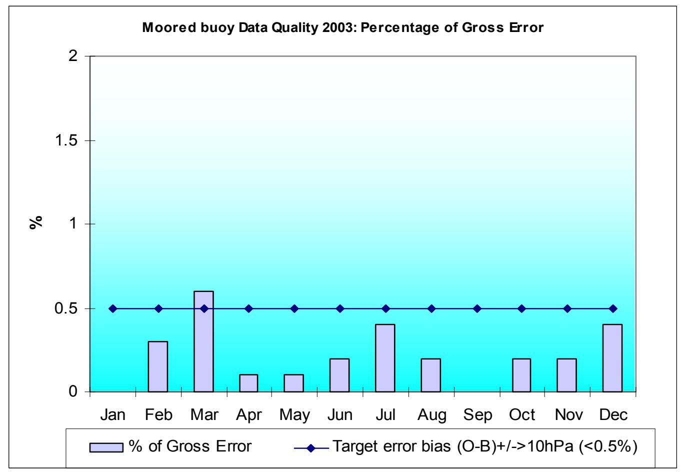


Figure 13: Moored buoy Network Performance 2003, Quality, January – December 2003: Percentage of Gross against Target (O-B) +/-> 1hPa (<0.5%)

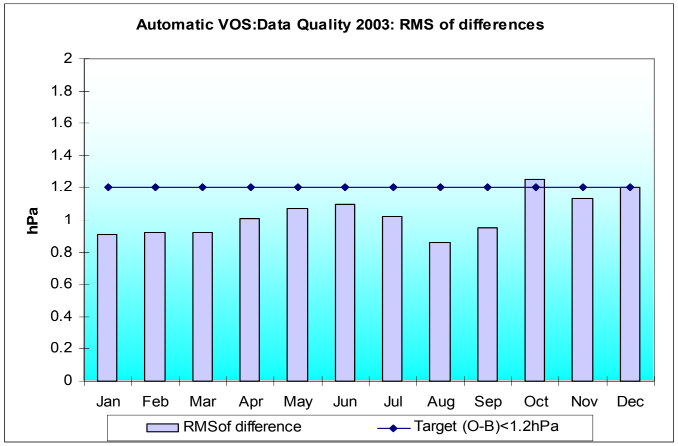


Figure 14: Automatic VOS Network Performance 2003, Quality, 2003 :RMS of differences against Target (O-B)<1.2hPa

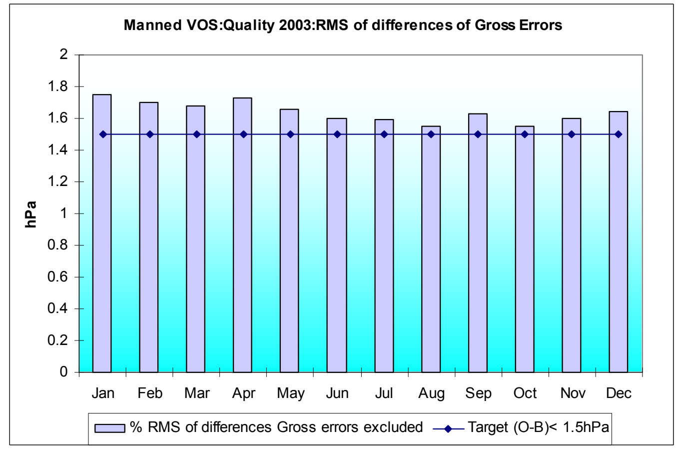


Figure 15: Manned VOS Network Performance 2003, Quality,2003 January–December 2003 RMS of differences Gross errors excluded against Target (O-B)<1.5hPa

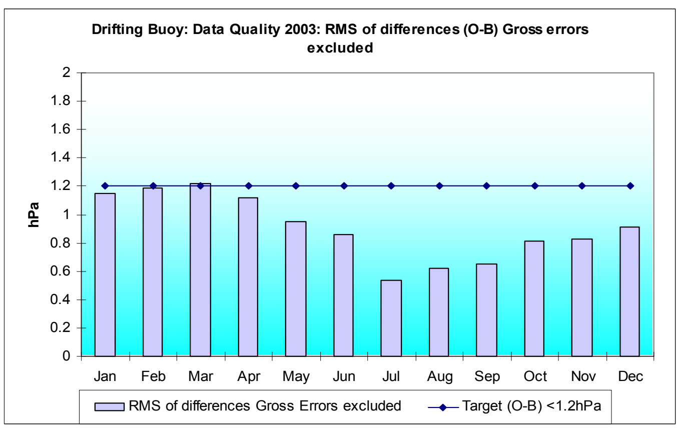


Figure 16: Drifting buoys Network Performance 2003, Quality January – December 2003: RMS of differences Gross Errors excluded against Target (O-B) <1.2hPa

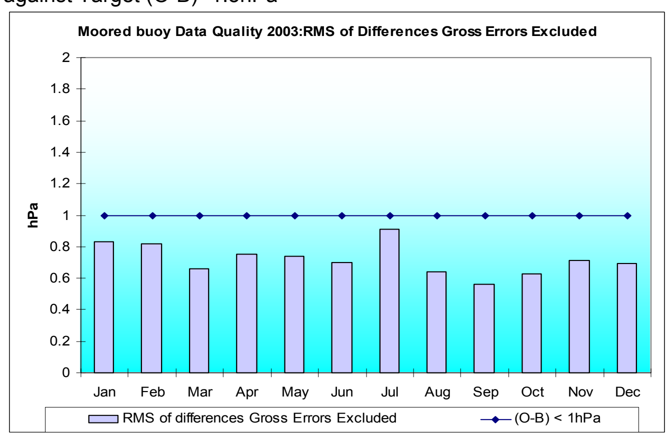


Figure 17: Moored buoy Network Performance 2003, Quality 2003 January–December 2003 RMS of differences Gross errors excluded against Target (O-B)<1hPa