

## Quarterly reports of the E-AMDAR Quality Evaluation Centre on AMDAR data

**2001-I**

Report number 6                      01 June 2001

Period: 1 JANUARY 2001 – 31 MARCH 2001

KNMI  
Wilhelminalaan 10  
NL-3732 GK De Bilt  
The Netherlands

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## 1) Introduction

AMDAR offers the potential for a large increase in upper air wind and temperature data, observed for use as input for models. To improve the usefulness of these data, quality evaluation is essential in combination with appropriate impact studies. Today the E-AMDAR fleet will number approximately 380 assigned aircraft, 80% of which will fly predominantly European routes and the remainder long haul. All E-AMDAR data for evaluation will be made available on the GTS with in near real time performances. ***It should be noted that not all identified aircraft are fully operational at present*** (operational on April, 1<sup>st</sup>, 2001: 180).

The purpose of this report is to provide statistical information on the quality, quantity and availability of aircraft reports made available from all Participating Members. The information will be used for further impact studies and feed back to the E-AMDAR operators to improve the quality of the E-AMDAR observing system.

The Quality Evaluation Centre has monitored AMDAR reports received at KNMI since September 17th 1999. The aim of the monitoring process is to detect and identify any incorrectness or anomalies of the data or transmission within 24 hours and to instigate fault correction procedures. Such a process is vital for maintaining data quality and credibility at the required level. The monitoring of the observations covers data availability, receipt delays, reporting frequency and checks on the consistency and quality of the meteorological data.

The EUMETNET Council agreed in September 1998 that the Met Office would be the Responsible Member for the E-AMDAR Programme. The Programme Manager is Mr Bruce Truscott. The appointed Technical Co-ordinator, Mr Stewart Taylor, will ensure that any faults identified are investigated and rectified in a timely manner. All irregularities on E-AMDAR data will be reported to the Programme Manager.

**Observations period:** The coverage of the data used for the statistical analysis for AMDAR reporting aircraft is the period January 1<sup>st</sup>, 2001, 00:00 UTC to March 31<sup>st</sup>, 2001, 24:00 UTC (2001Q1).

## 2) Operational AMDAR units

Data from 203 activated E-AMDAR units producing **FM 42-IX** or **BUFR AMDAR** code were received and analysed at KNMI HQ in De Bilt during the stated period. From one activated aircraft no data was received. Notice that a number of aircraft only report during the ascending phase. For a list of reporting aircraft and their identifiers, see [table 1](#). In this table aircraft are indicated, which were activated or deactivated during this period.

## 3) List of outstanding issues

- a) In previous quarterly reports a number of issues concerning errors in the FM 42-IX AMDAR code bulletins were presented. During this quarter a **significant decrease** of the number of such erroneous bulletins was found. Typical code errors found to be persistent in many bulletins (daily: 75):  $TBB_A=TB'$ ,  $i_p i_p i_p = ///$  in section 2 (see example 1) and  $Fh_d h_d h_d VG f_g f_g f_g = F))) VG)))$  in section 3 (see example 2). Both the " $TBB_A=TB'$ " and " $Fh_d h_d h_d VG f_g f_g f_g = F))) VG)))$ " errors are solved before the end of May after installing a new software release and not outstanding anymore. Note that the issue with obscure *end-of-line* characters (A or A=) was solved end of 2000.

AMDAR 1300 LVR EU1593 5619N 08038E <b>2325</b> F332 MS632 269/051 TB0 S011=
--------------------------------------------------------------------------------

```

LVR EU1593 5536N 08148E 2332 F332 MS632 268/050 TBO S011=
/// EU1593 5457N 08256E 2339 F332 MS637 274/048 TB/ S111=
LVR EU1593 5428N 08425E 2346 F332 MS630 285/051 TBO S011=
LVR EU1593 5404N 08558E 2353 F332 MS630 296/050 TB' S011=
LVR EU1593 5341N 08731E 0000 F332 MS630 303/049 TBO S011=
LVR EU1593 5321N 08906E 0007 F332 MS622 310/049 TBO S011=
LVR EU1593 5300N 09037E 0014 F332 MS625 326/047 TBO S011=
LVR EU1593 5238N 09207E 0021 F332 MS622 333/055 TBO S011=
LVR EU1593 5212N 09334E 0028 F332 MS627 338/058 TBO S011
333 F000 VG000=

```

errors:

[1] Date confusion 2325 to 2353 refer to previous day.

[2]  $TBB_A = TB'$  ; accent sign not allowed. Turbulence indicator  $B_A = 0, 1, 2$  or  $3$  (code table 0302)

[3]  $i_p i_p i_p = ///$  ; defined values: LVR, LVW, ASC, DES and UNS

date: 13 March 2001

#### Example 1

```

AMDAR 1900
ASC EU0372 4038N 07347W 0005 A001 PS015 267/001 TBO S011=
ASC EU0372 4038N 07347W 0005 F000 PS012 075/002 TBO S011=
ASC EU0372 4038N 07346W 0006 F003 PS007 073/004 TBO S011=
/// EU0372 4038N 07346W 0006 F003 PS005 091/006 TBO S111=
/// EU0372 4037N 07346W 0006 F006 PS000 111/005 TBO S111=
/// EU0372 4037N 07346W 0006 F009 MS002 122/006 TBO S111=
/// EU0372 4037N 07345W 0006 F012 MS010 141/008 TBO S111=
ASC EU0372 4036N 07344W 0006 F014 MS015 139/007 TBO S011=
ASC EU0372 4035N 07344W 0007 F017 MS017 156/009 TBO S011=
ASC EU0372 4035N 07343W 0007 F020 MS017 180/010 TBO S011
333 F))) VG))) =

```

errors:

[3]  $i_p i_p i_p = ///$  ; defined values: LVR, LVW, ASC, DES and UNS

[4]  $Fh_d h_d h_d VG F_g F_g F_g = F))) VG)))$  . Pressure altitude and maximum derived equivalent vertical gust should be presented in numbers only.

date: 19 January 2001

#### Example 2

- b) In section 2 of FM42-XI Ext. two additional groups are defined, i.e.  $TBB_A$  and  $SS_1S_2S_3$ , representing turbulence and system parameters respectively ( $S_1S_2S_3$  stand for type of navigation system, type of system used (ASDAR/ACARS) and temperature precision (2,0 or 1,0 °C)). Although these two groups are not very critical it will be good practice to confirm to the stated code recommendations. In example 3 a bulletin is presented where these two groups are omitted.

```

AMDAR 1914
LVR EU4444 6106N 01649E 1414 F310 MS559 011/002=
LVR EU4444 6153N 01604E 1421 F310 MS565 056/023=
DES EU4444 6213N 01544E 1424 F250 MS441 054/016=

```

```

AMDAR 1914
ASC EU5529 6228N 01050E 1440 F250 MS425 056/026=

```

date: 19 January 2001

```

AMDAR 1305
ASC EU4853 5618N 01251E 0523 F005 MS006 133/009=

```

date: 13 March 2001

[5] No "turbulence" and "system parameters group" ( $TBB_A$  and  $SS_1S_2S_3$ ) presented

#### Example 3

- c) Occasionally typical code errors are found (see example 4). The source of these errors is found to be a software application problem.

AMDAR 1806	
ASC EU4582 6328N 01100E 0625 F015 MS000 258/006=	
ASC EU4582 6328N <b>010100</b> E 0625 F017 MS003 248/008=	
ASC EU4582 6328N 01101E 0626 F019 MS008 245/008=	
ASC EU4582 6328N 01105E 0626 F031 MS025 297/006=	
	date: 19 January 2001
AMDAR 1311	
ASC EU4573 6328N 01059E 1127 F024 PS006 182/006=	
ASC EU4573 6328N 01100E 1127 F026 MS000 170/005=	
ASC EU4573 6328N <b>010100</b> E 1127 F027 MS006 167/006=	
ASC EU4573 6327N 01104E 1127 F038 MS030 218/010=	
	date: 13 March 2001
[6] Code error in L <sub>a</sub> L <sub>a</sub> L <sub>a</sub> L <sub>a</sub> A	

Example 4

- d) To prevent the storage of identical reports, each report is checked with reports which are already stored in the database. Moreover, for a number of flights, observations were continued after landing and a dense set of *identical surface measurements* was disseminated. To be able to discard these data all data having identical positions (latitude/longitude and altitude, using the maximum of available precision) are indicated as "double" and only one observation of this set is evaluated. It is found that the number of identical bulletins or identical reports is significantly reduced during this quarter and is now at a sufficient low level.
- e) To avoid date confusion (see example 1) an FM42-IX AMDAR code change is implemented officially by WMO on 3 May 2000 by extending the GGgg group with the day number to become YYGGgg. The addition of the day number will help to prevent the rejection of reports. Without the YY (day) the GGgg (hour/minute) will be interpreted as belonging to the day, indicated section 1 of the bulletin (AMDAR YYGG). Reports, within the bulletin, referring to hours from the previous day will be indicated as "to early" and disregarded. During this quarter, however, in none of the received FM42-IX AMDAR bulletins this code change was found. Nevertheless a software upgrade is foreseen in the near future.
- f) From two previously deactivated aircraft (EU4896 and EU5182), data was received.
- g) EU1456 reported as "EU1050" on January, 13<sup>th</sup>.

## 4) Monitoring results

### a) Data Availability

AMDAR reports are received via the different collecting centres with ground based receiving stations and consequently through GTS. Some aircraft fly "long haul" routes and where no ground station coverage available, send AMDAR data via satellite communications systems. An overview for all aircraft involved is presented in table 2. At the end of this table also a list of aircraft is presented for which more than one percent of the observations took more than two hours to arrive at the QEvC.

#### *Special issues*

- One officially activated aircraft reported during one day only: EU1345.
- Although activated for ten days, no data was received from EU2005.
- For seven identifiers, aircraft were replaced (EU0049, EU1001, EU1456, EU3544, EU3598, EU4527 and EU4532).

- As part of the E-AMDAR Optimisation Plan, aircraft were activated on January, 19<sup>th</sup>, March, 7<sup>th</sup> and on March, 13<sup>th</sup>.
- Please note that the data from aircraft activated for E-ADAS and Optimisation testing on March, 7<sup>th</sup>, was not input to the GTS until March, 20<sup>th</sup> and ceased on the March, 30<sup>th</sup>. These aircraft are reporting data when flying in selected regions.

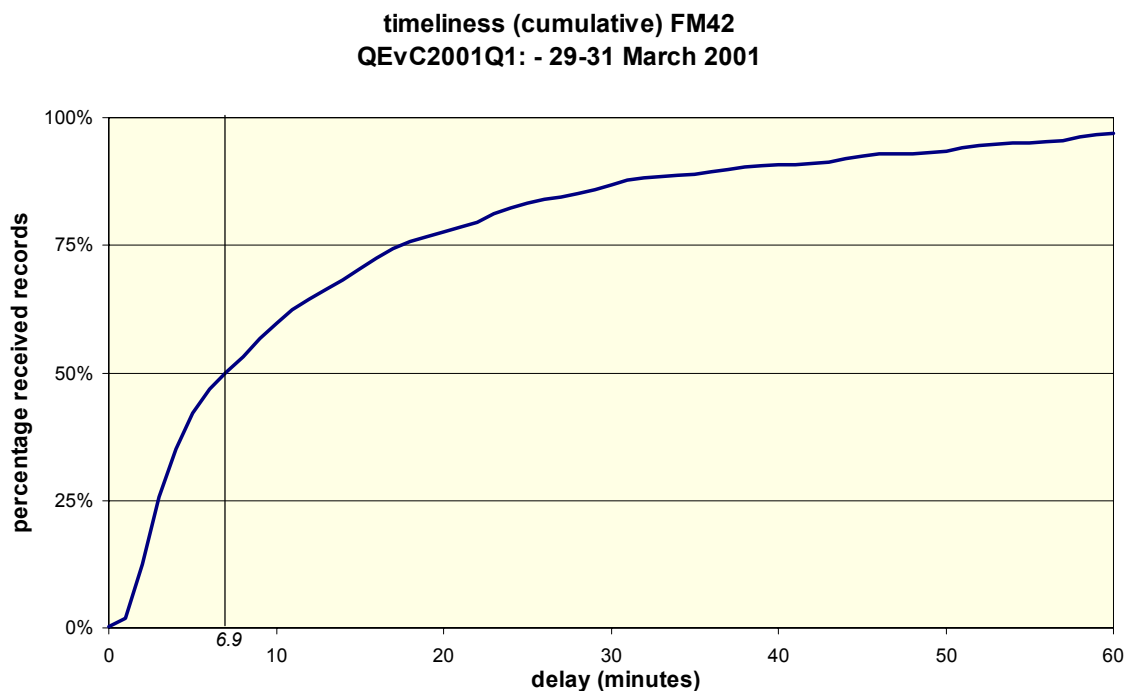
More details on availability issues are presented in table 3.

## b) Data coverage

Aircraft carrying the AMDAR units fly prominently within Europe. To get a brief impression of the EU AMDAR coverage of Europe and the Atlantic two figures are presented in Annex I.

## c) Data Timeliness

The delay between observation and reception at the GTS nodes should be small. During the period, 96,7 % of all reports was received within one hour of observation time and 99,1 % within 2 hours from observation. With respect to the previous quarter a significant decrease is found. The reason for this deterioration is being caused by a small set of aircraft and will be investigated by the E-AMDAR Technical Co-ordinator. Overall the data timeliness is very good. This is demonstrated by figure 1 below, where from the cumulative frequency distribution it follows that 50% of all FM42 recorded observations is received within 7 minutes:



*Fig. 1. Cumulative frequency distribution for all FM42 encoded EU-Amdar observations during the period 29-31 March 2001 as a function of the interval between observation and time of reception. (median value: 6,9 minute).*

## d) Frequency of reporting AMDAR observations

During level flight at cruising height the reporting frequency of AMDAR reports is expected to be one report per 7 minutes or 10 minutes depending on the Aircraft software. During the ascent or descent phase reports should be generated more frequently (*i.e.* every 50 hPa) with the higher frequency applying to the lower part of the atmosphere (*i.e.* every 10 hPa). It was found that the BUFR encoded AMDAR bulletins contain observations repeatedly done within one minute when in ascending or descending phase. As a consequence the reporting frequency of BUFR AMDARS is extremely high during that phase. Most of the aircraft operate within Europe and within relatively short travel distance. As a consequence data obtained from E-AMDAR reports at cruising heights is significant less than e.g. for data from ASDAR units during Atlantic flights.

## e) Data quality evaluation

Every day quality control procedures are performed. By comparing the meteorological and positional information supplied by the AMDAR units with a reference background, suspect reports are selected and presented. FM42-IX and BUFR encoded AMDAR bulletins passing through the KNMI MSS are analysed for statistical evaluation purposes. Incorrectly encoded reports are stored apart and kept outside further evaluation.

The differences between observations and model-forecast fields from the HIRLAM-3 1-level-global-forecast-model are used for analysing the quality of AMDAR reports. These differences between the values from the observation and the model background (indicated by “O-B”) are calculated for the levels from 950 to 400 hPa (ascent/descent levels) and for 350 to 150 hPa (cruise levels). Average values and standard deviations of the calculated differences for temperature, wind speed and wind direction are derived for all reports from any AMDAR unit separately and by taking into account time and place/position. For the evaluation process the most actual output from the HIRLAM model is used as reference. Note that this model has a 3 hours update interval. Consequently quality evaluation is performed every 3 hours. From this evaluation process AMDAR units are selected as an entry for identifying as a suspect report in case of overriding the stated criteria. As a result from this evaluation process a daily report is generated for direct transmission by e-mail to the E-AMDAR technical co-ordinator and all E-AMDAR operators. With the exception of rejected reports and of observations outside the HIRLAM area, **all** data is evaluated. For practical reasons, the daily reports present **only** those aircraft with identifiers starting with ‘EU’ (E-AMDAR) or ending on ‘Z’ (ASDAR).

### **Criteria**

The critical (absolute) margins used for selecting entries are:

- Air Temperature:  $|T_A(O)-T_A(B)| \geq 0,5 \text{ }^\circ\text{C} (0,5 \text{ K})$
- Wind speed:  $|f(O)-f(B)| \geq 2,0 \text{ m/s} (4 \text{ Knots})$
- Wind direction:  $|d(O)-d(B)| \geq 20 \text{ }^\circ (\text{Degrees})$

No criterion is stated concerning standard deviations.

The Obs-Background mean temperature differences vary between  $-0.6^\circ\text{C}$  and  $+1.2^\circ\text{C}$ . Aircraft with a mean difference, typically significant larger than expected are: EU0324, EU4593, EU5435 and EU6444. No aircraft exceeded typically the stated mean wind speed and wind direction differences. In Annex II, three figures are shown, presenting the frequency distribution of the mean O-B temperature differences, wind speed differences and wind direction differences as found for the set of aircraft.

For a number of observations extreme temperature differences were observed:

AIRCRAFT	Day	Time (UTC)	Latitude	Longitude	Altitude (m)	Temperature [observed] (°C)	Temperature [background] (°C)	Temperature difference (°C)
EU0022	2001.02.02	23.53	50.60	5.70	4690	216.0	254.6	-38.6
EU0022	2001.01.14	15.48	50.90	5.20	4080	204.2	261.7	-57.5
EU0051	2001.01.13	16.10	41.60	-8.10	3440	215.5	264.4	-48.9
EU0051	2001.02.12	10.35	49.00	14.20	2590	216.5	274.3	-57.8
EU0109	2001.01.07	16.05	50.50	7.00	2830	218.0	262.2	-44.2
EU8520	2001.03.22	11.37	45.70	9.90	6730	273.2	245.7	27.5

Aircraft with occasionally extreme temperature differences are: EU0022, EU0041, EU0043, EU0051, EU0324, EU2559 and EU6444.

Remarkable wind speed differences were observed for:

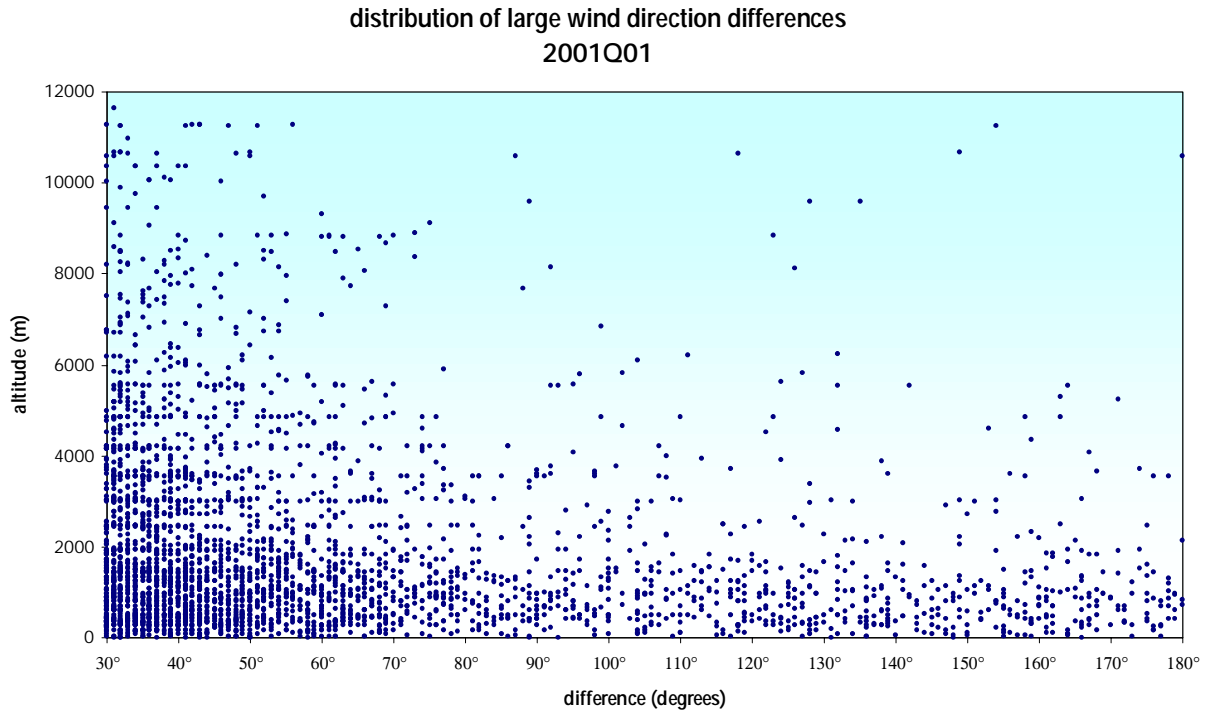
AIRCRAFT	Day	Time (UTC)	Latitude	Longitude	Altitude (m)	Wind speed [observed] (m/s)	Wind speed [background] (m/s)	Wind speed difference (m/s)
EU0041	2001.03.04	13.20	50.04	11.11	8820	64.8	41.7	23.1
EU0319	2001.01.06	06.44	44.59	26.13	5470	47.3	15.5	31.8
EU0921	2001.02.13	09.43	51.42	9.19	9440	52.0	23.0	29.0
EU2001	2001.03.21	07.03	48.20	2.00	8710	76.6	39.7	36.9
EU5612	2001.02.16	10.46	67.10	20.00	6430	20.0	41.8	-21.8

Aircraft with occasionally extreme wind speed differences are: EU0041, EU0185, EU0319, EU2001 and EU4582.

Occasionally wind direction difference of 90° or more are observed, even up to 180°, e.g.:

AIRCRAFT	Day	Time (UTC)	Latitude	Longitude	Altitude (m)	Wind direction [observed] (°)	Wind direction [background] (°)	Wind direction difference (°)
EU0002	2001.03.27	04.55	48.60	7.60	730	266	86	180
EU0022	2001.02.21	09.21	45.30	9.20	420	279	100	179
EU0041	2001.03.03	10.28	50.00	7.97	2130	245	65	180
EU0043	2001.02.21	15.42	33.38	-7.59	830	33	213	180
EU0045	2001.02.23	03.34	54.70	35.80	10600	243	63	180
EU0051	2001.02.11	09.14	46.30	6.20	970	45	224	179
EU0072	2001.01.06	09.39	45.50	8.70	600	294	113	179
EU0158	2001.02.05	10.57	45.64	8.72	950	42	221	179

Aircraft with occasionally extreme wind direction differences are: EU0002, EU0021, EU0022, EU0041 and EU0043. An impression of the distribution of the individual wind direction differences is given in figure 2, where  $\langle |\Delta DD| \rangle$  (=AVG(ABS(DD\_OBS - DD\_MOD))) is presented as a function of altitude by a scatter plot:



*Fig. 2. Scatter plot for the individual O-B obs wind direction differences,  $\langle |\Delta DD| \rangle$ , as a function of altitude. Note that for most of the observations it holds that  $\langle |\Delta DD| \rangle < 30^\circ$ , so this figure presents only a small subset of the total amount of received data: i.e. 0,2%.*

## f) Results (tables)

In the tables 4 to 6 attached to this report **all** (EU-)AMDAR units are presented together with the observed total of average differences and standard deviations. All these tables are divided in two lists, one for the DES/ASC phase and the other for the cruise level phase. No statistics are presented for the UNS phase (unstable) or with  $i_p i_p = '///'$ .

## 5) Outstanding identified anomalies.

The identified anomalies are to be considered by the Responsible Members. Reports from published detailed investigations on these issues will be summarised in the following quarterly report. Typical problems/faults (apart from routine maintenance) are presented in table 3 (information provided by the appointed Technical Co-ordinator of the E-AMDAR Programme).

## 6) Solutions and actions taken from the previous period.

The following errors/problems, as mentioned in paragraph 3 of this report, have been addressed:

- Code error "TBB<sub>A</sub>=TB'" (no. [2] in par. 3): operator contacted. Found to be a problem in the software application. The issue is fixed after the implementation of a new software release end of May 2001
- Code error due to obscure *end-of-line* characters (A or A=) was solved end of 2000 by a fix in the application software.
- Code error in L<sub>a</sub>L<sub>a</sub>L<sub>a</sub>L<sub>a</sub>A (no. [7] in par. 3) is found to be a software application problem. A fix, to solve this problem, is implemented in the second quarter of 2001.
- Data Timeliness - a decrease in timeliness was identified in QR 2000-4. This decrease was being caused by a small set of aircraft. On investigation it was found that the aircraft were

from one airline. A combination of increased aircraft numbers and ground processing changes had led to this decrease in data timeliness. Data from these aircraft are now back to > 90% of observations received within 45 minutes of transmission. Overall, data received within 45 minutes from the E-AMDAR fleet has increased from 95.5% in the fourth quarter of 2000 to 98.8% during this quarter.

## 7) Summary

1. Timeliness and data quality: Timeliness is comparable to ASDAR data or better. The number of anomalies is very low with respect to the total number of reports (98.8% within 45 min).
2. The number of aircraft reporting (EU-)AMDAR was 203.
3. Since reports are generated automatically, in general data is error free at the reception site.
4. Significant temperature, wind speed or wind direction anomalies were not found, except for the issues stated under par. 4.e. Overall, anomalies of  $\pm 0.3^{\circ}\text{C}$ ,  $\pm 0.1\text{ m/s}$ ,  $\pm 6^{\circ}$  (for LVR/LVW) and  $\pm 1.3^{\circ}$  (for ASC/DES) are typical (see Annexes II and III). These values are based on a 50% cumulative level score, i.e. 50% of all data are within these ranges.

## 8) Special case studies

### a) Frequency distribution of the mean O-B differences

In Annex II of this report three figures are presented to indicate the frequency distribution of the mean O-B differences for temperature, wind speed and wind direction for the set of observing aircraft ( $N=203$ ). In these figures distinction is made between observations in flight level (LVR/LVW) and observations during ascent or descent (ASC/DES). Note that only the absolute values of wind direction are analysed. Obviously differences (averaged over this quarter) vary within ranges of approx.  $-0.6$  to  $+1.2^{\circ}\text{C}$ ,  $-0.4$  to  $+0.5\text{ m/s}$  and  $\pm 1.1^{\circ}$  (for LVR/LVW) to  $\pm 1.8^{\circ}$  (for ASC/DES) (to be considered as the *uncertainty* of observation).

### b) Wind speed observations

In Annex III of this report the result of a case study on wind speed observations is presented. For the period 29-31 March 2001, data from five aircraft producing a large amount of observations, the wind speed data are analysed. In the figures both the measured wind speed and the O-B wind speed differences are presented in scatter plots as a function of altitude and with respect to each aircraft and with respect to each of the phases of flight (ASC, DEC, LVR). The plots with the O-B wind speed difference demonstrate clearly that there is no significant difference between the observations by each aircraft or between the phases of flight.

### c) Trends in the daily amount of observations

From January, 1st to March, 31st the amount of observations is registered on a daily base. In Annex IV of this report the trend of this daily amount is presented. Obviously there was a decrease in the number of received data during February and begin of March. Nevertheless, end of March the daily number of reports is of the same level of January again.

### d) Time and altitude distribution of ASC and DES data.

In Annex V of this report the results of a case study on the observing time and altitude distribution are presented. For the period 29-31 March 2001 all encoded observations during ascend and descend around London (within  $50^{\circ}$ - $53^{\circ}$  N and  $3^{\circ}$  W-  $3^{\circ}$  E) are investigated and the altitude of the observation are presented as a function of time of observation. Clearly all data are observed between 5:30 and 22:30 UTC. Moreover the distribution of the altitude levels of descending data differs significantly from ascending data.

**Table 1, List of operational AMDAR units**

(A: activated, D: deactivated, AD: both activated and deactivated during this quarter, DA: deactivated and new aircraft activated during this quarter)

Identifier	Identifier	Identifier	Identifier	Identifier	Identifier
EU0002	EU0234	EU0947	EU2005 AD	EU3684	EU5478
EU0003	EU0249	EU0961	EU2006 AD	EU3725	EU5529
EU0008	EU0254	EU0985	EU2007 AD	EU3781	EU5591
EU0021	EU0263	EU1001 DA	EU2008 AD	EU3803	EU5612
EU0022	EU0299	EU1002	EU2009 AD	EU3859 A	EU5777
EU0032	EU0301	EU1222	EU2010 AD	EU3874	EU5802
EU0034	EU0303	EU1234	EU2011 AD	EU3908	EU5821
EU0041	EU0307	EU1275	EU2012 AD	EU4002	EU6264
EU0043	EU0311	EU1282 A	EU2013 AD	EU4333	EU6281
EU0045	EU0313	EU1301	EU2014 AD	EU4426	EU6321
EU0047	EU0316	EU1312 A	EU2015 AD	EU4444	EU6349
EU0049	EU0319	EU1334 A	EU2016 AD	EU4519	EU6444
EU0050 D	EU0324 D	EU1345 A	EU2043	EU4527 A	EU6524
EU0051	EU0332	EU1367 A	EU2123 A	EU4529	EU6527
EU0052 D	EU0359	EU1389 A	EU2189	EU4532 A	EU6723 D
EU0054	EU0367	EU1411 A	EU2301	EU4573	EU6821
EU0055	EU0372	EU1436 A	EU2389	EU4582	EU6890
EU0059	EU0432	EU1456 DA	EU2547	EU4587	EU7218
EU0060	EU0456	EU1495	EU2559	EU4593 A	EU7629
EU0061 D	EU0458	EU1532	EU2590	EU4607	EU7643
EU0072	EU0475 D	EU1541	EU2618	EU4699	EU7654
EU0081	EU0476	EU1547	EU2630	EU4721	EU7724
EU0082	EU0482	EU1567	EU2751	EU4792	EU7866 D
EU0088	EU0498	EU1593	EU2773	EU4853	EU7888
EU0106	EU0568	EU1688 D	EU2845	EU4865	EU8520
EU0109	EU0592 D	EU1692	EU2984	EU4950	EU8969
EU0123	EU0689	EU1698	EU3000	EU4956	EU9145
EU0124	EU0711	EU1795	EU3257	EU5175	EU9158
EU0154	EU0802	EU1863	EU3268	EU5191	EU9234
EU0158	EU0807	EU1929	EU3321	EU5218	EU9245
EU0167	EU0826	EU2001 AD	EU3421	EU5331 A	EU9544
EU0185	EU0875	EU2002 AD	EU3544 A	EU5351 A	EU9680 A
EU0204	EU0921	EU2003 AD	EU3598 A	EU5435 A	EU9729 A
EU0209	EU0934	EU2004 AD	EU3654	EU5441	

**Table 2, *Quantity and Timeliness of AMDAR Reports***

<b>Summary</b>	
Number of days in this period	90
Number of aircraft reporting AMDAR	203
Number of E-AMDAR activated aircraft	205
Total number of observations evaluated during the period	1748790
Average daily number of aircraft reporting AMDAR	139 (68% of activated aircraft)
Percentage of data available within 60 minutes is	99.0%
Percentage of data available within 120 minutes is	99.3%
Average reports per day, per reporting aircraft is	139

<b>Legend</b>	
AIRCRAFT	Aircraft identifier
Total No of Reports	Number of reports received by E-AMDAR Quality Centre, exclusive of erroneous data.
Days of Reports	Number of days reports were received from aircraft by QEvC
Actual/possible	Ratio of Number of days aircraft reported/ maximum possible days in %
Average reports/day	Average number of reports per day of report from each aircraft
0 – 45	percentage of total reports received within 45 minutes of observation time
0 – 60	percentage of total reports received within 60 minutes of observation time
0 – 120	percentage of total reports received within 120 minutes of observation time

<b>AIRCRAFT</b>	<b>Total No of Reports</b>	<b>Days of Reports</b>	<b>Actual/possible</b>	<b>Average reports/day</b>	<b>0–45 min</b>	<b>0–60 min</b>	<b>0–120 min</b>
EU0002	12528	82	91%	153	99.6%	99.6%	99.7%
EU0003	5648	43	48%	131	94.7%	94.7%	95.9%
EU0008	6064	50	56%	121	96.5%	97.0%	97.9%
EU0021	10995	90	100%	122	99.4%	99.4%	99.5%
EU0022	13832	89	99%	155	99.5%	99.7%	99.7%
EU0032	1819	41	46%	44	100.0%	100.0%	100.0%
EU0034	2409	64	71%	38	100.0%	100.0%	100.0%
EU0041	21706	86	96%	252	99.0%	99.1%	99.4%
EU0043	22126	83	92%	267	99.4%	99.4%	99.5%
EU0045	12388	88	98%	141	96.6%	97.1%	98.1%
EU0047	22883	86	96%	266	99.8%	99.8%	99.8%
EU0049	4095	37	41%	111	100.0%	100.0%	100.0%
EU0050	11111	33	37%	337	98.4%	98.8%	98.9%
EU0051	7710	83	92%	93	99.9%	99.9%	99.9%
EU0052	8488	45	50%	189	98.0%	98.4%	98.4%
EU0054	8036	83	92%	97	99.8%	99.8%	99.8%

<b>AIRCRAFT</b>	<b>Total No of Reports</b>	<b>Days of Reports</b>	<b>Actual/ possible</b>	<b>Average reports/ day</b>	<b>0–45 min</b>	<b>0–60 min</b>	<b>0–120 min</b>
EU0055	12166	80	89%	152	99.6%	99.6%	99.8%
EU0059	15889	47	52%	338	99.0%	99.1%	99.3%
EU0060	8865	76	84%	117	99.5%	99.5%	99.6%
EU0061	7100	27	30%	263	98.1%	98.2%	98.2%
EU0072	4741	41	46%	116	99.6%	100.0%	100.0%
EU0081	14760	89	99%	166	99.5%	99.5%	99.7%
EU0082	10820	78	87%	139	99.6%	99.6%	99.8%
EU0088	14828	90	100%	165	99.8%	99.8%	99.8%
EU0106	23347	88	98%	265	99.5%	99.6%	99.6%
EU0109	14073	89	99%	158	99.4%	99.5%	99.5%
EU0123	7925	74	82%	107	96.4%	97.2%	98.2%
EU0124	10183	72	80%	141	99.3%	99.3%	99.7%
EU0154	22325	75	83%	298	98.9%	99.1%	99.4%
EU0158	23435	82	91%	286	99.3%	99.3%	99.5%
EU0167	19370	85	94%	228	99.7%	99.9%	99.9%
EU0185	22302	85	94%	262	98.8%	98.8%	99.4%
EU0204	12266	87	97%	141	99.6%	99.7%	99.7%
EU0209	1218	35	39%	35	100.0%	100.0%	100.0%
EU0234	7481	55	61%	136	99.3%	99.3%	99.5%
EU0249	11700	80	89%	146	99.3%	99.4%	99.6%
EU0254	9973	88	98%	113	99.1%	99.3%	99.8%
EU0263	8261	71	79%	116	99.5%	99.5%	99.5%
EU0299	8159	57	63%	143	99.7%	99.7%	99.7%
EU0301	11824	88	98%	134	99.4%	99.4%	99.6%
EU0303	22983	87	97%	264	99.2%	99.2%	99.5%
EU0307	22592	84	93%	269	99.4%	99.4%	99.6%
EU0311	18155	77	86%	236	99.4%	99.4%	99.7%
EU0313	17290	74	82%	234	99.6%	99.7%	99.9%
EU0316	22803	87	97%	262	99.3%	99.6%	99.7%
EU0319	17825	84	93%	212	99.4%	99.6%	99.7%
EU0324	4790	46	51%	104	98.9%	99.0%	99.2%
EU0332	9912	79	88%	125	99.9%	100.0%	100.0%
EU0359	17164	66	73%	260	98.6%	98.6%	99.3%
EU0367	9882	75	83%	132	99.1%	99.4%	99.4%
EU0372	6540	55	61%	119	98.8%	98.8%	98.9%
EU0432	12166	82	91%	148	98.8%	99.2%	99.4%
EU0456	18030	59	66%	306	98.7%	98.8%	99.1%
EU0457	4581	85	94%	54	99.8%	100.0%	100.0%
EU0458	20751	67	74%	310	99.6%	99.6%	100.0%
EU0475	3722	37	41%	101	99.8%	99.8%	99.8%
EU0476	22287	74	82%	301	99.1%	99.3%	99.6%
EU0482	9185	77	86%	119	99.4%	99.4%	99.6%
EU0498	2358	61	68%	39	100.0%	100.0%	100.0%
EU0568	11087	79	88%	140	99.4%	99.4%	99.6%
EU0592	6426	36	40%	179	99.3%	99.3%	99.3%
EU0689	3359	70	78%	48	100.0%	100.0%	100.0%

<b>AIRCRAFT</b>	<b>Total No of Reports</b>	<b>Days of Reports</b>	<b>Actual/ possible</b>	<b>Average reports/ day</b>	<b>0–45 min</b>	<b>0–60 min</b>	<b>0–120 min</b>
EU0711	26734	85	94%	315	99.6%	99.6%	99.8%
EU0802	21495	81	90%	265	99.4%	99.4%	99.5%
EU0807	9451	89	99%	106	99.5%	99.5%	99.6%
EU0826	10451	71	79%	147	99.1%	99.1%	99.3%
EU0875	22757	85	94%	268	99.4%	99.9%	99.9%
EU0921	14814	63	70%	235	99.9%	99.9%	99.9%
EU0934	12281	85	94%	144	95.5%	96.8%	97.6%
EU0947	10788	73	81%	148	96.3%	97.0%	97.8%
EU0961	11293	77	86%	147	97.0%	97.4%	98.3%
EU0985	9681	75	83%	129	95.7%	96.3%	97.5%
EU1001	4139	34	38%	122	99.4%	99.4%	99.4%
EU1002	10631	74	82%	144	95.9%	96.6%	97.8%
EU1050	1543	5	6%	309	100.0%	100.0%	100.0%
EU1222	12060	87	97%	139	96.5%	97.4%	98.2%
EU1234	24679	88	98%	280	99.2%	99.2%	99.6%
EU1275	4561	79	88%	58	99.8%	99.8%	100.0%
EU1282	3007	48	53%	63	99.2%	99.2%	99.2%
EU1301	2788	63	70%	44	100.0%	100.0%	100.0%
EU1312	4924	79	88%	62	99.3%	99.5%	99.8%
EU1334	5637	62	69%	91	98.7%	98.9%	99.3%
EU1345	69	4	4%	17	100.0%	100.0%	100.0%
EU1367	3333	47	52%	71	98.9%	98.9%	98.9%
EU1389	6188	65	72%	95	99.8%	99.8%	100.0%
EU1411	4360	55	61%	79	99.2%	99.2%	99.4%
EU1436	1981	29	32%	68	100.0%	100.0%	100.0%
EU1456	12465	47	52%	265	99.4%	99.4%	99.4%
EU1495	11503	84	93%	137	96.0%	96.6%	97.5%
EU1532	10923	78	87%	140	99.9%	99.9%	100.0%
EU1541	6650	82	91%	81	99.7%	99.9%	100.0%
EU1547	20792	79	88%	263	99.1%	99.3%	99.3%
EU1567	10750	75	83%	143	99.4%	99.4%	99.4%
EU1593	10352	75	83%	138	96.1%	96.8%	97.5%
EU1692	2424	54	60%	45	99.2%	99.2%	99.2%
EU1698	10843	76	84%	143	99.3%	99.3%	99.3%
EU1795	7580	85	94%	89	99.6%	99.7%	99.9%
EU1863	22868	85	94%	269	99.6%	99.7%	99.8%
EU1929	2412	70	78%	34	99.4%	99.4%	100.0%
EU2001	952	9	10%	106	100.0%	100.0%	100.0%
EU2002	1036	10	11%	104	100.0%	100.0%	100.0%
EU2003	871	8	9%	109	100.0%	100.0%	100.0%
EU2004	888	10	11%	89	100.0%	100.0%	100.0%
EU2006	1068	11	12%	97	100.0%	100.0%	100.0%
EU2007	769	9	10%	85	100.0%	100.0%	100.0%
EU2008	758	8	9%	95	100.0%	100.0%	100.0%
EU2009	729	11	12%	66	100.0%	100.0%	100.0%
EU2010	580	7	8%	83	100.0%	100.0%	100.0%

<b>AIRCRAFT</b>	<b>Total No of Reports</b>	<b>Days of Reports</b>	<b>Actual/ possible</b>	<b>Average reports/ day</b>	<b>0–45 min</b>	<b>0–60 min</b>	<b>0–120 min</b>
EU2011	439	8	9%	55	100.0%	100.0%	100.0%
EU2012	733	9	10%	81	100.0%	100.0%	100.0%
EU2013	609	7	8%	87	100.0%	100.0%	100.0%
EU2014	866	9	10%	96	95.3%	100.0%	100.0%
EU2015	963	8	9%	120	100.0%	100.0%	100.0%
EU2016	989	11	12%	90	100.0%	100.0%	100.0%
EU2043	1928	65	72%	30	99.5%	99.5%	100.0%
EU2123	2483	44	49%	56	98.5%	98.9%	99.2%
EU2189	21915	84	93%	261	99.1%	99.2%	99.5%
EU2301	15287	66	73%	232	99.5%	99.5%	99.5%
EU2389	11231	76	84%	148	99.1%	99.2%	99.3%
EU2547	9298	60	67%	155	96.8%	97.0%	97.9%
EU2559	20780	81	90%	257	99.7%	99.7%	99.7%
EU2590	9853	86	96%	115	97.8%	98.5%	99.1%
EU2618	8336	75	83%	111	97.5%	98.2%	99.4%
EU2630	1381	52	58%	27	99.9%	99.9%	100.0%
EU2751	7038	77	86%	91	99.6%	99.7%	99.9%
EU2773	4158	42	47%	99	99.3%	99.8%	100.0%
EU2845	9829	74	82%	133	99.5%	99.6%	99.6%
EU2984	3301	46	51%	72	98.6%	99.6%	99.6%
EU3000	21498	78	87%	276	98.6%	99.0%	99.2%
EU3181	7189	74	82%	97	99.7%	99.7%	99.9%
EU3257	16429	86	96%	191	98.7%	98.9%	99.1%
EU3268	2009	58	64%	35	93.3%	93.7%	96.0%
EU3321	4600	67	74%	69	97.3%	97.3%	98.6%
EU3421	22264	80	89%	278	98.8%	98.9%	99.3%
EU3544	1449	8	9%	181	100.0%	100.0%	100.0%
EU3598	2944	22	24%	134	100.0%	100.0%	100.0%
EU3654	7208	81	90%	89	97.3%	97.7%	98.4%
EU3684	4644	71	79%	65	99.4%	99.7%	99.9%
EU3725	6820	73	81%	93	99.7%	99.9%	99.9%
EU3781	2902	42	47%	69	99.4%	99.4%	99.7%
EU3803	2847	66	73%	43	98.7%	98.7%	99.2%
EU3859	2141	54	60%	40	100.0%	100.0%	100.0%
EU3874	8240	81	90%	102	100.0%	100.0%	100.0%
EU3908	9103	78	87%	117	97.8%	98.3%	99.0%
EU4002	3663	60	67%	61	94.9%	95.3%	96.5%
EU4333	10669	87	97%	123	96.4%	97.1%	98.4%
EU4426	11690	73	81%	160	99.6%	99.7%	99.7%
EU4444	7137	84	93%	85	96.0%	97.6%	98.0%
EU4519	8464	82	91%	103	98.2%	98.6%	99.0%
EU4527	4150	18	20%	231	98.6%	98.6%	99.1%
EU4529	11166	81	90%	138	99.4%	99.4%	99.6%
EU4532	14098	51	57%	276	99.2%	99.4%	99.5%
EU4573	11216	84	93%	134	98.3%	98.7%	99.3%
EU4582	7200	67	74%	107	97.7%	97.9%	99.1%

<b>AIRCRAFT</b>	<b>Total No of Reports</b>	<b>Days of Reports</b>	<b>Actual/ possible</b>	<b>Average reports/ day</b>	<b>0–45 min</b>	<b>0–60 min</b>	<b>0–120 min</b>
EU4587	6415	69	77%	93	99.0%	99.1%	99.4%
EU4593	3945	18	20%	219	99.5%	99.6%	100.0%
EU4607	7278	78	87%	93	98.1%	98.8%	99.0%
EU4699	7539	81	90%	93	98.5%	98.8%	99.1%
EU4721	4458	66	73%	68	98.9%	99.0%	99.8%
EU4792	1870	59	66%	32	96.8%	97.2%	98.4%
EU4853	6198	68	76%	91	98.0%	98.9%	98.9%
EU4865	8528	85	94%	100	96.3%	96.8%	98.0%
EU4896	92	1	1%	92	100.0%	100.0%	100.0%
EU4950	2550	54	60%	47	95.0%	95.5%	97.4%
EU5182	131	2	2%	66	100.0%	100.0%	100.0%
EU5191	356	9	10%	40	100.0%	100.0%	100.0%
EU5218	12454	80	89%	156	99.4%	99.4%	99.6%
EU5331	2810	19	21%	148	100.0%	100.0%	100.0%
EU5351	4653	19	21%	245	100.0%	100.0%	100.0%
EU5435	2294	12	13%	191	100.0%	100.0%	100.0%
EU5441	3336	55	61%	61	98.4%	98.7%	99.7%
EU5478	10154	86	96%	118	96.6%	97.1%	98.2%
EU5529	10232	88	98%	116	96.6%	97.5%	98.6%
EU5591	11658	85	94%	137	99.6%	99.6%	99.6%
EU5612	7366	80	89%	92	98.1%	98.4%	99.4%
EU5777	8207	85	94%	97	97.4%	98.1%	98.7%
EU5802	8842	86	96%	103	94.9%	95.5%	97.8%
EU5821	7909	78	87%	101	96.6%	97.3%	98.3%
EU6264	8599	88	98%	98	96.9%	97.9%	98.9%
EU6281	8168	83	92%	98	99.0%	99.1%	99.2%
EU6349	4492	59	66%	76	97.0%	97.9%	98.7%
EU6444	3889	61	68%	64	98.0%	98.3%	99.7%
EU6524	8402	63	70%	133	99.5%	99.6%	99.8%
EU6527	4477	64	71%	70	97.9%	99.2%	99.6%
EU6723	6649	38	42%	175	99.3%	99.3%	99.3%
EU6821	2100	40	44%	53	100.0%	100.0%	100.0%
EU6890	3030	53	59%	57	97.5%	97.6%	97.8%
EU7218	4426	67	74%	66	99.0%	99.0%	99.9%
EU7629	3358	62	69%	54	98.9%	99.0%	100.0%
EU7643	3228	55	61%	59	99.0%	99.2%	99.8%
EU7654	4757	73	81%	65	98.5%	98.8%	99.0%
EU7724	4017	63	70%	64	99.7%	99.7%	100.0%
EU7866	4357	35	39%	124	99.0%	99.0%	99.0%
EU7888	10111	88	98%	115	98.3%	98.7%	99.3%
EU8520	3541	59	66%	60	97.8%	98.1%	98.2%
EU8969	3515	52	58%	68	97.1%	97.5%	99.0%
EU9145	3952	65	72%	61	99.0%	99.3%	100.0%
EU9158	8900	75	83%	119	97.4%	97.9%	99.6%
EU9234	6147	69	77%	89	96.8%	97.6%	99.2%
EU9245	8697	82	91%	106	97.6%	98.2%	98.9%

AIRCRAFT	Total No of Reports	Days of Reports	Actual/possible	Average reports/day	0–45 min	0–60 min	0–120 min
EU9544	7648	78	87%	98	98.2%	98.6%	99.6%
EU9680	3588	58	64%	62	94.2%	95.4%	96.5%
EU9729	715	28	31%	26	99.7%	99.7%	99.7%

- *Timeliness: From 51 aircraft more than one percent of the received data had a delay after observation for more than two hours:*

Identifier	Identifier	Identifier	Identifier
EU0003	EU0985	EU4002	EU5777
EU0008	EU1002	EU4333	EU5802
EU0045	EU1222	EU4444	EU5821
EU0050	EU1367	EU4519	EU6264
EU0052	EU1495	EU4607	EU6349
EU0061	EU1593	EU4792	EU6890
EU0123	EU2547	EU4853	EU7654
EU0372	EU3268	EU4865	EU8520
EU0934	EU3321	EU4950	EU9245
EU0947	EU3654	EU5478	EU9680
EU0961	EU3908	EU5529	

- *No data was received from the following aircraft:*

Identifier
EU1688
EU2005
EU4956
EU5175
EU6321

**Table 3, Description and number of errors**

<b>Aircrafts with temperature anomalies:</b>	
• EU0032:	Warm temperature bias (1 °C) since January 1 <sup>st</sup> , 2001. During March occasionally.
• EU0041:	Warm temperature bias (1,5 °C) since September, 20 <sup>th</sup> 2000. Bias still present after aircraft maintenance (October, 29 <sup>th</sup> to November, 8 <sup>th</sup> 2000. Consistent bias during this quarter.
• EU0167:	Warm temperature bias (1 °C) since February 21 <sup>st</sup> , 2001. Consistent bias during February, but occasionally during March 2001.
• EU0316:	Warm temperature bias (1 °C) since December 2000. Consistent bias during this quarter.
• EU0324:	Warm temperature bias (1 °C) since October, 1 <sup>st</sup> 2000. Aircraft deactivated 16 <sup>th</sup> February 2001.
• EU0875:	Warm temperature bias (1 °C) since September, 1 <sup>st</sup> 2000. Bias still present after aircraft maintenance (September, 12 <sup>th</sup> to November 7 <sup>th</sup> 2000). Bias occurring infrequently/occasionally since January 2001.
• EU1334:	Warm temperature bias (1 °C) since February 1 <sup>st</sup> , 2001. Frequent this quarter.
• EU1541:	Warm temperature bias (1 °C) since January 1 <sup>st</sup> , 2001 Frequent bias during February
• EU1795:	Warm temperature bias (1,5 °C) since December 2000. Consistent bias during this quarter.
• EU3181:	Warm temperature bias (1 to 2 °C) since December 2000. Fault less frequent during January 2001. Very occasional bias now being recorded
• EU3421:	Warm temperature bias (1 °C) since June, 26 <sup>th</sup> 2000. (Operator informed). Consistent bias during this quarter.
• EU4527:	Warm temperature bias (1 °C) since February 10 <sup>th</sup> , 2001.
• EU4532:	Warm temperature bias (1 °C) since February 10 <sup>th</sup> , 2001. Consistent bias during February, but occasionally during March 2001.
• EU4582:	Warm temperature bias (1 °C) since January 1 <sup>st</sup> , 2001. Frequent bias during this quarter.
• EU4593:	Warm temperature bias (1,5 °C) since March 14 <sup>th</sup> , 2001 Consistent warm bias since activation.
• EU6444:	Warm temperature bias (2 °C) since November, 26 <sup>th</sup> 2000 (Bias still present after aircraft maintenance (November 30 <sup>th</sup> to December 5 <sup>th</sup> 2000). Consistent bias during this quarter.
<b>No reports received although expected:</b>	
• EU0003:	no reports February, 9 <sup>th</sup> – March, 15 <sup>th</sup> , 20 <sup>th</sup> - 31 <sup>st</sup> maintenance
• EU0008:	no reports March, 1 <sup>st</sup> - 31 <sup>st</sup> major maintenance - reactivation date unknown
• EU0032:	no reports February, 8 <sup>th</sup> – March, 21 <sup>st</sup> maintenance. (No reports from these aircraft due to a switching problem - no data sent to GTS during period February, 17-28 <sup>th</sup> - problem resolved 1 <sup>st</sup> March.)
• EU0034:	no reports February, 17 <sup>th</sup> - 28 <sup>th</sup> (No reports from these aircraft due to a switching problem - no data sent to GTS during period February, 17-28 <sup>th</sup> - problem resolved 1 <sup>st</sup> March.)
• EU0049:	no reports January, 1 <sup>st</sup> – February 15 <sup>th</sup> (major maintenance). Informed by operator on February, 15 <sup>th</sup> . aircraft software has been deactivated in error. New aircraft using the same EU identifier activated on February, 16 <sup>th</sup> .
• EU0060:	no reports January, 1 <sup>st</sup> - 7 <sup>th</sup> maintenance.
• EU0072:	no reports January, 10 <sup>th</sup> – February, 18 <sup>th</sup> , March, 13 <sup>th</sup> - 21 <sup>st</sup> maintenance.

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- EU0123: no reports January, 12<sup>th</sup> – 24<sup>th</sup> maintenance.
  - EU0124: no reports January, 13<sup>th</sup> – 19<sup>th</sup> maintenance.
  - EU0154: no reports March, 13<sup>th</sup> – 24<sup>th</sup> maintenance.
  - EU0209: no reports January, 17<sup>th</sup> – February, 28<sup>th</sup> maintenance. (No reports from these aircraft due to a switching problem - no data sent to GTS during period February, 17-28<sup>th</sup> - problem resolved 1<sup>st</sup> March.)
  - EU0234: no reports February, 1<sup>st</sup> - 23<sup>rd</sup> maintenance.
  - EU0263: no reports January, 1<sup>st</sup> – 19<sup>th</sup> maintenance.
  - EU0299: no reports February, 9<sup>th</sup> – March, 13<sup>th</sup> maintenance.
  - EU0311: no reports March, 6<sup>th</sup> - 14<sup>th</sup> maintenance
  - EU0313: no reports February, 20<sup>th</sup> - March, 4<sup>th</sup> maintenance.
  - EU0332: no reports March, 8<sup>th</sup> - 13<sup>th</sup> maintenance.
  - EU0359: no reports February, 18<sup>th</sup> - March, 10<sup>th</sup> maintenance.
  - EU0367: no reports February, 13<sup>th</sup> - 18<sup>th</sup> maintenance.
  - EU0372: no reports February, 11<sup>th</sup> - 28<sup>th</sup>, March, 20<sup>th</sup> - 31<sup>st</sup> operator investigating problem
  - EU0456: no reports March, 5<sup>th</sup> - 31<sup>st</sup> maintenance.
  - EU0458: no reports February, 1<sup>st</sup> – 17<sup>th</sup> maintenance.
  - EU0476: no reports January, 1<sup>st</sup> – 10<sup>th</sup> maintenance.
  - EU0498: no reports February, 17<sup>th</sup> - 28<sup>th</sup> (No reports from these aircraft due to a switching problem - no data sent to GTS during period February, 17-28<sup>th</sup> - problem resolved 1<sup>st</sup> March.)
  - EU0689: no reports February, 16<sup>th</sup> - 28<sup>th</sup> (No reports from these aircraft due to a switching problem - no data sent to GTS during period February, 17-28<sup>th</sup> - problem resolved 1<sup>st</sup> March.)
  - EU0826: no reports February, 20<sup>th</sup> - 28<sup>th</sup>
  - EU0921: no reports January, 1<sup>st</sup> – 25<sup>th</sup> major maintenance.
  - EU0947: no reports 1<sup>st</sup> - 7<sup>th</sup> maintenance.
  - EU0961: no reports January, 13<sup>th</sup> – 21<sup>st</sup> airborne hardware problems.
  - EU0985: no reports February, 6<sup>th</sup> – 11<sup>th</sup> maintenance.
  - EU1001: no reports January, 1<sup>st</sup> – February, 15<sup>th</sup> major maintenance. Informed by operator on February, 15<sup>th</sup> aircraft software has been deactivated in error. New aircraft using the same EU identifier activated February, 16<sup>th</sup>
  - EU1002: no reports March, 13<sup>th</sup> – 21<sup>st</sup> maintenance.
  - EU1282: no reports March, 5<sup>th</sup> - 21<sup>st</sup> maintenance.
  - EU1301: no reports March, 14<sup>th</sup> – 27<sup>th</sup> maintenance.
  - EU1345: no reports February, 1<sup>st</sup> – March, 14<sup>th</sup>, March, 21<sup>st</sup> - 31<sup>st</sup> maintenance. No data received since activation 19<sup>th</sup> Jan 2001. Problems within aircraft software - reconfigured.
  - EU1436: no reports February, 1<sup>st</sup> – 15<sup>th</sup> maintenance, no reports March, 12<sup>th</sup> - 29<sup>th</sup> although this unit is flying, no data received from the aircraft due to the configuration of reporting areas.
  - EU1456: no reports January, 1<sup>st</sup> - 12<sup>th</sup> software problems within DMU. Aircraft replaced January, 13<sup>th</sup> by aircraft using EU1050 identifier until identifier changed during January the 17<sup>th</sup>. No reports March, 10<sup>th</sup> - 20<sup>th</sup> maintenance
  - EU1547: no reports March, 5<sup>th</sup> - 14<sup>th</sup> maintenance.
  - EU1567: no reports March, 3<sup>rd</sup> - 9<sup>th</sup> maintenance.
  - EU1593: no reports January, 1<sup>st</sup> - 6<sup>th</sup> maintenance.
  - EU1688: no reports January, 1<sup>st</sup> - 31<sup>st</sup> ACMS software problems.
  - EU1692: no reports February, 8<sup>th</sup> - 15<sup>th</sup>, March, 19<sup>th</sup> - 24<sup>th</sup> maintenance.
  - EU2123: no reports March, 16<sup>th</sup> - 31<sup>st</sup> maintenance.
  - EU2301: no reports February, 3<sup>rd</sup> - 11<sup>th</sup>, March, 20<sup>th</sup> - 27<sup>th</sup> maintenance.
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- EU2389: no reports January, 11<sup>th</sup> - 18<sup>th</sup> maintenance.
  - EU2547: no reports February, 4<sup>th</sup> - 28<sup>th</sup>
  - EU2559: no reports January, 8<sup>th</sup> - 14<sup>th</sup> maintenance.
  - EU2618: no reports January, 20<sup>th</sup> - 29<sup>th</sup> maintenance.
  - EU2630: no reports January, 8<sup>th</sup> - 15<sup>th</sup>, February, 10<sup>th</sup> - 18<sup>th</sup> maintenance
  - EU2773: no reports January, 1<sup>st</sup> - February, 14<sup>th</sup> maintenance.
  - EU2984: no reports January, 1<sup>st</sup> - 7<sup>th</sup> and January, 16<sup>th</sup> - 25<sup>th</sup> maintenance.
  - EU3000: no reports January, 9<sup>th</sup> - 15<sup>th</sup> maintenance.
  - EU3321: no reports February, 1<sup>st</sup> - 6<sup>th</sup> maintenance.
  - EU3421: no reports January, 16<sup>th</sup> - 22<sup>nd</sup>
  - EU3544: no reports January, 1<sup>st</sup> - March, 23<sup>rd</sup> maintenance.
  - EU3598: no reports March, 4<sup>th</sup> - 29<sup>th</sup> maintenance.
  - EU3725: no reports January, 9<sup>th</sup> - 18<sup>th</sup> maintenance.
  - EU3781: no reports January, 1<sup>st</sup> - February, 14<sup>th</sup>
  - EU3908: no reports March, 9<sup>th</sup> - 18<sup>th</sup> maintenance.
  - EU4426: no reports February, 21<sup>st</sup> - 25<sup>th</sup> software problems within ACMS, no reports March, 13<sup>th</sup> - 21<sup>st</sup> maintenance.
  - EU4527: no reports March, 1<sup>st</sup> - 31<sup>st</sup> major maintenance - reactivation date unknown..
  - EU4529: no reports January, 1<sup>st</sup> - 6<sup>th</sup> maintenance.
  - EU4532: no reports March, 13<sup>th</sup> - 18<sup>th</sup> maintenance
  - EU4582: no reports March, 14<sup>th</sup> - 31<sup>st</sup> - operator investigating problem.
  - EU4607: no reports January, 9<sup>th</sup> - 15<sup>th</sup> maintenance.
  - EU4721: no reports February, 6<sup>th</sup> - 11<sup>th</sup> maintenance.
  - EU4792: no reports January, 1<sup>st</sup> - 6<sup>th</sup> maintenance.
  - EU4853: no reports February, 3<sup>rd</sup> - 12<sup>th</sup> maintenance.
  - EU4950: no reports February, 12<sup>th</sup> - 19<sup>th</sup>, March, 10<sup>th</sup> - 23<sup>rd</sup> maintenance.
  - EU5441: no reports March, 19<sup>th</sup> - 31<sup>st</sup> maintenance.
  - EU6524: no reports January, 16<sup>th</sup> - 24<sup>th</sup> maintenance.
  - EU6890: no reports March, 4<sup>th</sup> - 12<sup>th</sup> maintenance.
  - EU7629: no reports February, 10<sup>th</sup> - 15<sup>th</sup> maintenance.
  - EU7643: no reports January, 22<sup>nd</sup> - 27<sup>th</sup> maintenance.
  - EU7724: no reports January, 4<sup>th</sup> - 9<sup>th</sup> maintenance.
  - EU8520: no reports February, 6<sup>th</sup> - 11<sup>th</sup> and 19<sup>th</sup> - maintenance.
  - EU8969: no reports February, 11<sup>th</sup> - 17<sup>th</sup>, March, 1<sup>st</sup> - 9<sup>th</sup> maintenance.
  - EU9234: no reports January, 1<sup>st</sup> - 16<sup>th</sup> maintenance.
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#### Specific problems:

- EU5182: Reports received from this aircraft due AMDAR software being activated during operator testing
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#### Ground stations issues and other problems:

- SAS: Mainframe outage for 45 minutes January, 13<sup>th</sup> - this resulted in some telex messages not being handled - some data February, 17<sup>th</sup> and March 17<sup>th</sup> communications problems leading to reduction in data returns.
  - AF: February, 20<sup>th</sup> reduction in data and February, 21<sup>st</sup> no data received – problems with host program software, problem solved February, 22<sup>nd</sup>. Reduction in data on the March, 20<sup>th</sup> and no data received March, 21<sup>st</sup> – problems with host program software, problem solved March, 22<sup>nd</sup>. Reduction in data during the period March, 06/1600 - 13/0830 UTC. Problems with host program software.
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- LH: Low data returns February, 11<sup>th</sup>. and March, 8<sup>th</sup> - combination of SITA and Lido Data Uplink Module problems. Ground processing System out of operation March, 20/1100 - 20/1300 UTC for installation of software components at Lido.
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#### Activated and deactivated aircraft:

- The following aircraft were activated on January, 19<sup>th</sup> (Activated by operator as part of E-AMDAR Optimisation Plan. Aircraft are reporting data when flying in selected regions): EU1282, EU1334, EU1345, EU1367, EU1389, EU1411, EU1436, EU2123 and EU38591
  - The following aircraft were activated for E-ADAS and Optimisation testing on March, 7<sup>th</sup> (Please note that the data from these aircraft was not input to the GTS until March, 20<sup>th</sup> and ceased on the March, 30<sup>th</sup>): EU2001, EU2002, EU2003, EU2004, EU2005, EU2006, EU2007, EU2008, EU2009, EU2010, EU2011, EU2012, EU2013, EU2014, EU2015 and EU2016.
  - The following aircraft were activated as part of the E-AMDAR Optimisation Plan on March, 13<sup>th</sup>: EU4593, EU5331, EU5351 and EU5435
  - EU0049: New aircraft using the same EU identifier activated on February, 16<sup>th</sup>.
  - EU0050: February, 4<sup>th</sup> deactivated by operator (Aircraft deactivated due to positional errors detected in the software)
  - EU0052: February, 12<sup>th</sup> deactivated by operator (Aircraft deactivated due to positional errors detected in the software); March, 12<sup>th</sup> activated in error - deactivated March, 16<sup>th</sup>
  - EU0059: February, 16<sup>th</sup> deactivated by operator (Aircraft deactivated due to positional errors detected in the software)
  - EU0061: February, 1<sup>st</sup> deactivated by operator (Aircraft deactivated due to positional errors detected in the software)
  - EU0324: February, 16<sup>th</sup> deactivated by operator. (Aircraft deactivated as part of the E-AMDAR Optimisation Plan.)
  - EU0475: February, 7<sup>th</sup> deactivated by operator - reports received February, 13<sup>th</sup> and 14<sup>th</sup> due ACMS testing by operator. (Aircraft deactivated as part of the E-AMDAR Optimisation Plan.)
  - EU0592: February, 7<sup>th</sup> deactivated by operator (Aircraft deactivated as part of the E-AMDAR Optimisation Plan.)
  - EU1050: activated by operator January, 13<sup>th</sup> - 17<sup>th</sup> (this EU identifier has not been assigned). This was a new aircraft to replace EU1456 - see item "No reports received although expected".
  - EU1688: February, 7<sup>th</sup> deactivated by operator. (Aircraft deactivated as part of the E-AMDAR Optimisation Plan.)
  - EU3544: February, 1<sup>st</sup> activated by operator. No reports February, 5<sup>th</sup> - 28<sup>th</sup> due to maintenance. (Aircraft activated as replacements to aircraft deactivated due to positional errors detected in the software)
  - EU3598: February, 1<sup>st</sup> activated by operator. (Aircraft activated as replacements to aircraft deactivated due to positional errors detected in the software)
  - EU4527: February, 1<sup>st</sup> activated by operator. No reports February, 21<sup>st</sup> - 28<sup>th</sup> (Aircraft activated as replacements to aircraft deactivated due to positional errors detected in the software)
  - EU4532: February, 1<sup>st</sup> activated by operator. (Aircraft activated as replacements to aircraft deactivated due to positional errors detected in the software)
  - EU6723: February, 7<sup>th</sup> deactivated by operator. (Aircraft deactivated as part of the E-AMDAR Optimisation Plan.)
  - EU7866: February, 7<sup>th</sup> deactivated by operator. (Aircraft deactivated as part of the E-AMDAR Optimisation Plan.)
  - EU9622: deactivated by operator January, 1<sup>st</sup>
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- EU9680: activated by operator January, 3<sup>rd</sup>
  - EU9729: February, 24<sup>th</sup> activated by operator. (Aircraft activated as part of E-AMDAR Optimisation Plan)
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(problems/faults reported here are apart from routine maintenance (less than 5 days).  
Information provided by the appointed Technical Co-ordinator of the E-AMDAR Programme;  
more details to be inserted in the following Quarterly reports)

## Tables 4 to 6, *Evaluation results*

Presented values: Observation minus Reference (Model values), O–B.

All statistics are evaluated separately for two datasets:

- 1) Data from Ascent/Decent ( $i_p i_p i_p = \text{ASC or DES}$ )
- 2) Cruise level, level flight at cruising height ( $i_p i_p i_p = \text{LVR or LVW}$ )

Notes:

- Data with  $i_p i_p i_p = \text{UNS or ///}$  is not evaluated.
- AMDAR aircraft produce much more reports during Ascent/Decent than during Cruise level.
- O–B values larger than the stated criterion are presented in **bold**.
- Temperatures are in °C, wind speed in m/s and wind direction in degrees.
- The total number of reported observations in the table 4 to 6 differs from the total number in table 2. The main reason is that within table two data are presented from observations world wide, whereas in the tables 4 to 6 data are presented which were evaluated with using the HIRLAM model as reference. Since this model is a limited area model, only those data were evaluated which were observed within the HIRLAM area (roughly Europe, Northern Africa and the North Atlantic, see Annex 1 - Figure 3) and within the three hours time-window around main and intermediate hours (eight times a day). Other reasons for this difference are incorrect encoding (e.g.  $i_p i_p i_p$ ), cases with identical reports (only one is used) or in case of incomplete bulletins.
- Notice that a number of aircraft only report during the ascending phase.
- For wind direction (tabel 6) the column "Observed" is not filled to avoid confusion. For the column with the mean differences (*i.e.* Obs-backgrnd, Mean), these values are calculated based on  $\langle |\Delta DD| \rangle (= \text{AVG}(\text{ABS}(\text{DD\_OBS} - \text{DD\_MOD})))$  resulting in non-negative values.

### Legends

Number of Reports	Actual number of reports used for calculation of values
Observed Mean	Average value of the parameter for relevant phase in units of °C (for temperature), m/s (wind speed) or degrees (wind direction)
Observed SD	Standard Deviation of observed parameter
Obs–Backgrnd Mean	Average value of calculated differences (observed parameter minus model output value)
Obs–Backgrnd SD	Standard Deviation of calculated differences (observed parameter minus model output value)

a) Table 4, Temperature (°C)

AIRCRAFT	Temperature Cruise level in °C					Temperature Ascent & Descent in °C				
	Number of Reports	Observed		Obs-backgrnd		Number of Reports	Observed		Obs-backgrnd	
		Mean	SD	Mean	SD		Mean	SD	Mean	SD
EU0002						9936	-15.7	18.0	-0.1	1.1
EU0003	3635	-55.3	9.6	-0.2	1.4	1461	-5.5	15.7	0.0	1.4
EU0008	3791	-53.6	8.7	-0.1	1.6	1507	-11.5	10.3	0.0	1.5
EU0021	1900	-51.0	12.3	-0.6	1.3	6893	-8.7	11.1	-0.2	1.2
EU0022	2749	-52.7	11.1	0.2	2.3	8688	-3.9	11.2	0.0	1.5
EU0032	414	-45.6	12.2	0.0	1.4	1057	6.6	9.6	0.5	1.6
EU0034	533	-46.6	13.0	-0.1	1.1	1390	6.3	9.2	0.2	1.6
EU0041	1953	-49.8	13.7	1.2	1.4	19753	-11.8	17.2	0.6	1.4
EU0043	1545	-49.2	14.8	1.0	1.5	20581	-12.0	17.6	0.4	1.3
EU0045	7581	-53.1	10.5	-0.2	1.4	3503	-3.7	15.8	-0.1	1.2
EU0047	1790	-50.9	12.6	0.8	1.6	21093	-12.1	17.6	0.4	1.3
EU0049						3552	-21.4	19.4	-0.2	1.1
EU0050	550	-49.7	15.4	-0.3	1.2	10561	-11.6	15.3	-0.4	1.3
EU0051	1718	-53.1	9.9	-0.4	2.4	4841	-5.0	11.6	-0.3	1.7
EU0052	353	-50.4	14.5	-0.5	1.5	8135	-11.6	14.8	-0.5	1.3
EU0054	1814	-53.9	10.1	-0.4	1.6	4898	-4.7	11.9	0.0	1.6
EU0055						9910	-14.8	17.6	0.1	1.2
EU0059	802	-49.5	14.4	0.0	1.4	15087	-9.7	14.8	-0.1	1.5
EU0060	5754	-48.6	9.3	-0.4	1.5	2359	7.5	12.6	0.0	1.2
EU0061	351	-49.6	14.0	-0.3	1.3	6749	-11.7	15.2	-0.5	1.2
EU0072	1189	-52.5	9.5	0.1	1.4	2784	-4.5	12.0	0.0	1.4
EU0081	2812	-53.6	11.5	0.5	1.6	9238	-3.6	11.2	0.4	1.6
EU0082						9166	-17.2	17.5	0.3	1.1
EU0088	2177	-51.0	12.8	0.2	1.7	9900	-2.9	10.7	0.3	1.5
EU0106	1238	-49.1	15.6	-0.3	1.3	22109	-12.1	16.9	-0.3	1.2
EU0109	2791	-52.7	11.2	0.2	1.5	8802	-4.0	11.2	0.2	1.6
EU0123	4591	-54.2	8.6	0.0	1.6	2208	-13.0	11.1	0.0	1.4
EU0124						8597	-16.9	17.2	0.5	1.2
EU0154	1292	-49.9	15.0	-0.1	1.3	21033	-12.0	16.4	-0.4	1.3
EU0158	1368	-48.7	13.6	0.7	1.3	22067	-11.0	16.7	0.6	1.3
EU0167	1140	-48.7	13.7	0.5	1.3	18230	-10.1	16.2	0.6	1.2
EU0185	1196	-46.1	15.7	0.5	1.2	21106	-11.2	16.6	0.4	1.2
EU0204	2831	-54.2	10.3	0.6	1.6	7216	-2.2	11.3	0.6	1.6
EU0209	201	-49.3	13.1	0.0	1.7	779	5.3	9.1	0.2	1.6
EU0234						6269	-17.6	17.8	-0.1	1.1
EU0249	2306	-53.9	11.3	-0.2	1.5	7189	-1.2	11.2	0.6	1.7
EU0254	4988	-52.1	8.6	0.5	1.7	3893	2.3	12.6	0.2	1.3
EU0263	4390	-52.7	8.5	0.2	1.8	3044	-1.0	12.2	0.1	1.3
EU0299						6979	-18.4	17.8	0.0	1.1

2001-I T	Temperature Cruise level in °C					Temperature Ascent & Descent in °C					
	AIRCRAFT	Number of Reports	Observed		Obs-backgrnd		Number of Reports	Observed		Obs-backgrnd	
			Mean	SD	Mean	SD		Mean	SD	Mean	SD
EU0301	733	-49.2	15.2	0.6	1.2	11091	-10.6	17.0	0.5	1.3	
EU0303	1091	-47.1	16.5	-0.3	1.3	21892	-12.1	16.8	-0.4	1.2	
EU0307	1250	-47.8	15.7	-0.3	1.4	21342	-12.0	16.7	-0.4	1.2	
EU0311	905	-46.4	15.3	0.5	1.3	17250	-11.3	16.1	0.4	1.3	
EU0313	917	-47.1	14.7	0.6	1.1	16373	-10.4	15.9	0.4	1.2	
EU0316	1636	-49.7	13.8	1.4	1.5	21167	-11.2	17.4	0.8	1.4	
EU0319	936	-46.5	16.5	0.3	1.3	16889	-11.7	16.7	0.3	1.2	
EU0324	2179	-55.2	6.5	2.0	1.4	1923	-2.5	12.5	1.3	1.9	
EU0332	5067	-53.0	8.5	-0.1	1.8	3756	-1.3	11.8	0.0	1.3	
EU0359	923	-47.2	14.9	0.6	1.2	16241	-10.8	15.9	0.5	1.2	
EU0367						8346	-16.8	16.9	-0.2	1.2	
EU0372	3361	-52.1	8.5	0.4	1.8	2466	0.3	12.2	0.1	1.3	
EU0432						10302	-17.3	17.2	-0.1	1.2	
EU0456	436	-37.6	19.8	0.2	1.3	17594	-12.7	16.0	0.2	1.4	
EU0457	3136	-49.2	9.2	0.1	1.5	11116	17.1	12.0	0.1	1.5	
EU0458	595	-38.8	20.5	-0.2	1.3	20156	-12.8	17.0	0.0	1.3	
EU0475	1452	-55.0	7.9	0.2	1.4	1734	-4.3	11.7	0.2	1.8	
EU0476	652	-41.7	17.8	-0.3	1.5	21635	-13.1	16.9	0.0	1.4	
EU0482	4835	-52.7	8.2	0.0	1.8	3465	0.5	12.7	0.0	1.3	
EU0498	409	-47.0	13.5	-0.1	1.3	1485	5.4	9.5	0.2	1.6	
EU0568						9299	-16.7	17.5	0.4	1.2	
EU0592	1437	-52.9	10.1	1.1	1.5	3875	-2.5	10.6	0.7	1.6	
EU0689	793	-47.7	12.6	-0.2	1.9	1940	6.7	9.8	0.1	1.6	
EU0711	742	-40.7	18.0	-0.4	1.2	25992	-13.0	16.6	-0.1	1.3	
EU0802	1212	-46.8	15.7	0.5	1.3	20283	-10.2	15.5	0.3	1.3	
EU0807	2985	-52.5	8.2	0.0	1.3	4958	-3.8	12.6	0.0	1.5	
EU0826						8812	-16.6	17.4	0.0	1.2	
EU0875	1182	-46.6	15.1	0.8	1.4	21575	-10.7	16.2	0.5	1.3	
EU0921	886	-48.4	14.4	0.5	1.4	13928	-12.4	17.4	-0.2	1.3	
EU0934	7657	-53.8	9.4	-0.2	1.5	3345	-4.4	14.6	-0.1	1.2	
EU0947	6187	-52.2	11.0	-0.3	1.4	3408	-2.3	16.6	-0.2	1.4	
EU0961	6804	-52.2	10.1	0.0	1.6	3195	-5.3	15.5	0.0	1.5	
EU0985	6794	-53.7	7.1	-0.5	1.7	2176	-10.6	10.6	-0.2	1.1	
EU1001						3517	-23.4	19.5	-0.3	1.2	
EU1002	7219	-53.9	6.8	-0.2	1.5	2511	-7.9	11.7	-0.1	1.2	
EU1050						1375	-24.1	18.3	-0.5	1.1	
EU1222	7620	-54.0	8.6	-0.4	1.6	2953	-11.8	11.1	-0.1	1.4	
EU1234	1262	-48.1	16.4	-0.4	1.3	23417	-12.3	16.8	-0.4	1.3	
EU1275	3170	-51.2	7.9	0.1	1.6	1034	13.3	14.7	0.1	1.1	
EU1282	2048	-52.9	8.2	-0.3	1.6	717	-0.6	12.4	0.2	1.4	
EU1301	1242	-45.4	11.0	0.1	1.2	1170	13.3	10.6			

2001-I T	Temperature Cruise level in °C					Temperature Ascent & Descent in °C					
	AIRCRAFT	Number of Reports	Observed		Obs-backgrnd		Number of Reports	Observed		Obs-backgrnd	
			Mean	SD	Mean	SD		Mean	SD	Mean	SD
EU1312	3018	-49.2	9.8	0.3	1.7	1418	10.8	11.8	0.1	1.5	
EU1334	4009	-46.4	10.1	0.4	1.5	1245	4.0	13.9	0.3	1.5	
EU1345	68	-52.8	4.8	1.3	1.3						
EU1367	2327	-50.2	8.9	0.4	1.7	738	5.1	13.6	0.3	1.4	
EU1389	4884	-49.5	8.9	0.2	1.9	976	2.1	12.0	0.3	1.6	
EU1411	3168	-49.7	9.1	0.1	1.6	893	7.4	13.9	0.1	1.5	
EU1436	1590	-48.4	9.5	0.4	1.6	279	8.4	11.1	0.2	1.4	
EU1456						10762	-25.5	20.6	-0.2	1.3	
EU1495	7140	-53.5	8.5	-0.3	1.6	2860	-11.6	10.8	0.0	1.5	
EU1532						9207	-16.2	16.8	-0.2	1.2	
EU1541	4453	-47.2	9.0	0.3	1.6	1589	13.6	10.5	0.0	1.4	
EU1547	1268	-49.3	15.5	0.0	1.4	19524	-11.8	16.6	-0.2	1.3	
EU1567						9108	-17.5	17.4	-0.1	1.2	
EU1593	6301	-55.6	8.4	-0.4	1.5	2858	-8.3	12.8	-0.1	1.2	
EU1692	545	-50.6	9.0	-0.5	1.3	1483	-8.8	12.5	0.2	1.4	
EU1698						9109	-16.0	17.0	0.2	1.2	
EU1795	5726	-45.6	8.9	0.5	1.6	1361	10.4	12.5	0.2	1.2	
EU1863	1385	-49.3	15.8	-0.5	1.3	21483	-12.0	16.4	-0.4	1.2	
EU1929	2039	-48.6	9.4	0.0	1.4	251	11.5	10.2	0.0	1.3	
EU2001						837	-33.4	21.0	-0.6	1.3	
EU2002						917	-31.6	20.8	-0.3	1.4	
EU2003						784	-32.7	20.1	-0.4	1.3	
EU2004						761	-34.1	20.8	-0.1	1.4	
EU2006						934	-30.6	20.1	-0.2	1.1	
EU2007						699	-31.2	19.7	-0.6	1.1	
EU2008						647	-30.4	20.0	0.3	1.4	
EU2009						620	-32.1	21.1	-0.4	1.2	
EU2010						514	-28.9	18.8	-0.1	1.0	
EU2011						383	-33.0	21.2	-0.2	1.2	
EU2012						636	-30.4	20.4	0.7	1.1	
EU2013						531	-31.8	19.7	-0.3	1.3	
EU2014						769	-30.4	19.5	-0.1	1.3	
EU2015						857	-29.3	19.4	-0.1	1.4	
EU2016						871	-31.7	20.3	-0.4	1.1	
EU2043	1545	-51.6	8.9	0.1	1.5	268	9.7	12.8	0.1	1.7	
EU2123	1860	-49.8	8.9	0.6	1.8	455	1.0	12.0	0.7	1.5	
EU2189	1034	-45.9	15.3	0.7	1.2	20881	-11.1	16.2	0.4	1.2	
EU2301	1104	-49.7	14.1	0.8	1.4	14183	-12.5	17.1	0.3	1.3	
EU2389	1062	-46.5	14.5	-0.4	1.2	7908	-4.3	11.0	0.0	1.3	
EU2547	5341	-50.5	10.2	0.0	1.5	2753	-2.8	16.2	0.0	1.4	
EU2559	948	-48.4	14.8	0.9	1.4	19832	-12.5	17.9	0.6	1.3	

2001-I T	Temperature Cruise level in °C					Temperature Ascent & Descent in °C					
	AIRCRAFT	Number of Reports	Observed		Obs-backgrnd		Number of Reports	Observed		Obs-backgrnd	
			Mean	SD	Mean	SD		Mean	SD	Mean	SD
EU2590	829	-48.9	8.6	0.3	1.2	9024	-15.2	16.2	0.0	1.4	
EU2618	484	-52.0	6.9	0.2	1.2	7852	-16.3	16.3	-0.2	1.2	
EU2630	294	-53.7	5.5	0.8	1.4	1087	-18.0	18.0	0.0	1.4	
EU2751	5038	-47.2	9.2	-0.2	1.5	1460	13.4	10.3			
EU2773	2658	-47.0	9.6	0.1	1.6	1051	12.6	10.6	0.0	1.6	
EU2845	2288	-52.0	10.1	-0.2	1.3	5834	-3.2	11.8	-0.1	1.4	
EU2984	566	-51.1	8.5	0.7	1.4	2735	-16.7	17.7	-0.3	1.4	
EU3000	1239	-49.6	14.7	-0.4	1.3	20259	-11.6	16.7	-0.5	1.2	
EU3181	5155	-45.7	9.4	-0.1	1.7	1489	12.6	10.2	0.0	1.1	
EU3257	979	-49.9	15.1	-0.2	1.3	15450	-11.2	16.3	-0.5	1.2	
EU3268	460	-54.0	8.0	0.4	1.4	1549	-17.7	17.7	-0.2	1.4	
EU3321	906	-54.8	8.5	0.3	1.2	3694	-14.5	17.2	-0.3	1.4	
EU3421	1425	-49.4	13.9	1.4	1.4	20839	-11.4	17.5	0.8	1.3	
EU3544	85	-31.9	32.7	-0.3	1.0	1364	-16.6	18.9	-2.4	9.8	
EU3598	597	-51.7	10.1	0.1	1.5	2347	-13.4	18.4	0.4	1.5	
EU3654	777	-48.9	8.7	0.3	1.2	6431	-17.4	16.0	-0.2	1.5	
EU3684	847	-52.2	8.9	1.3	1.7	3797	-14.3	17.4	0.0	1.5	
EU3725	4197	-46.4	9.9	-0.2	1.5	1920	13.1	10.5	0.0	1.4	
EU3781	1649	-51.0	9.2	0.3	1.9	977	6.5	13.0	0.1	1.3	
EU3803	1550	-46.0	9.9	0.0	1.4	1025	11.6	11.2			
EU3859	1672	-53.8	7.9	0.5	1.4	330	-2.2	11.1	0.6	1.6	
EU3874	5664	-45.5	9.6	0.0	1.7	1915	11.5	12.6	0.1	1.3	
EU3908	748	-52.5	7.2	0.9	1.4	8354	-16.3	16.2	-0.1	1.3	
EU4002	769	-52.6	9.3	0.5	1.4	2894	-13.4	17.2	-0.1	1.4	
EU4333	822	-50.3	8.4	0.6	1.4	9847	-16.0	16.3	0.0	1.3	
EU4426	1267	-47.3	14.1	-0.5	1.1	7660	-5.5	10.8	-0.2	1.3	
EU4444	835	-50.2	7.8	0.3	1.0	6302	-16.9	16.1	0.1	1.4	
EU4519	812	-51.3	7.8	0.7	1.4	7650	-17.2	16.1	-0.1	1.5	
EU4527	59	-19.5	17.6	1.1	3.3	4091	-12.1	16.9	0.4	1.5	
EU4529	2450	-51.4	11.0	-0.3	1.3	6800	-3.8	11.5	0.0	1.5	
EU4532	246	-26.7	20.7	0.1	1.3	13852	-13.7	17.4	0.0	1.4	
EU4573	804	-52.6	7.6	0.5	1.4	10412	-16.7	16.5	-0.1	1.3	
EU4582	722	-52.0	9.2	0.9	1.3	6478	-15.7	16.5	0.6	1.4	
EU4587	1908	-52.5	9.0	0.3	1.3	3486	-6.7	12.0	0.2	1.5	
EU4593	428	-49.5	14.4	1.9	1.3	3517	-9.9	18.4	1.1	1.2	
EU4607	982	-50.6	8.8	0.6	1.2	6296	-19.9	16.0	0.2	1.5	
EU4699	968	-53.5	7.0	-0.1	1.2	6571	-19.4	16.5	-0.3	1.4	
EU4721	896	-55.6	8.8	0.3	1.3	3562	-14.7	17.2	-0.1	1.4	
EU4792	418	-57.2	8.2	-0.1	1.3	1452	-18.1	17.5	-0.4	1.4	
EU4853	645	-49.9	7.5	-0.1	1.1	5552	-18.0	15.7	-0.4	1.4	
EU4865	1078	-52.7	6.9	0.3	1.2	7450	-19.6	16.5	-0.1	1.5	

2001-I T	Temperature Cruise level in °C					Temperature Ascent & Descent in °C					
	AIRCRAFT	Number of Reports	Observed		Obs-backgrnd		Number of Reports	Observed		Obs-backgrnd	
			Mean	SD	Mean	SD		Mean	SD	Mean	SD
EU4896	42	-48.5	12.3	0.0	0.2	27	13.1	10.8	0.1	0.8	
EU4950	519	-54.2	7.2	1.2	1.4	2031	-15.7	17.8	0.2	1.7	
EU5182	48	-55.6	8.3	0.6	0.6	66	-3.1	10.4	0.4	1.6	
EU5191	96	-37.9	15.6			163	10.9	9.7	0.0	2.1	
EU5218	1334	-45.7	15.0	0.1	1.2	8670	-4.1	10.7	0.2	1.5	
EU5331	268	-48.6	13.2	1.1	1.2	2542	-11.9	18.9	0.7	1.3	
EU5351	278	-44.8	16.3	0.7	1.2	4375	-10.9	16.5	0.3	1.1	
EU5435	132	-42.8	12.4	1.2	1.1	2162	-11.1	18.3	1.0	1.2	
EU5441	742	-52.5	7.9	1.3	1.4	2594	-15.1	17.5	0.0	1.5	
EU5478	916	-53.8	7.2	0.0	1.4	9238	-17.6	16.4	-0.4	1.3	
EU5529	837	-52.6	7.1	0.4	1.3	9395	-17.3	16.2	-0.1	1.3	
EU5591	1217	-46.4	14.3	-0.3	1.2	7539	-6.7	10.2	-0.1	1.3	
EU5612	940	-52.3	8.0	-0.3	1.0	6426	-19.9	16.4	-0.3	1.4	
EU5777	954	-52.9	7.6	0.4	1.3	7159	-18.7	16.5	-0.1	1.5	
EU5802	1093	-52.5	7.8	-0.1	1.1	7749	-20.0	16.0	-0.2	1.5	
EU5821	1073	-50.4	7.9	0.3	1.1	6835	-19.8	15.8	-0.1	1.4	
EU6264	891	-52.7	8.3	0.0	1.2	7708	-18.3	15.9	-0.3	1.5	
EU6281	825	-49.5	8.6	0.5	1.2	7341	-17.3	15.7	-0.1	1.5	
EU6349	1160	-53.2	9.0	1.4	1.6	3332	-13.4	17.6	0.3	1.4	
EU6444	686	-52.4	8.0	4.0	1.8	3203	-13.4	17.3	1.5	1.7	
EU6524	1465	-50.5	11.1	0.2	1.3	5428	-2.9	11.7	0.5	1.4	
EU6527	788	-53.4	10.2	0.8	1.4	3689	-14.5	17.4	-0.1	1.4	
EU6723	1524	-52.2	9.8	0.1	1.3	3939	-4.7	11.3	0.2	1.5	
EU6821	625	-44.9	11.3	0.0	1.4	1126	7.1	10.1	0.5	1.7	
EU6890	552	-54.0	10.1	0.5	1.3	2478	-14.9	17.5	-0.2	1.4	
EU7218	967	-53.7	9.7	0.1	1.5	3459	-15.2	17.5	-0.2	1.5	
EU7629	587	-53.9	7.4	1.5	1.3	2771	-13.6	17.8	0.4	1.4	
EU7643	671	-54.2	7.2	0.0	1.2	2557	-15.2	17.5	-0.4	1.4	
EU7654	975	-53.7	9.2	0.4	1.5	3782	-13.8	17.6	-0.3	1.4	
EU7724	739	-52.5	7.2	0.9	1.4	3278	-15.7	17.2	-0.3	1.4	
EU7866	1319	-53.0	8.5	0.0	1.3	2342	-6.3	11.9	0.0	1.5	
EU7888	664	-51.1	9.0	0.4	1.4	9446	-15.6	16.1	0.0	1.4	
EU8520	840	-53.8	9.1	1.4	1.5	2701	-12.6	17.2	0.1	1.6	
EU8969	720	-52.6	8.1	0.6	1.4	2795	-14.8	17.9	-0.3	1.4	
EU9145	895	-55.4	9.6	1.2	1.5	3057	-14.0	17.7	-0.1	1.5	
EU9158	726	-53.5	7.7	0.0	1.4	8173	-16.6	16.3	-0.1	1.2	
EU9234	802	-51.2	7.4	-0.1	1.1	5345	-19.6	16.0	-0.3	1.5	
EU9245	1076	-52.3	8.1	0.1	1.2	7621	-19.6	16.1	-0.2	1.5	
EU9544	1015	-52.4	8.0	-0.3	1.1	6633	-20.2	16.2	-0.3	1.4	
EU9680	705	-53.9	9.6	-0.1	1.2	2883	-16.7	17.4	-0.3	1.4	
EU9729	123	-56.3	5.5	-0.2	1.3	592	-18.7	16.6	-0.3	1.2	

b) Table 5, *Wind Speed (m/s)*

2001-I FF	Wind Speed Cruise level in m/s					Wind Speed Ascent & Descent in m/s					
	AIRCRAFT	Number of Reports	Observed		Obs-backgrnd		Number of Reports	Observed		Obs-backgrnd	
			Mean	SD	Mean	SD		Mean	SD	Mean	SD
EU0002						9936	16.1	11.6	0.0	3.0	
EU0003	3635	23.1	15.2	0.1	2.5	1461	10.0	7.4	0.2	2.1	
EU0008	3791	25.6	15.4	0.1	2.5	1507	14.0	9.5	0.0	2.4	
EU0021	1900	23.6	13.7	0.2	2.9	6893	11.2	7.4	0.0	2.3	
EU0022	2749	23.5	12.4	0.1	2.7	8688	10.3	7.0	-0.2	2.3	
EU0032	414	20.1	14.4	0.2	3.0	1057	8.8	6.1	0.1	2.2	
EU0034	533	17.5	13.7	0.0	2.1	1390	8.1	5.2	0.0	2.2	
EU0041	1953	24.9	13.2	0.3	2.5	19753	13.3	10.0	0.0	2.6	
EU0043	1545	26.5	15.2	0.3	2.8	20581	13.5	10.3	0.0	2.5	
EU0045	7581	22.9	14.4	0.0	2.2	3503	9.9	8.0	0.0	1.9	
EU0047	1790	26.5	14.2	0.1	3.7	21093	13.6	9.8	0.0	2.6	
EU0049						3552	16.1	10.7	0.0	2.8	
EU0050	550	21.7	13.5	0.3	2.6	10561	12.7	8.4	0.1	2.7	
EU0051	1718	26.6	13.0	0.0	3.0	4841	10.1	7.3	0.0	2.6	
EU0052	353	23.3	12.7	0.2	3.9	8135	13.7	8.9	0.0	2.9	
EU0054	1814	25.7	14.4	0.1	3.0	4898	10.3	7.3	0.1	2.6	
EU0055						9910	16.9	12.6	0.0	3.0	
EU0059	802	23.9	13.1	0.2	3.1	15087	12.6	8.5	0.2	2.9	
EU0060	5754	22.2	15.1	0.0	2.4	2359	7.5	6.1	-0.1	2.3	
EU0061	351	25.5	14.3	0.3	2.7	6749	12.7	8.8	0.0	2.8	
EU0072	1189	27.0	14.7	0.1	2.6	2784	9.8	6.5	-0.1	2.4	
EU0081	2812	24.8	13.6	0.1	2.7	9238	10.6	7.0	-0.1	2.2	
EU0082						9166	16.5	11.6	-0.2	2.8	
EU0088	2177	25.8	14.7	0.1	2.9	9900	10.6	7.1	-0.1	2.5	
EU0106	1238	23.9	13.2	0.1	2.8	22109	13.3	9.9	-0.1	2.8	
EU0109	2791	24.9	13.7	0.1	2.5	8802	10.2	6.9	-0.1	2.3	
EU0123	4591	19.9	13.7	0.0	2.4	2208	12.8	8.7	-0.1	2.2	
EU0124						8597	17.7	12.2	-0.1	3.0	
EU0154	1292	25.3	13.9	0.2	2.8	21033	13.5	9.4	0.0	2.7	
EU0158	1368	25.0	13.0	0.2	3.1	22067	12.8	9.3	0.1	2.5	
EU0167	1140	27.2	14.2	0.3	2.7	18230	13.1	9.3	0.1	2.4	
EU0185	1196	25.8	13.5	0.2	2.8	21106	13.3	9.5	0.0	2.5	
EU0204	2831	27.3	13.8	0.2	2.9	7216	10.4	6.9	0.0	2.3	
EU0209	201	22.5	11.2	0.1	2.9	779	7.9	4.5	-0.2	1.8	
EU0234						6269	16.5	11.2	0.0	2.8	
EU0249	2306	27.0	14.6	0.1	2.8	7189	10.4	7.0	0.0	2.4	
EU0254	4988	28.6	16.4	0.0	2.7	3893	10.1	7.6	-0.1	2.2	
EU0263	4390	29.7	16.0	0.1	2.8	3044	11.2	8.7	-0.2	2.3	
EU0299						6979	17.7	12.7	-0.2	2.9	

2001-I FF	Wind Speed Cruise level in m/s					Wind Speed Ascent & Descent in m/s					
	AIRCRAFT	Number of Reports	Observed		Obs-backgrnd		Number of Reports	Observed		Obs-backgrnd	
			Mean	SD	Mean	SD		Mean	SD	Mean	SD
EU0301	733	26.3	12.6	0.1	2.6	11091	13.2	9.5	0.0	2.7	
EU0303	1091	25.9	13.7	0.1	2.9	21892	13.7	10.1	0.0	2.8	
EU0307	1250	26.5	13.6	0.2	3.0	21342	14.1	10.0	0.0	2.9	
EU0311	905	28.7	15.4	0.4	3.4	17250	13.1	9.8	0.0	2.5	
EU0313	917	26.3	15.1	0.0	2.9	16373	13.3	9.5	0.1	2.5	
EU0316	1636	26.0	13.5	0.3	2.8	21167	13.6	10.4	0.1	2.6	
EU0319	936	24.7	13.5	0.2	2.7	16889	14.1	10.1	-0.1	2.6	
EU0324	2179	25.7	12.9	0.1	2.7	1923	10.2	7.1	0.4	2.6	
EU0332	5067	29.0	16.8	0.0	3.1	3756	10.9	8.2	-0.2	2.4	
EU0359	923	25.6	14.7	0.2	2.7	16241	13.6	9.7	0.0	2.6	
EU0367						8346	16.6	11.2	0.0	2.8	
EU0372	3361	28.5	16.1	0.1	2.8	2466	10.8	7.6	0.0	2.4	
EU0432						10302	16.5	11.6	-0.2	2.8	
EU0456	436	23.8	13.8	0.1	3.0	17594	14.5	9.6	0.2	2.4	
EU0457	3136	25.4	13.2	0.1	2.4	1116	5.8	3.0	0.0	1.8	
EU0458	595	23.9	14.5	-0.6	3.9	20156	14.6	9.6	0.2	2.5	
EU0475	1452	26.2	12.2	0.2	2.7	1734	9.7	7.3	0.3	2.3	
EU0476	652	25.1	14.7	0.1	2.9	21635	13.8	9.7	0.2	2.5	
EU0482	4835	28.9	16.1	0.1	2.7	3465	10.3	7.7	-0.2	2.3	
EU0498	409	14.7	9.3	0.0	3.5	1485	8.2	5.1	0.0	2.6	
EU0568						9299	16.9	11.9	-0.1	2.7	
EU0592	1437	26.4	14.5	0.2	3.1	3875	10.7	7.0	0.1	2.4	
EU0689	793	19.3	13.5	0.1	2.9	1940	8.4	5.6	0.0	2.5	
EU0711	742	25.3	15.0	0.0	3.0	25992	14.0	10.3	0.2	2.6	
EU0802	1212	26.3	14.7	0.2	2.9	20283	13.8	9.9	0.1	2.5	
EU0807	2985	27.8	14.8	-0.1	2.9	4958	10.8	7.6	0.0	2.6	
EU0826						8812	16.9	11.9	-0.2	2.8	
EU0875	1182	26.7	13.3	0.3	3.0	21575	13.8	9.8	0.1	2.5	
EU0921	886	27.5	13.3	0.2	3.0	13928	13.9	10.1	-0.1	3.0	
EU0934	7657	24.0	14.3	0.1	2.3	3345	10.8	8.5	0.0	2.2	
EU0947	6187	24.7	14.9	0.1	2.3	3408	8.9	7.2	0.0	2.2	
EU0961	6804	23.5	14.9	0.1	2.5	3195	11.0	8.5	0.0	2.2	
EU0985	6794	23.4	14.7	0.0	2.2	2176	12.3	8.4	-0.1	2.0	
EU1001						3517	19.6	13.1	-0.1	3.1	
EU1002	7219	20.8	13.1	0.0	2.2	2511	11.0	7.8	0.0	2.2	
EU1050						1375	13.7	9.7	0.2	2.2	
EU1222	7620	22.5	14.4	-0.1	2.4	2953	13.1	9.3	0.0	2.2	
EU1234	1262	25.1	14.5	0.0	3.0	23417	13.4	10.1	0.0	2.7	
EU1275	3170	26.7	14.2	0.0	2.4	1034	6.7	4.7	0.0	2.2	
EU1282	2048	24.2	14.6	0.0	2.5	717	10.9	7.4	0.2	2.6	
EU1301	1242	21.8	14.5	0.0	2.4	1170	6.9	4.7			

2001-I FF	Wind Speed Cruise level in m/s					Wind Speed Ascent & Descent in m/s					
	AIRCRAFT	Number of Reports	Observed		Obs-backgrnd		Number of Reports	Observed		Obs-backgrnd	
			Mean	SD	Mean	SD		Mean	SD	Mean	SD
EU1312	3018	28.2	16.1	0.1	2.7	1418	7.2	5.3	0.0	2.1	
EU1334	4009	21.4	14.6	0.1	2.4	1245	9.5	7.1	0.0	2.7	
EU1345	68	17.2	13.1	-0.2	2.7						
EU1367	2327	23.0	15.4	0.0	2.5	738	9.6	8.2	0.1	2.4	
EU1389	4884	21.0	13.6	0.0	2.5	976	9.6	6.6	-0.1	2.4	
EU1411	3168	22.8	14.8	0.1	2.3	893	8.4	7.3	0.1	2.5	
EU1436	1590	21.6	13.5	0.2	2.3	279	5.9	3.7	0.1	2.0	
EU1456						10762	20.9	13.0	0.1	3.0	
EU1495	7140	21.8	14.7	0.0	2.4	2860	12.8	9.2	0.0	2.2	
EU1532						9207	16.0	11.0	-0.1	2.8	
EU1541	4453	22.6	15.3	0.1	2.5	1589	6.0	4.3	0.0	2.9	
EU1547	1268	26.2	14.7	0.2	2.9	19524	13.8	10.1	0.0	2.7	
EU1567						9108	16.6	11.6	-0.1	2.8	
EU1593	6301	24.5	15.0	0.1	2.5	2858	11.5	7.7	0.0	2.4	
EU1692	545	25.3	14.6	0.4	3.0	1483	8.6	5.7	0.1	2.4	
EU1698						9109	17.3	12.0	-0.1	2.7	
EU1795	5726	20.6	14.0	0.1	2.6	1361	6.6	4.4	0.0	2.3	
EU1863	1385	26.0	15.2	0.2	2.9	21483	13.8	9.8	-0.1	2.7	
EU1929	2039	23.2	15.1	0.2	2.4	251	7.6	4.6	0.0	1.3	
EU2001						837	25.0	16.6	0.9	5.2	
EU2002						917	27.6	18.8	0.5	3.7	
EU2003						784	30.4	20.6	-0.2	3.8	
EU2004						761	25.3	19.9	1.3	5.2	
EU2006						934	26.9	15.3	0.3	3.7	
EU2007						699	20.2	14.5	-0.4	2.6	
EU2008						647	24.1	15.7	-0.2	3.6	
EU2009						620	21.4	16.9	0.1	3.5	
EU2010						514	22.2	14.8	-0.2	3.4	
EU2011						383	24.8	18.6	0.1	4.0	
EU2012						636	20.5	14.5	-0.4	2.8	
EU2013						531	25.0	19.0	1.1	5.5	
EU2014						769	25.5	18.6	0.4	3.1	
EU2015						857	29.1	19.1	-0.5	4.2	
EU2016						871	24.1	16.4	-0.5	2.8	
EU2043	1545	24.0	14.8	0.0	2.4	268	5.6	3.9	0.1	2.0	
EU2123	1860	23.1	14.3	0.1	2.5	455	9.7	6.4	-0.1	2.4	
EU2189	1034	26.5	13.6	0.3	3.0	20881	13.0	9.8	0.0	2.7	
EU2301	1104	24.2	13.7	0.3	2.7	14183	13.4	9.9	0.0	2.4	
EU2389	1062	23.7	13.7	0.2	3.0	7908	10.4	6.8	-0.1	2.5	
EU2547	5341	23.5	14.1	0.1	2.3	2753	9.1	6.8	0.1	2.0	
EU2559	948	23.4	14.1	0.3	2.7	19832	14.5	10.8	-0.1	2.7	

2001-I FF	Wind Speed Cruise level in m/s					Wind Speed Ascent & Descent in m/s					
	AIRCRAFT	Number of Reports	Observed		Obs-backgrnd		Number of Reports	Observed		Obs-backgrnd	
			Mean	SD	Mean	SD		Mean	SD	Mean	SD
EU2590	829	18.6	12.1	0.2	2.7	9024	10.8	9.1	-0.1	2.9	
EU2618	484	17.2	12.6	0.1	2.7	7852	10.2	8.1	-0.1	2.7	
EU2630	294	16.6	9.7	-0.1	2.1	1087	9.7	7.2	0.0	2.4	
EU2751	5038	20.6	14.0	0.0	2.2	1460	5.8	3.4			
EU2773	2658	21.3	14.9	0.1	2.7	1051	5.5	3.4	0.0	2.2	
EU2845	2288	27.0	15.4	0.2	2.9	5834	10.3	7.3	0.0	2.5	
EU2984	566	23.5	12.7	0.3	2.4	2735	11.8	8.8	0.1	2.5	
EU3000	1239	25.4	13.5	0.2	3.0	20259	13.7	10.1	0.1	2.7	
EU3181	5155	20.2	13.5	0.1	2.3	1489	6.0	3.8	0.0	2.2	
EU3257	979	26.8	14.5	0.1	3.2	15450	13.3	9.7	0.0	2.8	
EU3268	460	21.8	11.7	0.1	2.6	1549	12.5	9.6	-0.2	2.8	
EU3321	906	18.5	10.5	0.3	2.2	3694	11.5	8.4	-0.1	2.5	
EU3421	1425	27.3	13.1	0.2	3.6	20839	14.1	10.5	-0.2	2.7	
EU3544	85	27.6	17.4	0.1	2.6	1364	19.8	15.2	5.3	13.8	
EU3598	597	27.5	14.1	0.2	2.6	2347	15.3	12.1	0.4	2.8	
EU3654	777	18.4	13.1	0.4	2.8	6431	11.2	8.4	0.1	2.8	
EU3684	847	20.9	10.5	0.3	2.5	3797	12.1	9.2	0.0	2.5	
EU3725	4197	21.5	14.7	0.1	2.3	1920	5.3	3.5	0.0	2.2	
EU3781	1649	23.9	15.5	0.1	3.2	977	7.5	4.9	-0.1	2.3	
EU3803	1550	23.3	13.5	0.0	1.9	1025	7.5	4.3			
EU3859	1672	25.1	14.2	0.0	2.5	330	11.0	7.9	-0.2	2.3	
EU3874	5664	19.2	13.2	0.0	2.5	1915	6.4	4.9	0.0	2.2	
EU3908	748	18.4	11.9	0.0	2.7	8354	10.5	8.4	-0.2	2.8	
EU4002	769	22.4	10.8	0.2	2.4	2894	13.5	11.0	-0.3	2.8	
EU4333	822	17.2	11.2	0.2	2.7	9847	11.0	8.9	0.0	2.8	
EU4426	1267	26.5	15.5	0.3	3.0	7660	11.0	7.0	-0.2	2.3	
EU4444	835	16.3	13.1	0.0	2.6	6302	11.3	8.5	0.0	2.6	
EU4519	812	17.1	11.4	-0.2	2.2	7650	10.9	8.0	0.1	2.5	
EU4527	59	20.7	10.7	0.5	3.8	4091	15.9	9.8	0.3	2.5	
EU4529	2450	25.9	14.1	0.3	2.9	6800	9.8	6.6	-0.1	2.5	
EU4532	246	19.0	13.2	0.2	2.6	13852	14.5	10.7	0.3	2.4	
EU4573	804	16.5	9.6	0.1	2.1	10412	10.3	8.1	0.0	2.7	
EU4582	722	21.3	12.5	0.2	2.6	6478	11.5	9.4	-0.1	3.0	
EU4587	1908	27.5	15.0	0.5	3.0	3486	10.8	7.5	0.0	2.6	
EU4593	428	24.7	15.8	0.4	2.6	3517	15.0	10.8	0.0	2.7	
EU4607	982	16.6	10.9	0.1	2.6	6296	10.4	8.0	0.0	2.5	
EU4699	968	17.9	12.8	-0.1	2.3	6571	11.5	9.0	0.0	2.5	
EU4721	896	19.1	10.9	-0.2	2.4	3562	10.5	7.6	0.0	2.5	
EU4792	418	20.6	12.5	0.1	2.3	1452	11.8	10.3	-0.1	2.6	
EU4853	645	17.0	12.0	0.0	2.3	5552	10.4	7.7	0.0	2.5	
EU4865	1078	18.3	12.3	-0.1	2.2	7450	10.8	7.8	0.0	2.5	

2001-I FF	Wind Speed Cruise level in m/s					Wind Speed Ascent & Descent in m/s					
	AIRCRAFT	Number of Reports	Observed		Obs-backgrnd		Number of Reports	Observed		Obs-backgrnd	
			Mean	SD	Mean	SD		Mean	SD	Mean	SD
EU4896	42	37.3	11.9	-0.3	1.5	27	6.0	3.1	-0.3	2.3	
EU4950	519	22.2	14.2	0.0	2.3	2031	12.2	9.8	-0.4	2.6	
EU5182	48	16.2	8.6	-0.2	2.3	66	6.9	4.8	0.2	1.9	
EU5191	96	11.0	6.2			163	9.1	5.5	0.1	1.7	
EU5218	1334	26.2	14.3	0.2	2.9	8670	10.4	6.9	-0.2	2.4	
EU5331	268	25.3	10.7	-0.1	2.6	2542	14.9	9.6	-0.1	2.8	
EU5351	278	30.7	15.9	0.2	3.1	4375	15.4	10.1	-0.1	2.7	
EU5435	132	28.1	16.6	0.4	2.9	2162	12.2	7.6	0.0	2.4	
EU5441	742	21.8	9.9	0.1	2.2	2594	12.1	8.9	0.0	2.7	
EU5478	916	16.8	12.2	0.1	2.3	9238	10.7	9.0	0.1	2.7	
EU5529	837	15.7	10.6	0.2	2.1	9395	10.7	9.0	0.0	2.7	
EU5591	1217	24.3	13.7	0.3	3.1	7539	11.6	7.4	-0.1	2.5	
EU5612	940	17.8	13.2	0.3	2.3	6426	10.7	8.1	0.0	2.5	
EU5777	954	20.5	14.0	-0.2	2.3	7159	12.0	9.2	-0.2	2.6	
EU5802	1093	18.6	13.8	0.1	2.5	7749	10.9	8.1	0.1	2.5	
EU5821	1073	17.8	13.3	0.1	2.3	6835	10.4	8.1	0.1	2.4	
EU6264	891	18.5	11.5	0.1	2.8	7708	11.2	7.9	0.1	2.7	
EU6281	825	18.2	12.0	0.0	2.5	7341	10.8	8.0	0.0	2.5	
EU6349	1160	21.2	9.3	0.0	2.7	3332	13.2	10.6	-0.2	2.8	
EU6444	686	20.9	12.1	0.1	2.4	3203	13.4	9.1	0.1	2.7	
EU6524	1465	28.7	15.8	0.2	3.1	5428	10.0	7.1	-0.1	2.5	
EU6527	788	20.3	11.1	-0.1	2.4	3689	12.7	9.7	0.0	2.8	
EU6723	1524	25.7	14.7	0.2	3.0	3939	11.7	7.7	-0.1	2.6	
EU6821	625	22.8	15.0	0.1	2.9	1126	8.3	5.8	-0.4	2.3	
EU6890	552	23.3	14.1	0.2	2.8	2478	11.7	9.7	0.1	2.8	
EU7218	967	22.6	12.6	-0.1	2.4	3459	12.5	10.0	-0.1	2.6	
EU7629	587	19.7	11.5	0.0	2.1	2771	10.9	8.5	-0.2	2.6	
EU7643	671	20.3	11.4	-0.1	2.4	2557	11.5	8.8	-0.1	2.8	
EU7654	975	21.5	11.2	0.2	2.5	3782	12.5	9.6	-0.2	2.8	
EU7724	739	18.2	11.2	0.1	2.4	3278	11.8	9.9	-0.1	2.7	
EU7866	1319	26.5	14.7	0.4	2.9	2342	10.6	7.5	0.1	2.6	
EU7888	664	20.2	12.9	0.4	2.8	9446	11.2	9.5	0.0	2.8	
EU8520	840	22.2	11.7	0.0	2.5	2701	12.1	10.2	-0.1	2.8	
EU8969	720	20.4	11.9	-0.1	2.5	2795	12.0	9.6	-0.1	2.8	
EU9145	895	20.9	10.9	0.1	2.6	3057	11.3	8.6	0.0	2.8	
EU9158	726	16.1	10.8	0.2	2.5	8173	10.6	8.4	-0.2	2.8	
EU9234	802	18.0	12.3	-0.3	2.8	5345	11.2	8.5	0.0	2.6	
EU9245	1076	18.3	13.0	0.0	2.4	7621	11.8	8.9	-0.1	2.6	
EU9544	1015	17.0	12.1	0.1	2.0	6633	10.9	8.1	0.0	2.5	
EU9680	705	22.8	13.2	0.1	2.5	2883	12.1	10.3	0.0	2.6	
EU9729	123	21.5	10.0	0.1	2.3	592	8.8	7.1	0.3	2.3	

c) Table 6, *Wind direction (deg)*

2001-I DD	Wind Direction Cruise level in degrees					Wind Direction Ascent & Descent in degrees					
	AIRCRAFT	Number of Reports	Observed		Obs-backgrnd		Number of Reports	Observed		Obs-backgrnd	
			Mean	SD	Mean	SD		Mean	SD	Mean	SD
EU0002						9936			12	20	
EU0003	3635			4	10	1461			7	21	
EU0008	3791			5	9	1507			7	20	
EU0021	1900			7	11	6893			15	23	
EU0022	2749			6	9	8688			15	23	
EU0032	414			1	7	1057			9	27	
EU0034	533			1	10	1390			9	24	
EU0041	1953			6	8	19753			14	21	
EU0043	1545			6	9	20581			14	21	
EU0045	7581			4	12	3503			6	19	
EU0047	1790			7	12	21093			13	19	
EU0049						3552			12	20	
EU0050	550			9	13	10561			14	19	
EU0051	1718			6	7	4841			16	25	
EU0052	353			9	12	8135			14	19	
EU0054	1814			7	13	4898			16	23	
EU0055						9910			12	22	
EU0059	802			9	15	15087			19	27	
EU0060	5754			3	11	2359			4	25	
EU0061	351			7	10	6749			16	22	
EU0072	1189			6	11	2784			15	22	
EU0081	2812			7	10	9238			14	22	
EU0082						9166			11	19	
EU0088	2177			7	10	9900			15	22	
EU0106	1238			7	9	22109			15	22	
EU0109	2791			6	10	8802			16	24	
EU0123	4591			7	14	2208			9	19	
EU0124						8597			11	19	
EU0154	1292			8	14	21033			15	21	
EU0158	1368			7	10	22067			15	22	
EU0167	1140			6	10	18230			13	20	
EU0185	1196			6	10	21106			14	21	
EU0204	2831			6	10	7216			15	25	
EU0209	201			2	16	779			8	20	
EU0234						6269			11	19	
EU0249	2306			7	11	7189			16	26	
EU0254	4988			5	10	3893			7	25	
EU0263	4390			5	9	3044			8	22	
EU0299						6979			13	21	
EU0301	733			6	12	11091			15	25	

2001-I DD	Wind Direction Cruise level in degrees					Wind Direction Ascent & Descent in degrees					
	AIRCRAFT	Number of Reports	Observed		Obs-backgrnd		Number of Reports	Observed		Obs-backgrnd	
			Mean	SD	Mean	SD		Mean	SD	Mean	SD
EU0303	1091			7	13	21892			15	22	
EU0307	1250			7	12	21342			15	23	
EU0311	905			7	14	17250			14	21	
EU0313	917			7	11	16373			13	18	
EU0316	1636			6	10	21167			15	21	
EU0319	936			6	9	16889			13	19	
EU0324	2179			8	13	1923			18	27	
EU0332	5067			5	11	3756			7	20	
EU0359	923			7	10	16241			14	21	
EU0367						8346			11	19	
EU0372	3361			5	8	2466			8	26	
EU0432						10302			12	20	
EU0456	436			8	16	17594			11	17	
EU0457	3136			4	11	1116			1	21	
EU0458	595			10	24	20156			12	17	
EU0475	1452			6	8	1734			17	28	
EU0476	652			8	15	21635			12	18	
EU0482	4835			5	11	3465			7	20	
EU0498	409			1	11	1485			13	24	
EU0568						9299			11	18	
EU0592	1437			8	15	3875			14	21	
EU0689	793			1	12	1940			8	20	
EU0711	742			7	7	25992			13	20	
EU0802	1212			7	12	20283			13	18	
EU0807	2985			6	11	4958			17	27	
EU0826						8812			11	20	
EU0875	1182			6	8	21575			13	21	
EU0921	886			6	7	13928			16	22	
EU0934	7657			3	10	3345			6	17	
EU0947	6187			3	9	3408			7	22	
EU0961	6804			4	12	3195			8	22	
EU0985	6794			5	11	2176			7	19	
EU1001						3517			11	20	
EU1002	7219			5	12	2511			5	15	
EU1050						1375			13	20	
EU1222	7620			6	11	2953			9	25	
EU1234	1262			7	11	23417			14	21	
EU1275	3170			4	10	1034			3	22	
EU1282	2048			5	11	717			10	20	
EU1301	1242			1	8	1170					
EU1312	3018			2	8	1418			2	22	
EU1334	4009			3	9	1245			7	26	

2001-I DD	Wind Direction Cruise level in degrees					Wind Direction Ascent & Descent in degrees					
	AIRCRAFT	Number of Reports	Observed		Obs-backgrnd		Number of Reports	Observed		Obs-backgrnd	
			Mean	SD	Mean	SD		Mean	SD	Mean	SD
EU1345	68			11	14						
EU1367	2327			4	11	738			7	22	
EU1389	4884			4	11	976			8	16	
EU1411	3168			3	9	893			7	26	
EU1436	1590			3	9	279			5	18	
EU1456						10762			10	16	
EU1495	7140			7	13	2860			10	26	
EU1532						9207			11	20	
EU1541	4453			2	9	1589			0	15	
EU1547	1268			7	11	19524			14	20	
EU1567						9108			12	19	
EU1593	6301			4	9	2858			8	23	
EU1692	545			8	15	1483			19	30	
EU1698						9109			10	18	
EU1795	5726			2	10	1361			3	17	
EU1863	1385			7	10	21483			15	20	
EU1929	2039			3	9	251			2	41	
EU2001						837			9	11	
EU2002						917			9	11	
EU2003						784			7	10	
EU2004						761			10	16	
EU2006						934			7	10	
EU2007						699			7	9	
EU2008						647			9	11	
EU2009						620			10	16	
EU2010						514			10	12	
EU2011						383			7	8	
EU2012						636			9	13	
EU2013						531			9	12	
EU2014						769			10	13	
EU2015						857			8	11	
EU2016						871			10	14	
EU2043	1545			5	14	268			6	34	
EU2123	1860			4	10	455			12	19	
EU2189	1034			7	11	20881			16	23	
EU2301	1104			7	11	14183			14	20	
EU2389	1062			8	13	7908			16	24	
EU2547	5341			4	10	2753			7	23	
EU2559	948			7	11	19832			12	18	
EU2590	829			9	14	9024			18	28	
EU2618	484			8	10	7852			17	27	
EU2630	294			13	24	1087			16	19	

2001-I DD	Wind Direction Cruise level in degrees					Wind Direction Ascent & Descent in degrees					
	AIRCRAFT	Number of Reports	Observed		Obs-backgrnd		Number of Reports	Observed		Obs-backgrnd	
			Mean	SD	Mean	SD		Mean	SD	Mean	SD
EU2751	5038			2	7	1460					
EU2773	2658			3	10	1051			1	18	
EU2845	2288			6	10	5834			17	26	
EU2984	566			6	11	2735			15	23	
EU3000	1239			7	13	20259			15	22	
EU3181	5155			2	9	1489			1	18	
EU3257	979			7	11	15450			15	21	
EU3268	460			6	7	1549			13	19	
EU3321	906			7	10	3694			16	24	
EU3421	1425			6	9	20839			14	21	
EU3544	85			4	4	1364			22	42	
EU3598	597			6	12	2347			9	17	
EU3654	777			9	14	6431			16	22	
EU3684	847			7	8	3797			15	20	
EU3725	4197			3	12	1920			1	25	
EU3781	1649			5	12	977			4	15	
EU3803	1550			1	4	1025					
EU3859	1672			4	8	330			14	18	
EU3874	5664			2	10	1915			2	18	
EU3908	748			7	8	8354			17	28	
EU4002	769			6	7	2894			16	25	
EU4333	822			8	9	9847			17	29	
EU4426	1267			8	14	7660			15	21	
EU4444	835			9	12	6302			16	24	
EU4519	812			7	8	7650			16	23	
EU4527	59			12	18	4091			11	16	
EU4529	2450			6	10	6800			16	24	
EU4532	246			9	18	13852			12	19	
EU4573	804			11	20	10412			17	27	
EU4582	722			7	11	6478			15	26	
EU4587	1908			6	9	3486			14	21	
EU4593	428			6	7	3517			13	20	
EU4607	982			11	16	6296			16	23	
EU4699	968			8	10	6571			14	21	
EU4721	896			7	12	3562			16	24	
EU4792	418			6	6	1452			16	28	
EU4853	645			10	20	5552			18	26	
EU4865	1078			8	16	7450			14	21	
EU4896	42			0	1	27			10	70	
EU4950	519			7	9	2031			17	28	
EU5182	48			7	9	66			14	12	
EU5191	96					163			2	19	

2001-I DD	Wind Direction Cruise level in degrees					Wind Direction Ascent & Descent in degrees					
	AIRCRAFT	Number of Reports	Observed		Obs-backgrnd		Number of Reports	Observed		Obs-backgrnd	
			Mean	SD	Mean	SD		Mean	SD	Mean	SD
EU5218	1334			6	8	8670			15	22	
EU5331	268			5	5	2542			12	21	
EU5351	278			5	7	4375			11	15	
EU5435	132			7	15	2162			13	21	
EU5441	742			6	7	2594			16	24	
EU5478	916			9	12	9238			16	27	
EU5529	837			9	13	9395			15	25	
EU5591	1217			9	13	7539			16	22	
EU5612	940			9	15	6426			16	23	
EU5777	954			8	15	7159			14	22	
EU5802	1093			9	15	7749			14	20	
EU5821	1073			9	16	6835			15	22	
EU6264	891			8	9	7708			17	25	
EU6281	825			8	8	7341			17	24	
EU6349	1160			5	5	3332			15	24	
EU6444	686			7	12	3203			14	22	
EU6524	1465			6	9	5428			18	27	
EU6527	788			6	9	3689			15	22	
EU6723	1524			8	12	3939			17	27	
EU6821	625			1	8	1126			12	28	
EU6890	552			6	8	2478			18	28	
EU7218	967			6	9	3459			17	26	
EU7629	587			8	16	2771			16	26	
EU7643	671			7	13	2557			17	24	
EU7654	975			7	9	3782			15	22	
EU7724	739			8	16	3278			16	26	
EU7866	1319			7	10	2342			19	32	
EU7888	664			7	10	9446			16	26	
EU8520	840			7	12	2701			17	26	
EU8969	720			7	10	2795			18	29	
EU9145	895			6	9	3057			17	24	
EU9158	726			11	20	8173			16	25	
EU9234	802			8	11	5345			15	22	
EU9245	1076			9	15	7621			14	19	
EU9544	1015			8	11	6633			14	20	
EU9680	705			8	15	2883			15	23	
EU9729	123			5	5	592			17	24	

## Annex I. EU Amdar Observations from 29 – 31 March, 2001.

In order to have a brief impression of the distribution of the locations of observations, two maps are presented. In fig. 3 Europe is presented with all EU Amdar observations for the period 29 – 31 March 2001. Note that most data is acquired during ascending or descending (see Annex IV). In figure 4 (next page), data from the North Atlantic is displayed. AMDAR data is evaluated using HIRLAM numerical model data as background. This background reference is restricted by a limited area, as shown in fig. 4.

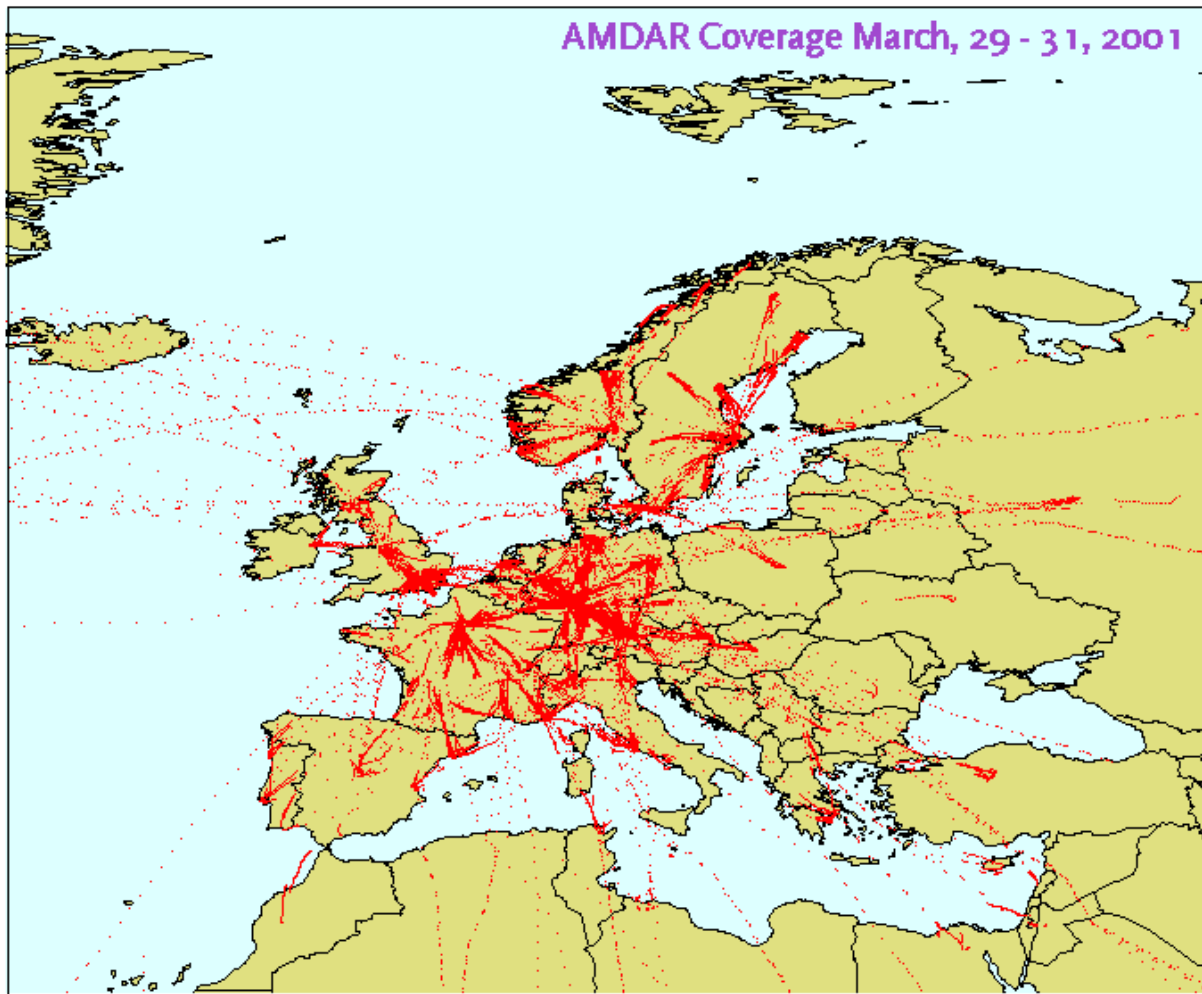


Fig. 3 All EU AMDAR observation locations, for the period 29 – 31 March 2001 and zoomed in over Europe.

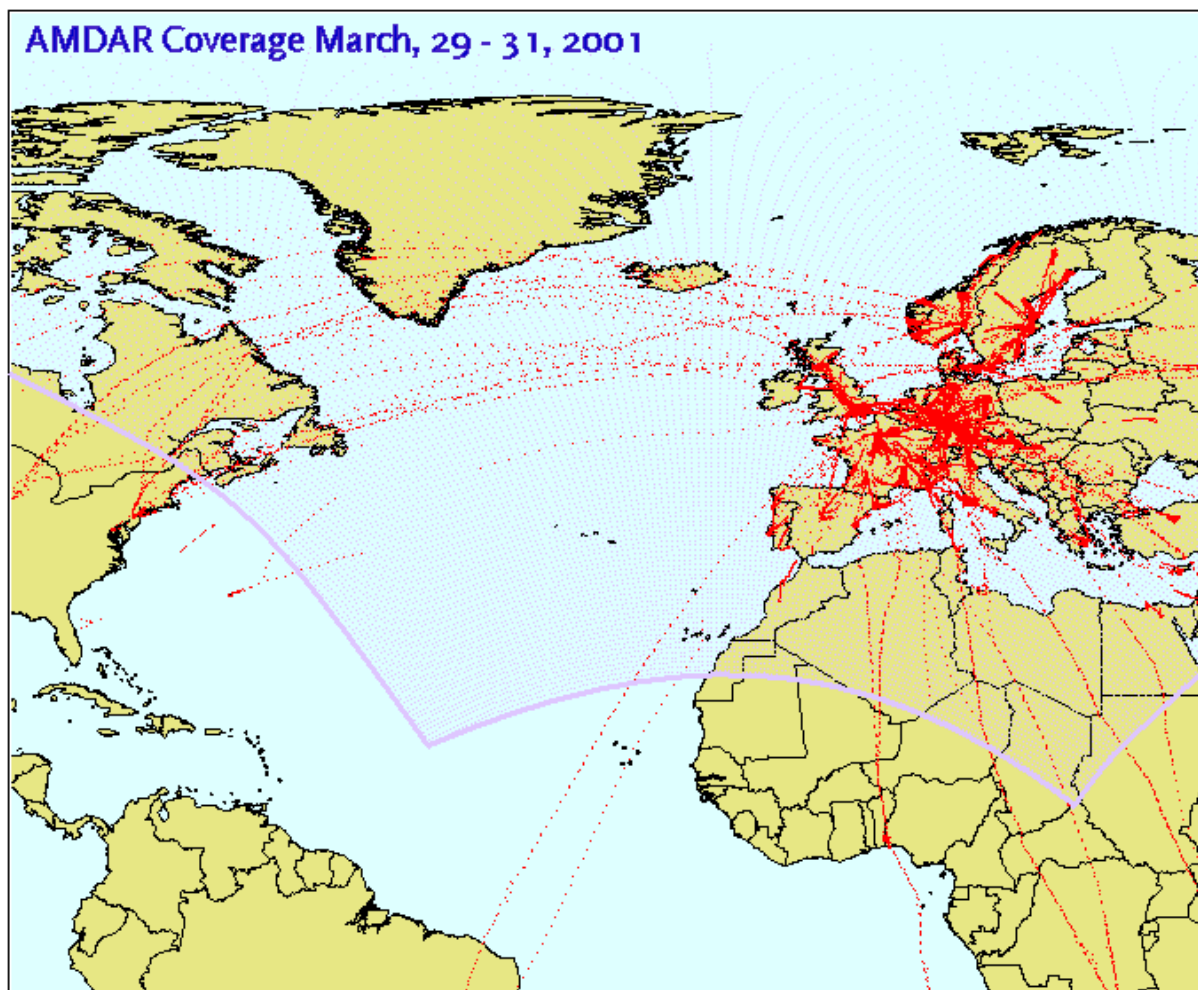


Fig. 4 All EU-AMDAR observations locations for 29 – 31 March 2001. In this figure the HIRLAM area used for the evaluation purposes is indicated ( )

**Annex II. Frequency distribution of mean temperature, mean wind speed and wind direction differences.**

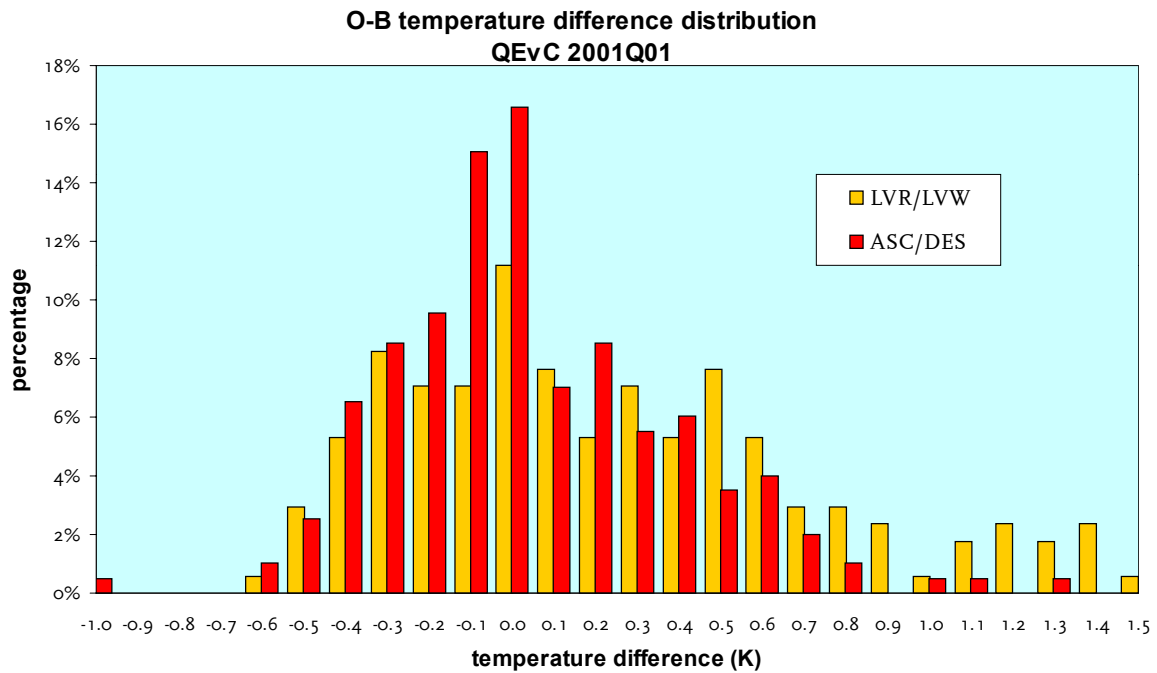


Fig. 5 Frequency distribution of the mean temperature difference (OBS–Background) for the number of aircraft reporting AMDAR reports (N=203). Distinction is made between the Flight Level (LVR/LVW) and the Ascending or Descending phase (ASC/DES). Clearly, there is no significant difference between the distributions of both phases.

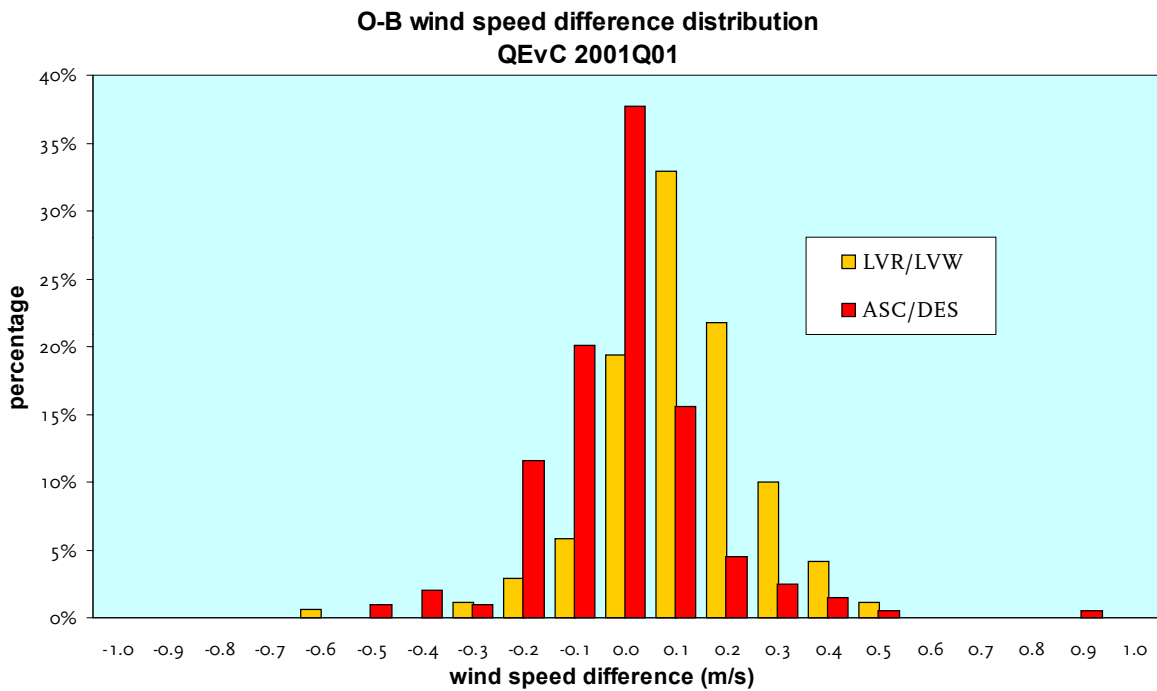


Fig. 6. Frequency distribution of the mean wind speed difference (OBS–Background) for the number of aircraft reporting AMDAR reports (N=203). Distinction is made between the Flight Level (LVR/LVW) and the Ascending or Descending phase (ASC/DES). Clearly, there is no significant difference between the distributions of both phases

O-B abs wind direction difference distribution  
QEvC 2001Q01

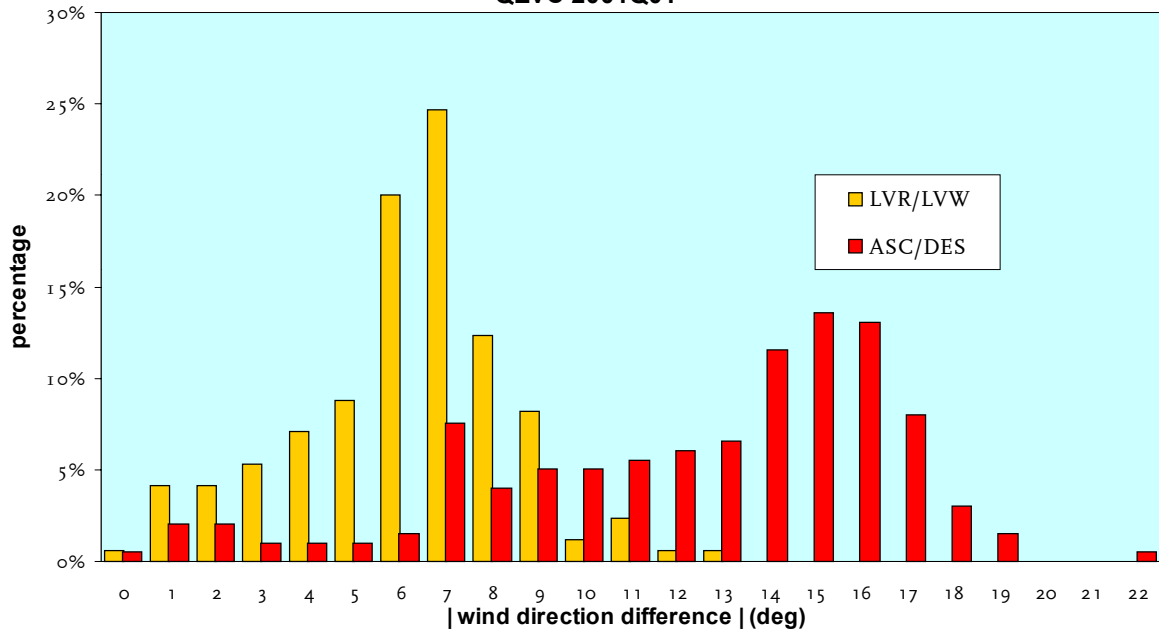


Fig. 7. Frequency distribution of the mean of the absolute wind direction difference ( $|OBS-Background|$ ) for the number of aircraft reporting AMDAR reports ( $N=203$ ). Distinction is made between the Flight Level (LVR/LVW) and the Ascending or Descending phase (ASC/DES). Clearly, in this case there is a significant difference between the distributions of both phases.

### Annex III. Wind speed observations: An analyses.

For five aircraft producing a significant number of observations during the period 29-31 March 2001, wind speed data are analysed. In figure 8 the observed wind speed is presented as function of altitude for the five aircraft. Note that these observations are made at different locations and time and therefore not correlated but give a brief impression of the wind speed as a function of altitude. The OBS-MOD wind speed differences are presented in figure 9. Clearly no significant particular difference in behaviour of any aircraft can be recognised.

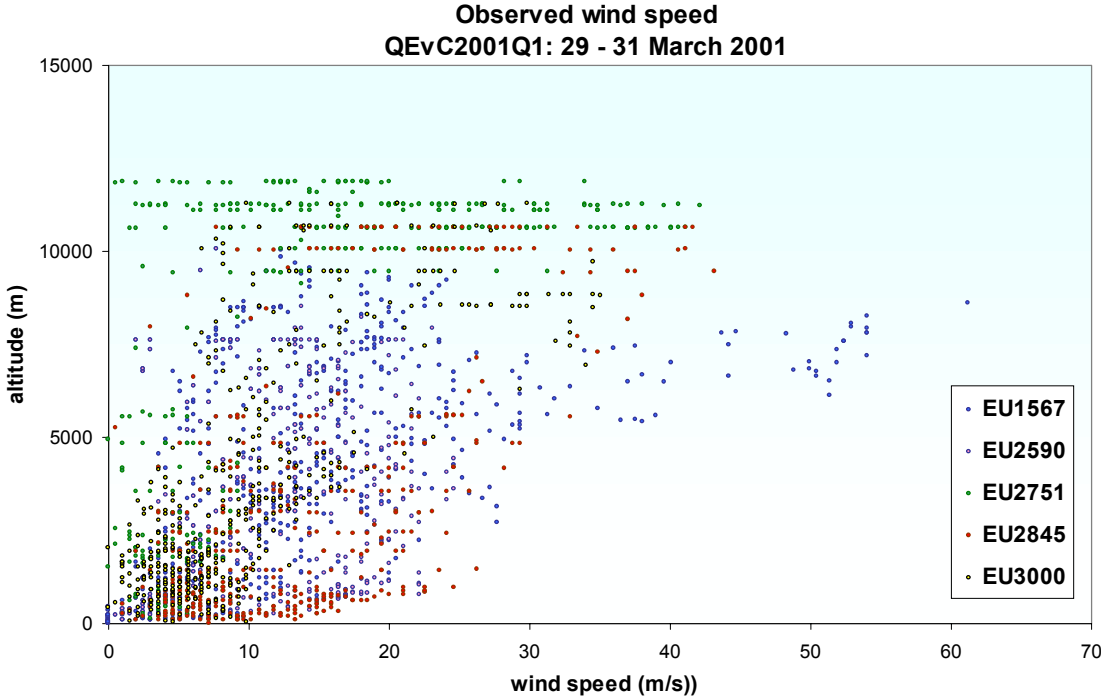


Fig. 8. Wind speed, measured during the period 29 - 31 march 2001 for the five aircraft EU1567, EU2590, EU2751, EU2845 and EU3000.

In particular the OBS-MOD wind speed differences might demonstrate significant differences. In figure 10, the OBS-MOD wind speed differences are shown as a function of altitude for the three reported phases of flight, LVR (level flight), ASC (ascending) and DES (descending). Obviously there is no significant difference in the observations for these three types of phases.

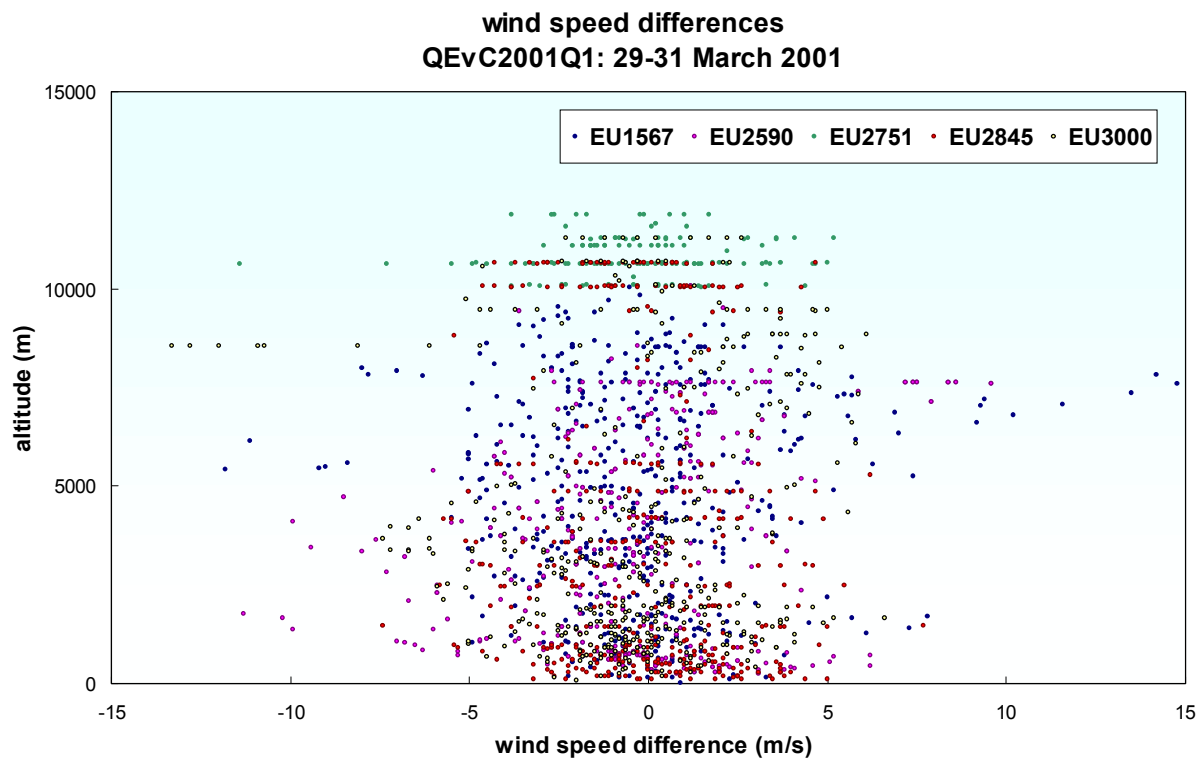


Fig. 9. OBS-MOD Wind speed differences as a function of altitude, measured during the period 29-31 March 2001 by the five aircraft EU1567, EU2590, EU2751, EU2845 and EU3000. No significant mutual difference is found.

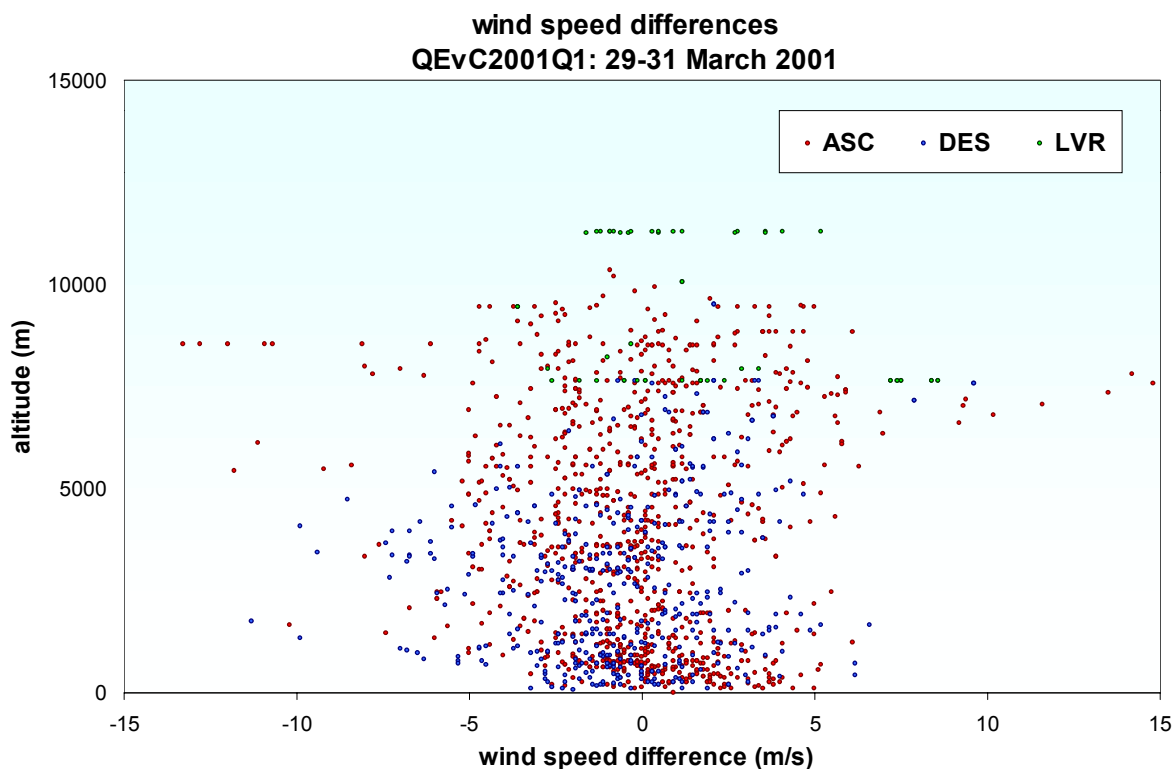


Fig. 10. OBS-MOD Wind speed differences as a function of altitude, measured during the period 29-31 March 2001 for the five aircraft together but for each phase of flight apart. No significant difference is found.

**Annex IV. Trend in the daily amount of observations.**

The number of observations, received every day can be presented as a function of time (see fig. 11). Such a figure will demonstrate the trend in this daily amount. The figure shows clearly an increase during January and a decrease end of February. Nevertheless end of March the daily number is at the same level of begin January 2001.

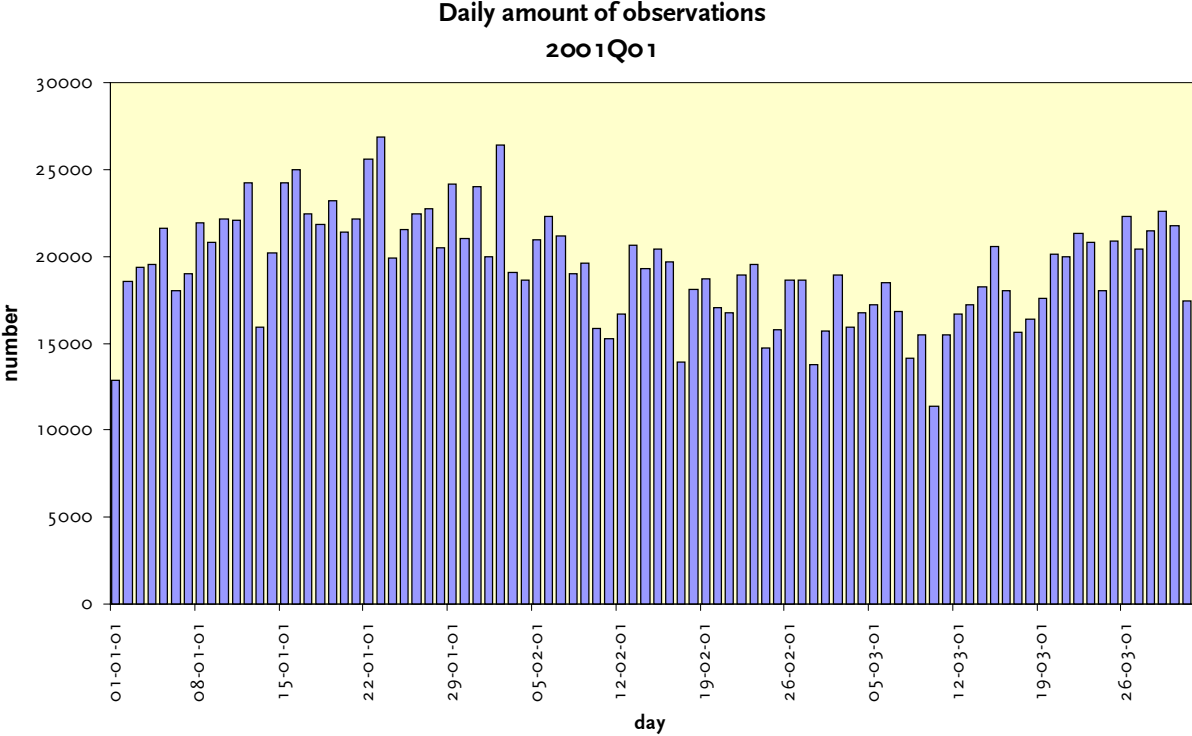


Fig. 11. The daily amount of EU-Amdar observation, recived at De Bilt. Notice the variability.

## Annex V. Observation time and altitude distribution for ASC/DES data

For the period 29-31 March 2001 all encoded bulletins with data observed during ascend and descend around London [Heathrow Airport, EGLL, City Airport, EGLC and Gatwick Airport, EGKK] (within  $50^{\circ}$ - $53^{\circ}$  N and  $3^{\circ}$  W- $3^{\circ}$  E, see fig. 12) are investigated to obtain an impression of the distribution of the observations as a function of place and time. The location of London was not chosen for any particular reason, in a future quarterly other locations will be presented as well. Figure 12 shows clearly the positions of all observations. Notice the rather raw resolution in the position of the FM42 encoded observations (resolution in latitude and longitude = 10,0 centi-degrees, *i.e.*  $NN^{\circ}06' N$ ,  $NN^{\circ}12' N$ , etc.). This issue is typical for FM42 encoded bulletins with observations in the London area. As a consequence most dots represent many observations in this figure.

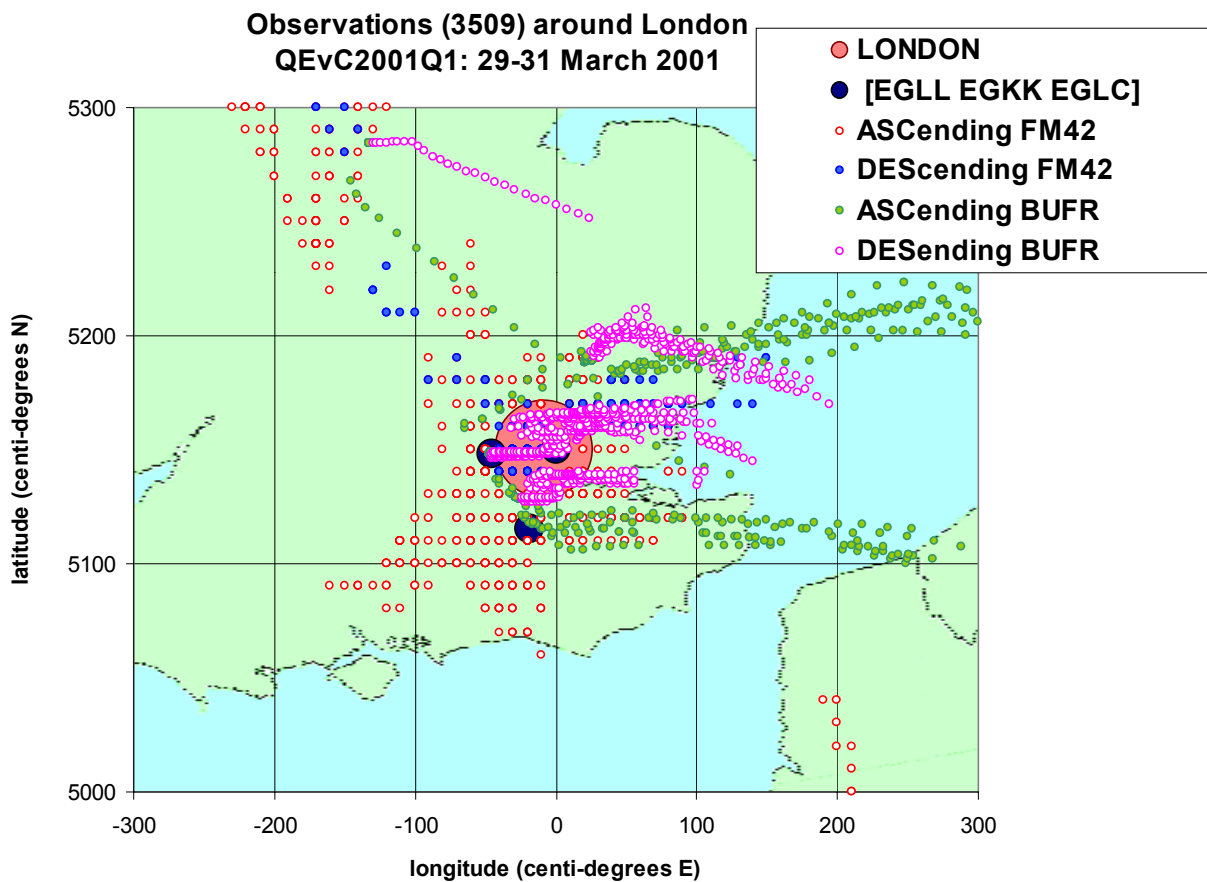


Fig. 12. Spatial distribution of FM42 and BUFR encoded data for observations during the ascending and the descending phase (period 29-31 March 2001). Latitude and longitude are in centi-degrees, *e.g.*  $4890 N = 48,90^{\circ} N = 48^{\circ}54' N$ . Notice the raw spatial resolution (10,0 centi-degrees) for the FM42 observations - typical for observations around London [EGLL, EGLC & EGKK]. Because of this the presented dots referring to FM42 represent many observation in most cases.

In the figures 13 and 14 a distribution as a function of observing time is presented. Clearly at this site all observations are from 7:30 to 21:00 UTC. Moreover the distribution of the altitude levels for descending data differs significantly from ascending data (see fig. 14).

Observations (2002 FM42) around London  
 QEvC2001Q1: 29-31 March 2001

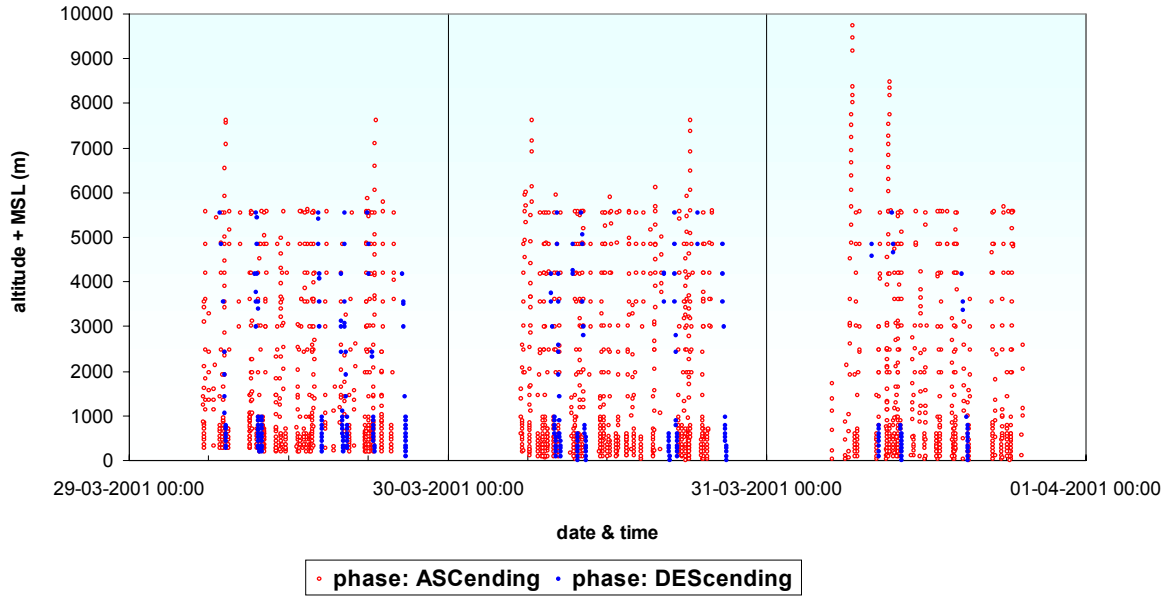


Fig. 13 Distribution of the observations over altitude and time of observation. Note the difference between ASC and DES data. Typically, all daily observations are within 5:30 and 22:30 UTC. Period: 29-31 March 2001, location: London, area: 3°W-4° E, 49°-53°N (see fig. 12)

Observations (2002 FM42) around London  
 QEvC2001Q1: 29 March 2001 6-12 UTC

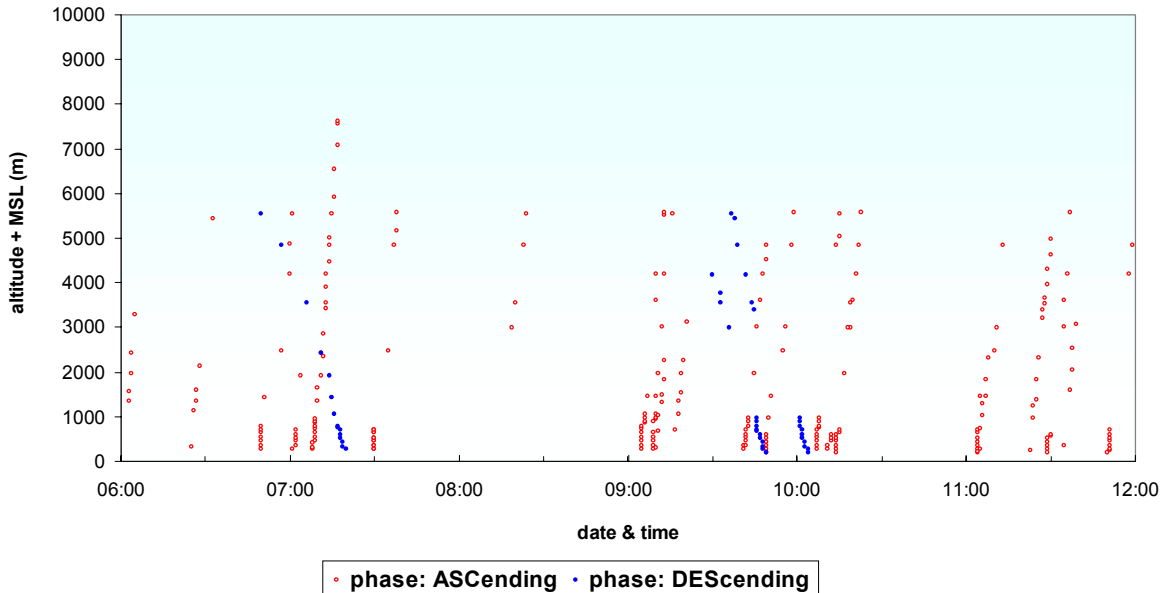


Fig. 14 The same as with fig. 13, but zoomed in on March, 29<sup>th</sup>, 6-12 UTC.