

European Centre for Medium-Range Weather Forecasts

SUMMARY REPORT ON THE MONITORING OF ASAP SHIP DATA

January-December 2013

1. Summary

In 2013, the number of ASAP reports received at ECMWF were comparable to 2012 levels despite a decrease from 31 to 26 in the number of reporting platform identifiers. A drop in numbers later in November-December was due to problems in our data processing system affecting only ASAP reports. The problem has been fixed early in 2014. Unrelated to this issue the percentage of ascents reaching the 100 hPa level was as low as around 70% in the first months of 2013.

The problem of wrongly located reports still exists (Table 1). These erroneous reports constituted approximately 0.3% of all reports. The quality of the data has continued to be good and highly valuable.

2. Data reception

Figures 1 to 3 show time series from January 1994 to December 2013 with monthly counts of ASAP reports at different levels. In previous years we have been looking at the percentage of launches reaching the lower stratosphere (100 hPa). As stated in the report from last year, the percentage decreased in 2012 and in the beginning of 2013 to the lowest values since 1994. This continued into the first months of 2013. Figure 2 shows that it was mostly observations made at 06 and 18 UTC which contributed to this drop. Table 2 and Table 3 show annual counts for each ship.

**Monthly counts of ASAP received at ECMWF
Temperature 500 hPa - GLOBAL**

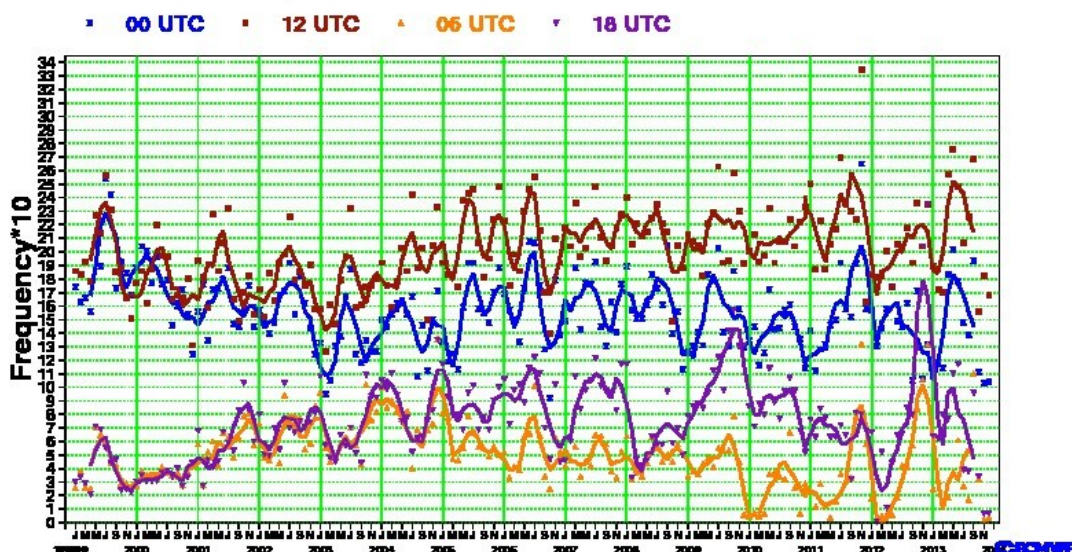


Figure 1: ASAP temperature data received at ECMWF 500 hPa (Jan 1994 to December 2013). Symbols show monthly totals and lines show moving averages.

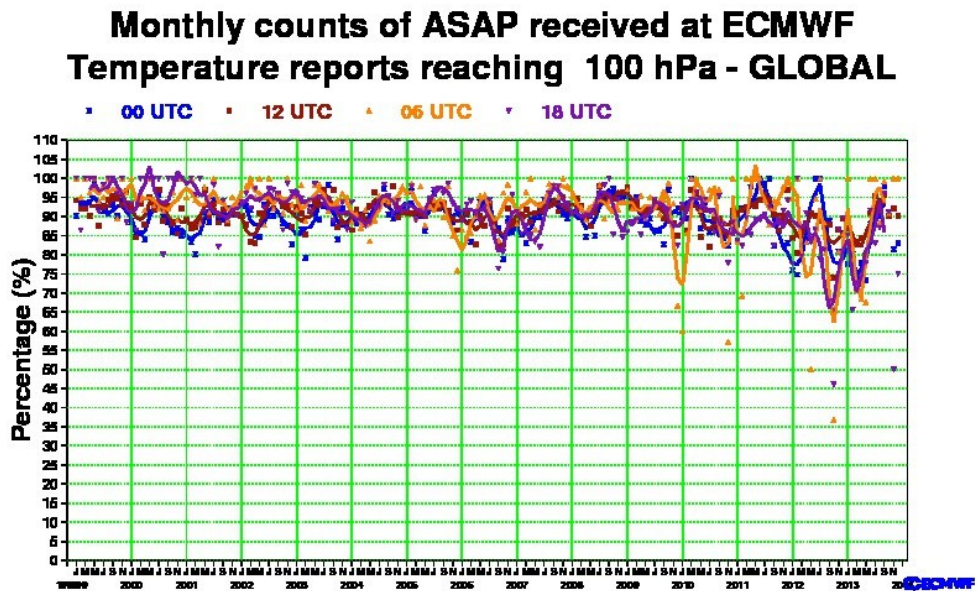


Figure 2: Percentage of ASAP reports reaching the 100 hPa level (Jan 1994 to Dec 2013). Symbols show monthly totals and lines show moving averages.

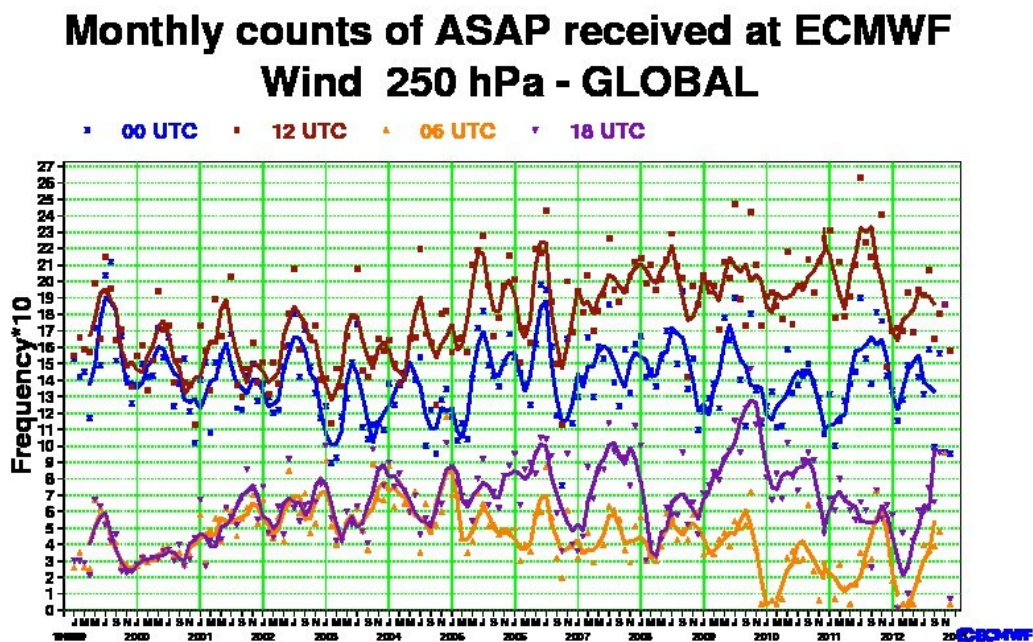


Figure 3: ASAP wind data received at ECMWF 250 hPa (Jan 1994 to December 2013). Symbols show monthly totals and lines show moving averages.

As in previous years most of the ASAP units were operating in the North Atlantic and some in the South Atlantic and Indian Ocean. We can also see in Figure 4 the Japanese ASAP operating close to Japan.

ASAP tracks 1 Jan-31 Dec 2013

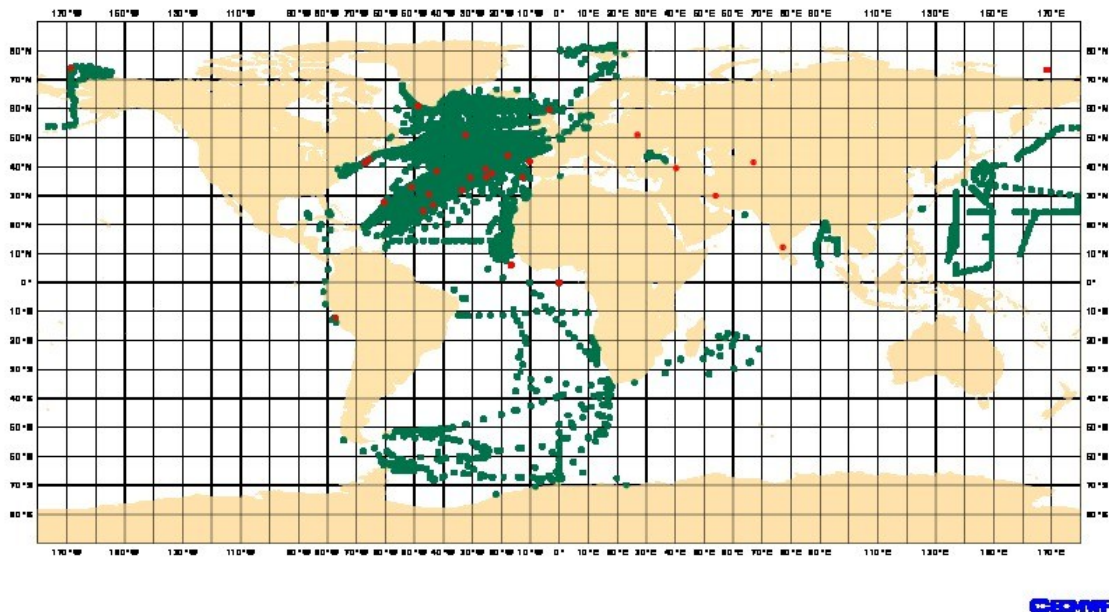


Figure 4: ASAP tracks January to December 2013

3. Troubleshooting

The main problem related to ASAP reports continue to be misplaced reports. Figure 5 shows the tracks of ASAP units with some suspect positions in January to December 2013 period. A number of misplaced reports (red dots) are evident on the chart.

Figures 6 and 7 show one of these cases. Here our tracker checks consecutive positions and derived speeds. We could see from the tracker output that the report at 1 February 2013 11UTC from ASFR3 had a stuck position. Having a look at the tephigrams plotted for this suspicious report and the consecutive one as shown in Figure 6, we can see how different both profiles are. The observation departure from model background is larger in the suspected observation (see tephigram on the right hand side). The time series shown in Figure 7 confirms the suspicious observation mentioned before and also the overall good quality of the observations from this unit.

The question is whether these platforms need to be blacklisted. To answer this we look at

monthly statistics and time series. Only when the erroneous positions are systematic we proceed to blacklist an ASAP. This was not the case, as the time series shown in Figure 7 and Figure 8 show good performance of ASFR3, and one or two isolated incidents are not enough to blacklist this unit.

We have seen several other platforms where longitude is occasionally reported with the wrong sign, hence reporting far from its actual position. Our position tracker has flagged these cases. (See Table 1 for all such cases in 2013). In such cases where an odd report had its latitude or longitude signs flipped, looking at previous/next reports in the tracker output allows us to spot the erroneous observation.

In 2013, as in previous years, we have seen a few ASAPs reporting missing values for latitude/longitude. In those cases the assimilation system assumes a position $lat=0/lon=0$. This particular position is dynamically blacklisted in the assimilation.

Table 1: Suspicious position errors. The tracker identifies suspect observations based on excessive speed (>40km/h). Manual inspection shows cases are linked to wrongly reported sign of longitude (as marked in the table).

Date	Time	Lat	Lon	Cruise Speed	
#####					
# Id no 1 ASDK1					
#####					
2013-05-02	05:00:00	57.0	10.0	7.0 km/hr	-> Wrong position/Lon sign flipped
2013-05-02	11:00:00	59.7	-3.4	139.6 km/hr	<*>
2013-05-02	23:00:00	60.8	-8.8	26.8 km/hr	
#####					
# Id no 3 ASDE1					
#####					
2013-01-06	17:00:00	40.6	-60.9	36.1 km/hr	
2013-01-06	23:00:00	41.4	-67.1	88.0 km/hr	<*> -> Wrong position?
2013-01-07	11:00:00	43.6	-64.2	28.4 km/hr	
#####					
2013-04-12	23:00:00	45.7	-56.7	28.0 km/hr	
2013-04-14	17:00:00	41.5	67.0	237.4 km/hr	<*> -> Wrong position/Lon sign flipped
2013-04-14	11:00:00	42.6	-65.5	1823.5 km/hr	<*> (See Figure 6)
2013-04-22	11:00:00	40.4	-69.3	2.1 km/hr	
#####					
# Id no 4 ASFR2					
#####					
2013-04-25	11:00:00	34.2	-29.4	38.5 km/hr	
2013-04-25	12:00:00	32.0	-33.6	461.4 km/hr	<*> -> Wrong position
2013-04-25	23:00:00	36.4	-25.2	83.1 km/hr	<*>
2013-04-26	23:00:00	40.4	-17.0	35.1 km/hr	
#####					
2013-11-14	12:00:00	36.3	-30.7	36.4 km/hr	
2013-11-14	12:00:00	36.3	-30.7	99.0 km/hr	<*>
2013-11-15	11:00:00	40.8	-22.6	37.6 km/hr	
#####					
# Id no 5 ASFR3					
#####					
2013-01-31	23:00:00	31.1	-35.8	36.9 km/hr	
2013-02-01	11:00:00	31.1	-35.8	0.0 km/hr	-> Stuck position?
2013-02-01	23:00:00	26.7	-43.5	74.6 km/hr	<*>
2013-02-02	11:00:00	24.5	-47.3	37.7 km/hr	
#####					
2013-02-26	23:00:00	35.5	-27.5	37.9 km/hr	
2013-02-27	00:00:00	37.7	-23.2	455.2 km/hr	<*> -> Wrong position
2013-02-28	23:00:00	35.5	-27.5	9.7 km/hr	-> Wrong position?
2013-03-01	11:00:00	24.7	-47.0	185.6 km/hr	<*>
2013-03-01	23:00:00	22.4	-50.8	38.7 km/hr	
2013-03-02	11:00:00	20.1	-54.7	39.9 km/hr	
#####					
# Id no 7 ASDK2					
#####					
2013-02-06	11:00:00	0.0	0.0	43.6 km/hr	-> Lat/Lon = 0/0
2013-02-07	11:00:00	6.0	-16.6	81.7 km/hr	<*>
2013-02-07	23:00:00	8.3	-18.6	28.1 km/hr	
#####					
2013-02-11	23:00:00	28.3	-15.9	22.3 km/hr	
2013-02-12	11:00:00	0.0	0.0	298.6 km/hr	<*> -> Lat/Lon = 0/0
2013-02-13	11:00:00	36.4	-12.7	177.7 km/hr	<*>
2013-02-13	23:00:00	0.0	0.0	355.3 km/hr	<*>
2013-02-14	11:00:00	41.9	-10.3	398.4 km/hr	<*> -> Lat/Lon = 0/0
2013-02-14	23:00:00	44.7	-8.8	27.8 km/hr	
#####					
2013-05-20	11:00:00	58.1	-39.2	19.8 km/hr	
2013-05-20	23:00:00	0.0	0.0	625.0 km/hr	<*> -> Lat/Lon = 0/0
2013-05-21	23:00:00	60.9	-48.6	342.5 km/hr	<*>

Continued...

```
2013-05-23 11:00:00    65.3   -53.4    15.2 km/hr

2013-06-10 11:00:00     0.0     0.0     0.0 km/hr  -> Lat/Lon = 0/0
2013-06-11 11:00:00    61.0   -48.9   343.5 km/hr <*>
2013-06-11 23:00:00    62.9   -51.0    19.8 km/hr

#####
# Id no 9 ASEU5
#####

2013-02-14 11:00:00    51.5   -24.5    19.7 km/hr
2013-02-14 23:00:00    51.0    27.0   298.7 km/hr <*>  ->Longitude sign is wrong
2013-02-15 11:00:00    50.9   -32.4   346.8 km/hr <*>
2013-02-15 23:00:00    50.0   -36.0    22.8 km/hr

#####
# Id no 10 ASDE2
#####

2013-01-07 17:00:00   -12.1   -77.2
2013-01-08 17:00:00    12.2    77.2   724.2 km/hr <*>  ->Longitude sign is wrong
2013-01-09 17:00:00   -12.2   -77.2   724.2 km/hr <*>
2013-01-10 17:00:00   -12.6   -77.8     3.3 km/hr

#####
# Id no 12 ASFR4
#####

2013-05-09 23:00:00    34.8   -38.8     0.0 km/hr
2013-05-10 11:00:00    30.5   -45.0    62.7 km/hr <*>  -> Wrong position
2013-05-10 23:00:00    28.1   -48.1    33.5 km/hr

#####
# Id no 13 ASFR1
#####

2013-06-18 11:00:00    41.6   -21.6    33.5 km/hr
2013-06-18 12:00:00    43.8   -17.7   401.8 km/hr <*>  -> Wrong position
2013-06-18 23:00:00    39.3   -25.4    73.9 km/hr
2013-06-19 11:00:00    36.9   -29.4    36.7 km/hr

#####
# Id no 20 ASEU2
#####

2013-04-22 23:00:00    23.4    64.0    18.2 km/hr  ->Longitude sign is wrong
2013-04-23 17:00:00    27.6   -60.4   694.1 km/hr <*>
2013-04-23 23:00:00    29.3   -59.4    35.5 km/hr

2013-05-12 23:00:00    42.5   -34.0    34.6 km/hr
2013-05-13 17:00:00    39.5    40.4   347.4 km/hr <*>
2013-05-13 23:00:00    38.5   -42.3  1191.2 km/hr <*>
2013-05-14 17:00:00    35.6   -48.0    33.3 km/hr

#####
# Id no 22 ASDE4
#####

2013-07-16 23:00:00    28.4   -57.5    34.5 km/hr
2013-07-17 11:00:00    30.0    54.0   902.0 km/hr <*>  ->Longitude sign is wrong
2013-07-17 23:00:00    33.0   -51.0   830.0 km/hr <*>
2013-07-18 11:00:00    35.0   -47.0    35.9 km/hr

#####
# Id no 23 JNSR
#####

2013-09-09 18:00:00    74.5  -166.9    21.1 km/hr
2013-09-10 06:00:00    73.4   168.3    64.3 km/hr <*>  ->Longitude sign is wrong
2013-09-10 00:00:00    74.0  -168.7   120.1 km/hr <*>
2013-09-10 03:00:00    73.6  -168.4    15.1 km/hr
```

ASAP tracks 1 Jan-31 Dec 2013

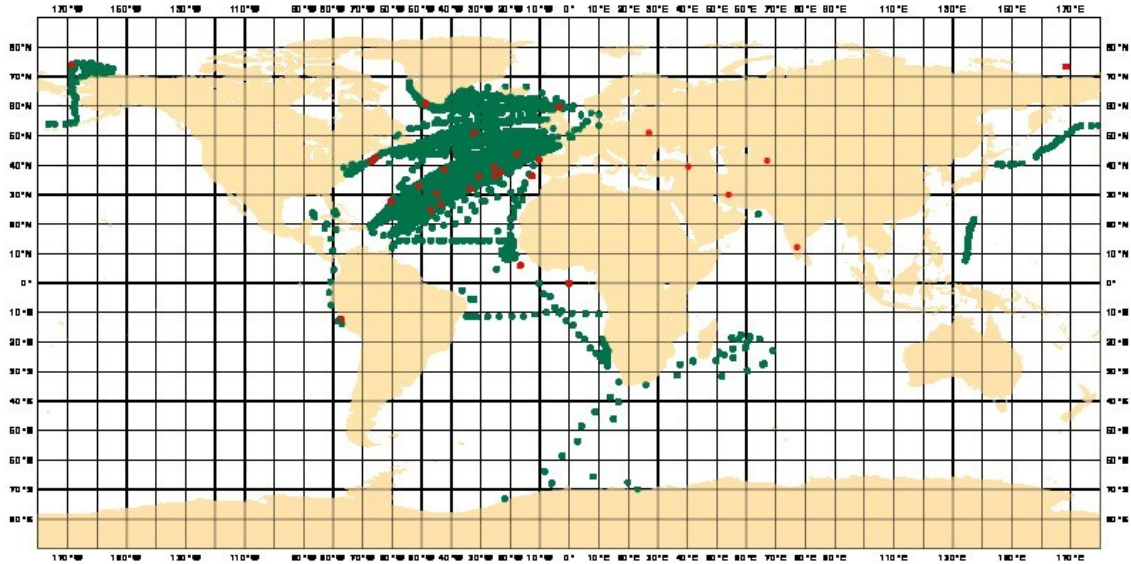


Figure 5: ASDK1, ASDE1, ASFR2, ASFR3, ASDK2, ASEU5, ASDE2, ASFR4, ASFR1, ASEU2, ASDE4 and JNSR tracks January to December 2013. Red dots show erroneous positions.

Stuck Position

```
#####
# Id no 5 ASFR3
#####
2013-01-31 23:00:00 31.1 -35.8 36.9 km/hr
2013-02-01 11:00:00 31.1 -35.8 0.0 km/hr -> Stuck position?
2013-02-01 23:00:00 26.7 -43.5 74.6 km/hr <*>
2013-02-02 11:00:00 24.5 -47.3 37.7 km/hr

2013-02-26 23:00:00 35.5 -27.5 37.9 km/hr
2013-02-27 00:00:00 37.7 -23.2 455.2 km/hr <*> -> Wrong position
2013-02-28 23:00:00 35.5 -27.5 9.7 km/hr -> Wrong position?
2013-03-01 11:00:00 24.7 -47.0 185.6 km/hr <*>
2013-03-01 23:00:00 22.4 -50.8 38.7 km/hr
2013-03-02 11:00:00 20.1 -54.7 39.9 km/hr
```

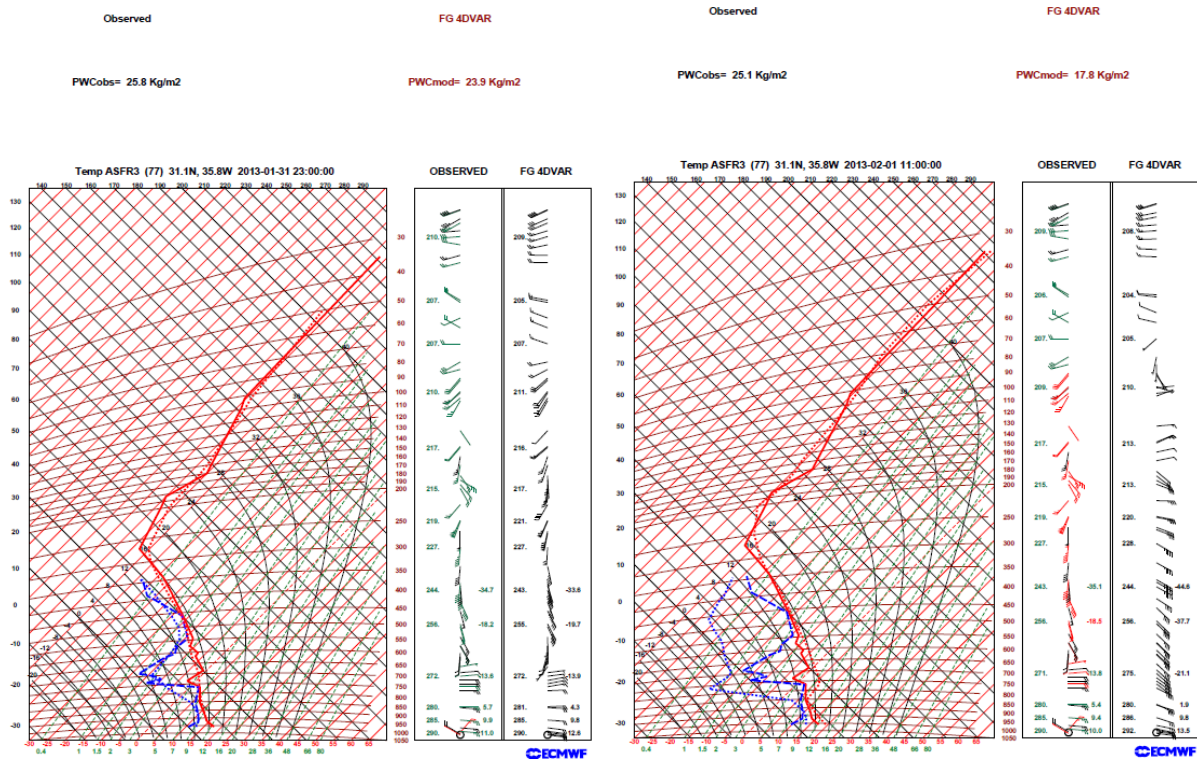


Figure 6: Tephigrams of two consecutive reports from ASFR3. Full red: Observed t, dotted red: Firs Guess (FG) t, dashed blue: Observed dew point, dotted blue: FG dew point profiles. Departures from FG are much larger in the second observation at 12UTC (right hand side) than in the first observation at 00UTC (left hand side). This comparison confirms our suspicion of position error at 2013-02-01 11:00.

Temp ASFR3 temperature 0-1030 hPa bias/std

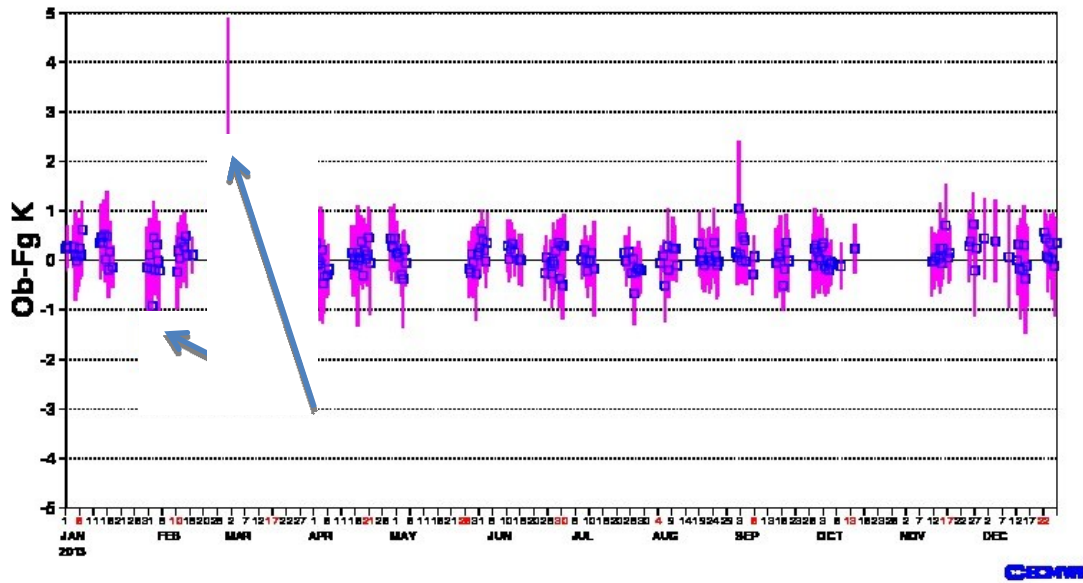
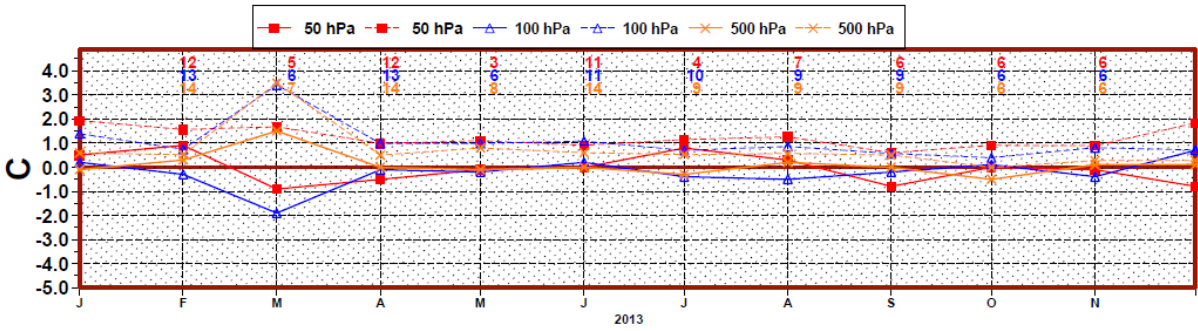


Figure 7: Time series for ASFR3: Temperature. Notice the jump in Obs-First Guess value on 1 February 2013. The positional error on 1 March 00UTC window is also noticeable as a jump in the departures.

Station ASFR3(77) (32N, 039W) Elevation: 0 m
 OBS-FG TEMPERATURE: BIAS and STD OUTC



ECMWF

Station ASFR3(77) (32N, 039W) Elevation: 0 m
 OBS-FG TEMPERATURE: BIAS and STD 12UTC

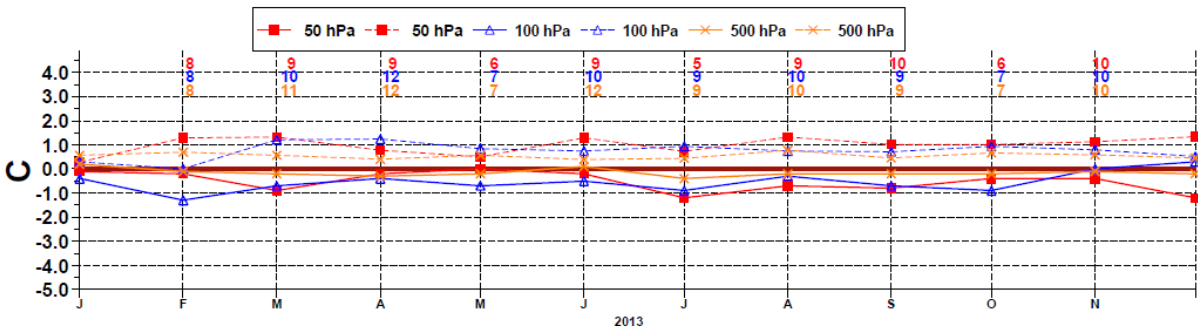


Figure 8: Time series based on monthly averages January-December 2013 for ASFR3

4. Quality Control.

We run on a monthly basis vertical statistics of all units. The results are included in the ECMWF Monthly Monitoring Report, which is freely available at the [ECMWF web site](#).

The large background error seen in Figure 9 at 20-10hPa for temperature is due to the suspect reports from platform JNSR (Figure 11).

Compared to 2012, in 2013 we see a similar standard deviation and bias curve for temperature and winds. We can see slightly more rejections at all levels. A quick look at individual platforms reveals large temperature/wind departures and rejections for platform ASDK2. (see Figures 12,13). Note that we have seen several position errors for this platform within the 2013 and these erroneous reports may have contributed to the large average departures. (Table 1).

Particular problems as those related with wrong positions are detected in the Daily Monitoring carried out by the Met Analyst on duty.

The quality of the ASAP data continues to be good and is highly valuable over the oceans where data with high quality and high vertical resolution are needed.

Figures 9 and 10 show composite vertical statistics for January to December 2013 of all ASAP data. The profiles show high quality standards fully comparable to land-based radiosondes.

Sondes AREA AVERAGE JAN - DEC 2013

00/06/12/18 UTC DATA COMBINED

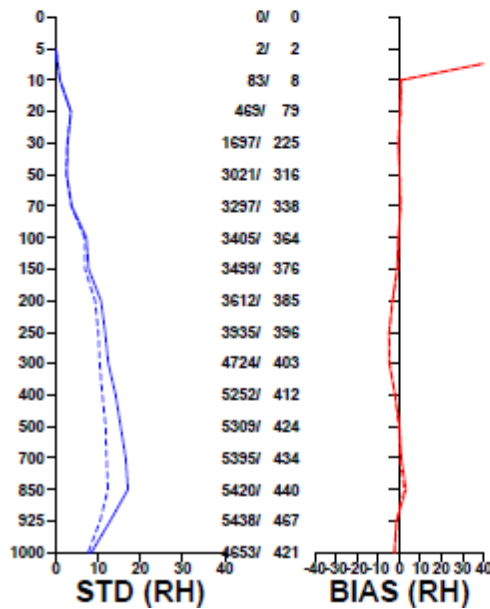
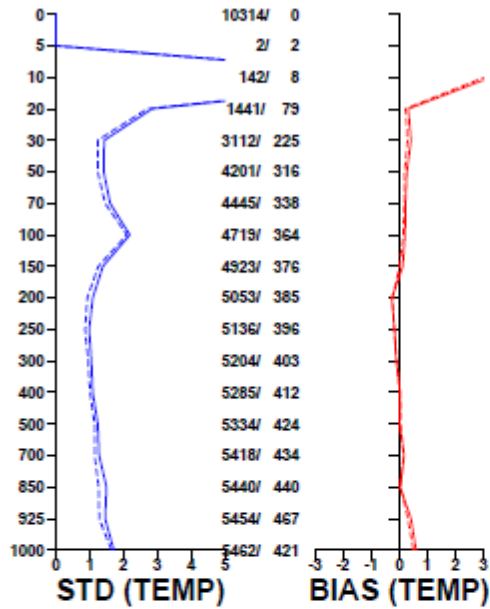


Figure 9: Vertical statistics ASAP Global (temperature and relative humidity) January to December 2013
 Solid lines : Obs-First guess (background)
 Dashed lines : Obs-Analysis
 Middle scale : Number of reports for each level/Number of rejected reports for each level

**Sondes AREA AVERAGE
JAN - DEC 2013**

00/06/12/18 UTC DATA COMBINED

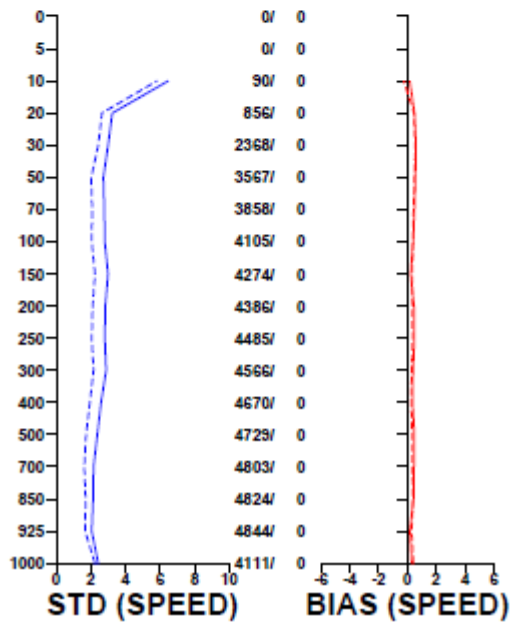
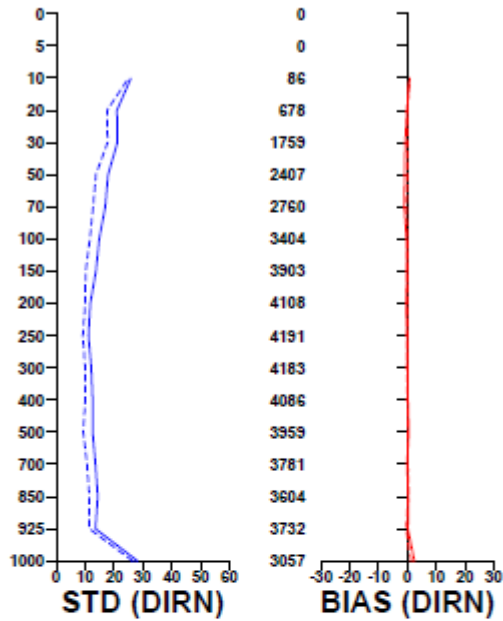


Figure 10: Vertical statistics ASAP Global (wind direction and speed) January to December 2013
 Solid lines : Obs-First guess (background)
 Dashed lines : Obs-Analysis
 Middle scale : Number of reports for each level/Number of rejected reports for each level

JNSR
JAN - DEC 2013
 POSITION: 72.70N 168.20W HEIGHT: 0M
 00/06/12/18 UTC DATA COMBINED

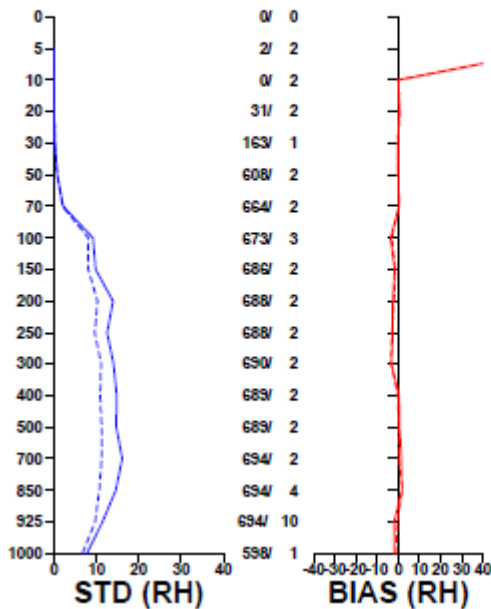
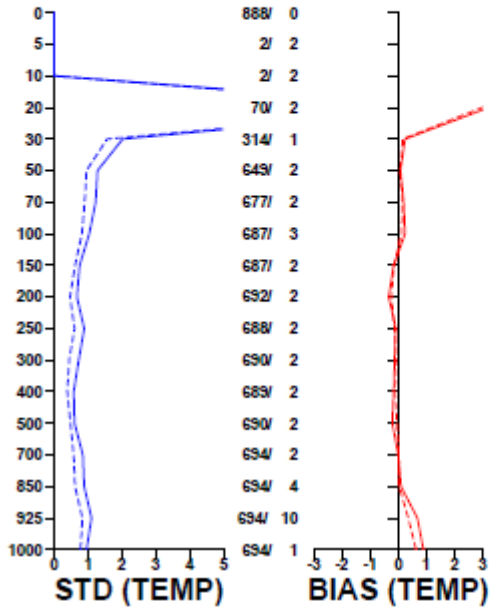


Figure 11: Vertical statistics ASAP platform JNSR (temperature and relative humidity) January to December 2013. Large standard deviation and bias for temperature at 20hPa is noticeable.

Solid lines : Obs-First guess (background)
 Dashed lines : Obs-Analysis
 Middle scale : Number of reports for each level/Number of rejected reports for each level

ASDK2
JAN - DEC 2013
 POSITION: 45.70N 8.50W HEIGHT: ----
 00/06/12/18 UTC DATA COMBINED

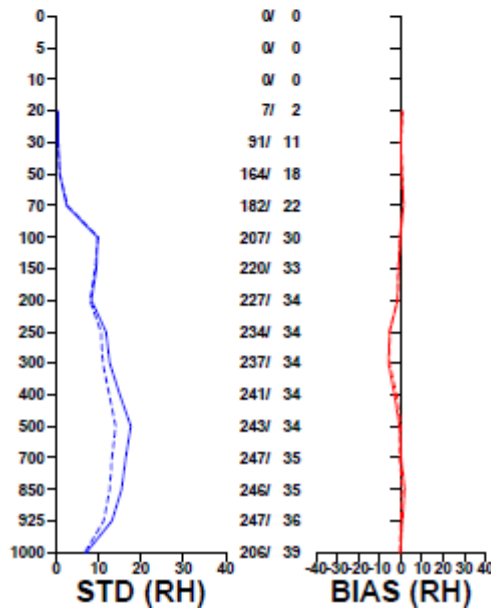
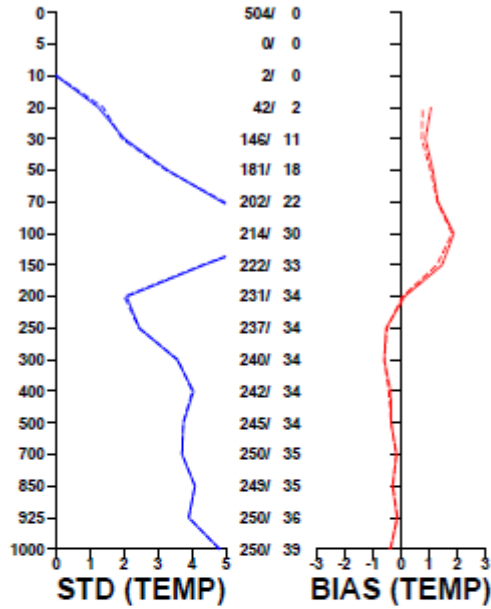


Figure 12: Vertical statistics for ASAP platform ASDK2 (temperature and relative humidity) January to December 2013. Large standard deviation for temperature and associated rejections at all levels are noticeable.

- Solid lines : Obs-First guess (background)
- Dashed lines : Obs-Analysis
- Middle scale : Number of reports for each level/Number of rejected reports for each level

ASDK2
JAN - DEC 2013
 POSITION: 45.70N 8.50W HEIGHT: ----
 00/06/12/18 UTC DATA COMBINED

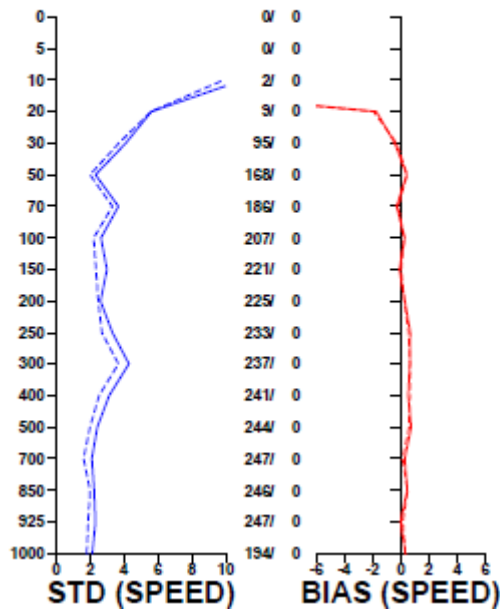
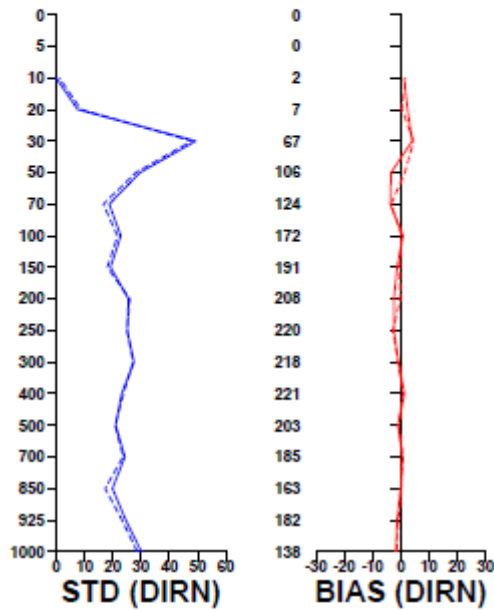


Figure 13: Vertical statistics for ASAP platform ASDK2 (wind direction and speed) January to December 2013. Large standard deviation at all levels is noticeable.

Solid lines : Obs-First guess (background)

Dashed lines : Obs-Analysis

Middle scale : Number of reports for each level/Number of rejected reports for each level

TABLE 2: Number of ASAP reports received at ECMWF January-December 2012 at 500 hPa

ID	TEMPERATURE					WIND				
	00	06	12	18	TOTAL	00	06	12	18	TOTAL
ASDE1	130	0	134	106	370	128	0	132	105	365
ASDE2	114	25	158	49	346	108	20	149	42	319
ASDE3	94	0	85	85	264	90	0	84	85	259
ASDE4	91	0	92	68	251	85	0	87	67	239
ASDE5	3	0	6	3	12	3	0	6	3	12
ASDE9	0	4	20	1	25	0	4	20	1	25
ASDK1	120	13	111	29	273	118	12	110	27	267
ASDK2	47	7	60	5	119	38	6	53	3	100
ASDK3	27	13	38	13	91	27	13	38	13	91
ASES1	0	0	242	0	242	0	0	242	0	242
ASEU1	79	0	90	4	173	78	0	90	4	172
ASEU2	58	0	56	40	154	55	0	56	40	151
ASEU3	38	1	50	32	121	37	1	50	32	120
ASEU4	26	3	33	28	90	26	2	32	28	88
ASEU5	58	0	79	55	192	58	0	79	55	192
ASEU6	92	0	88	68	248	89	0	85	68	242
ASFR1	146	1	127	0	274	145	1	127	0	273
ASFR2	89	0	109	0	198	88	0	109	0	197
ASFR3	121	0	124	2	247	120	0	124	2	246
ASFR4	117	1	128	0	246	116	1	127	0	244
DBLK	1	104	269	5	379	1	97	263	5	366
DRG	12	11	14	13	50	12	11	14	12	49
FRCOR	6	35	40	29	110	5	21	22	19	67
FRSGU	10	52	66	46	174	10	32	36	31	109
HYME1	11	10	14	17	52	10	7	9	10	36
HYME2	24	22	21	22	89	15	12	8	11	46
HYME3	3	4	7	6	20	3	2	3	3	11
JGQH	109	0	103	0	212	108	0	103	0	211
JNSR	28	27	24	25	104	26	25	22	23	96
KAOU	32	5	30	1	68	29	5	30	1	65
PACDG	2	1	0	1	4	0	0	0	0	0
UFTA	9	0	0	0	9	4	0	0	0	4
	1697	339	2418	753	5207	1632	272	2310	690	4904

Total number of identifiers: 32

TABLE 3: Number of ASAP reports received at ECMWF January-December 2013 at 500 hPa

ID	TEMPERATURE					WIND				
	00	06	12	18	TOTAL	00	06	12	18	TOTAL
ASDE1	119	1	118	59	297	117	1	118	58	294
ASDE2	51	0	69	37	157	51	0	69	37	157
ASDE3	87	0	100	65	252	86	0	100	65	251
ASDE4	93	0	93	60	246	92	0	91	60	243
ASDE9	4	5	23	7	39	4	5	22	7	38
ASDK1	57	5	38	4	104	55	4	38	4	101
ASDK2	110	9	120	6	245	109	9	120	6	244
ASDK3	52	1	33	1	87	51	1	33	1	86
ASES1	0	0	217	0	217	0	0	217	0	217
ASEU1	0	0	177	6	183	0	0	177	6	183
ASEU2	88	0	81	50	219	87	0	81	50	218
ASEU3	39	1	46	33	119	35	1	44	31	111
ASEU4	51	3	61	50	165	50	3	61	50	164
ASEU5	79	2	96	68	245	78	1	95	68	242
ASEU6	70	2	79	42	193	69	2	78	41	190
ASFR1	126	1	129	1	257	124	1	128	1	254
ASFR2	127	0	135	0	262	124	0	133	0	257
ASFR3	113	0	114	0	227	108	0	114	0	222
ASFR4	87	1	95	0	183	84	1	94	0	179
DBLK	1	92	292	2	387	1	91	289	2	383
DEJUE	59	46	112	37	254	53	26	59	21	159
HYPE2	8	11	11	15	45	7	9	8	10	34
HYPE3	1	2	3	4	10	1	2	3	2	8
JDSS	12	13	11	9	45	8	9	9	7	33
JGQH	96	15	93	2	206	89	5	87	2	183
JNSR	172	171	174	173	690	72	69	70	67	278
	1703	381	2520	731	5335	1556	240	2338	596	4730

Total number of identifiers: 26