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CENTRAL FORECASTING MONITORING NOTE NO. 14

THE EFFECT OF USING SYNOP REPORTED MEAN SEA-LEVEL PRESSURE
ON QUALITY-CONTROL DECISIONS

J.D.Wright

Central Forecasting Division

April 1993

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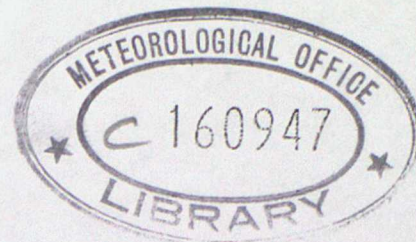
CENTRAL FORECASTING MONITORING NOTE NO. 14

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METEOROLOGICAL OFFICE.

Central Forecasting Monitoring Note No.14

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on quality-control decisions. By WRIGHT, J.D.

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1. Introduction

SYNOP stations can report pressure in a number of ways: they can report mean sea-level pressure (P_{msl}), station-level pressure (P_{stn}), the height of a standard pressure level (P_{std}) or a combination of these. P_{std} is normally used for high-level stations only, but P_{msl} & P_{stn} are reported widely, regardless of height.

SYNOP reports are coded in WMO code FM 12-IX (1988, WMO, pp I-A-10 - I-A-44); P_{stn} is stored in section 1 position 3.... of the code, whilst P_{msl} or P_{std} is stored in section 1 position 4.... ; P_{msl} & P_{std} therefore are mutually exclusive.

WMO impose certain guidelines on reporting practice, to eliminate any bias that may occur at a station due solely to its practice. These guidelines include the compulsory reporting of P_{stn} above 500 metres (1988, WMO, pp I-A-20, 12.2.4), which has recently been extended to include all stations, regardless of height, in a new directive issued in November 1991 (1991, WMO, pp I-A-20, 12.2.4).

In the operational suite, P_{stn} is used to calculate a value of P_{msl} (1991, R.K. Dumelow), using station heights stored in **SDB.STATION.INDEX**, in preference to using the reported value of P_{msl} directly or calculating P_{msl} from P_{std} ; P_{msl} or P_{std} is only used if P_{stn} is not available. The reported value of P_{msl} can be calculated in a variety of ways by the reporting station, using their own value of station height (1968, WMO).

It was thought that values of station height stored on-line may be incorrect, or even missing, for certain stations, leading to observations being unduly flagged, thus preventing their use in the model. Station height as used by each individual station is likely to be more accurate & less likely to be unavailable than the values on-line. It was considered worthwhile therefore to use the reported value of P_{msl} (ie: that calculated at the station), where available, in preference to a model derived value.

A change to the model suite was implemented for SYNOPs with station heights of 500 metres or less, to give preference to the reported P_{msl} ; above this height, no change was made. The new version became operational from the QG12 run on 7th July 1992. A limit of 500 metres was chosen to tie-in with the former guidelines of WMO (1988, WMO, pp I-A-20, 12.2.4). This limit is fairly arbitrary, but obviously the higher the station, the greater the likelihood of major errors arising in P_{msl} due to the increased magnitude of the difference between station-level temperature or pressure and the values of these parameters at mean sea-level.

This report attempts to summarise the effect of the aforementioned change on the flags raised on SYNOP P_{msl} , regardless of the way it is obtained.

2. Statistics + discussion

Table 1 shows the method used to arrive at the value of P_{msl} used by the model. Statistics are broken down into two sections - observations made at a height of 500 metres or less, and those made at a height greater than 500 metres. The table shows values at weekly intervals for the period June-August 1992, which have been chosen so that the change to the suite coincides with the change of week.

Table 1: Methods of obtaining Pmsl from SYNOP reports, June-August 1992

Week No.	Station height \leq 500 metres				Station height $>$ 500 metres			
	Total Pmsl obs.	Pmsl as rep.	Pmsl from Pstn	Pmsl from Pstd	Total Pmsl obs.	Pmsl as rep.	Pmsl from Pstn	Pmsl from Pstd
01	92150	44150	47955	45	23414	2741	19513	1160
02	89510	42293	47187	30	22109	2511	18409	1189
03	91869	43600	48246	23	23138	2686	19351	1101
04	93157	43932	49187	38	22499	2593	18931	975
05	93321	44049	49243	29	22737	2663	18979	1095
06	93313	47269	46013	31	22743	2708	18994	1041
07	93083	93043	0	40	22706	2703	19054	949
08	79040	79013	0	27	19565	2258	16405	902
09	88696	88663	0	33	21769	2583	18159	1027
10	93834	93795	0	39	22746	2780	18814	1152
11	92202	92165	0	37	22468	2661	18620	1187
12	90588	90551	0	37	22374	2573	18637	1164
13	89798	89769	0	29	21893	2426	18355	1112
14	91952	91918	0	34	22634	2576	18941	1117

Week	Period covered	Week	Period covered
01	09:00 26/05/92 - 08:59 02/06/92	08	09:00 14/07/92 - 08:59 21/07/92
02	09:00 02/06/92 - 08:59 09/06/92	09	09:00 21/07/92 - 08:59 28/07/92
03	09:00 09/06/92 - 08:59 16/06/92	10	09:00 28/07/92 - 08:59 04/08/92
04	09:00 16/06/92 - 08:59 23/06/92	11	09:00 04/08/92 - 08:59 11/08/92
05	09:00 23/06/92 - 08:59 30/06/92	12	09:00 11/08/92 - 08:59 18/08/92
06	09:00 30/06/92 - 08:59 07/07/92	13	09:00 18/08/92 - 08:59 25/08/92
07	09:00 07/07/92 - 08:59 14/07/92	14	09:00 25/08/92 - 08:59 01/09/92

One can see that 80% of observations are made below 500 metres. Of these, approximately half of the Pmsl values used in the model are the observed values and half are calculated from Pstn; very few are calculated from Pstd. The most common standard pressure level height to be reported is that at 850hPa. Since this is way above 500 metres even in the deepest of depressions, Pstd for a station below this height is likely to be inaccurate; & the value of Pmsl calculated from Pstd will be just as inaccurate. It is no surprise to see therefore that ~80% of such observations receive final flags.

Note the marked change from week 7 (the week commencing 7th July, ie: when the change to the model was implemented): from then on, 99% of Pmsl values used in the model below 500 metres are the observed value. Note that above 500 metres, no such change occurs. Here, ~80% of Pmsl values used in the model are calculated from Pstn, with just 15% of values used being the actual observed value of Pmsl and the remaining 5% being calculated from Pstd. Figure 1 shows the change in the number of reported Pmsl values and those calculated from Pstn at all heights, very clearly. The change would show up even more clearly if only observations made at a height of 500 metres or less had been used.

Table 2 shows the percentage of SYNOP Pmsl observations receiving a final flag. A final flag is raised when an observation fails quality control of some sort or another. The most common causes of final flags are observations being

grossly different from the model background field or not agreeing with other observations within close proximity. In this table, figures are given for all Pms1 observations, regardless of the way they are obtained; these figures are then segregated into Pms1 as reported and Pms1 calculated. No account has been taken of observation height in this case.

Table 2: Final flags on SYNOP Pms1 values, June-August 1992

Week No.	All Pms1 observations			Pms1 as reported			Pms1 calculated		
	Total obs.	Total final flags	% final flags	Total obs.	Total final flags	% final flags	Total obs.	Total final flags	% final flags
01	115564	5362	4.64	46891	833	1.78	68673	4529	6.60
02	111619	5085	4.56	44804	730	1.63	66815	4355	6.52
03	115007	5308	4.62	46286	773	1.67	68721	4535	6.60
04	115656	5467	4.73	46525	867	1.86	69131	4600	6.65
05	116058	5475	4.72	46712	823	1.76	69346	4652	6.71
06	116056	5351	4.61	49977	869	1.74	66079	4482	6.78
07	115789	3881	3.35	95746	1432	1.50	20043	2449	12.22
08	98605	3294	3.34	81271	1289	1.59	17334	2005	11.57
09	110465	3668	3.32	91246	1417	1.55	19219	2251	11.71
10	116580	3758	3.22	96575	1432	1.48	20005	2326	11.63
11	114670	3995	3.48	94826	1633	1.72	19844	2362	11.90
12	112962	3792	3.36	93124	1469	1.58	19838	2323	11.71
13	111691	3858	3.45	92195	1528	1.66	19496	2330	11.95
14	114586	4156	3.63	94494	1741	1.84	20092	2415	12.02

Once again, from week 7 onwards one can see a notable change - in the percentage of final flags for all Pms1 observations; the value decreasing from 4.6% to 3.3%, approximately 1500 observations per week (see figure 2). This can be solely attributed to the change that was made on 7th July and thus confirms the initial doubts regarding the accuracy of station heights in **SDB.STATION.INDEX**.

When one compares the stations where the reported Pms1 is used with those where the preprocessing calculates a value of Pms1 (sections 2 & 3 in table 2), it can be seen that the transfer of ~46000 observations from one category to the other, resulted in the reduction of the number of flagged observations. Although an extra 563 observations were flagged in section 2, this amounts to only around 1.2% of the 46000 transferred.

3. Conclusions

Following a change to the operational suite on July 7th 1992, to use reported Pms1 for station heights of 500 metres or less, rather than calculating a value using an on-line dataset containing station heights, the number of final flags for SYNOP Pms1 has dropped by about 1500 observations per week. The change has therefore had a beneficial effect.

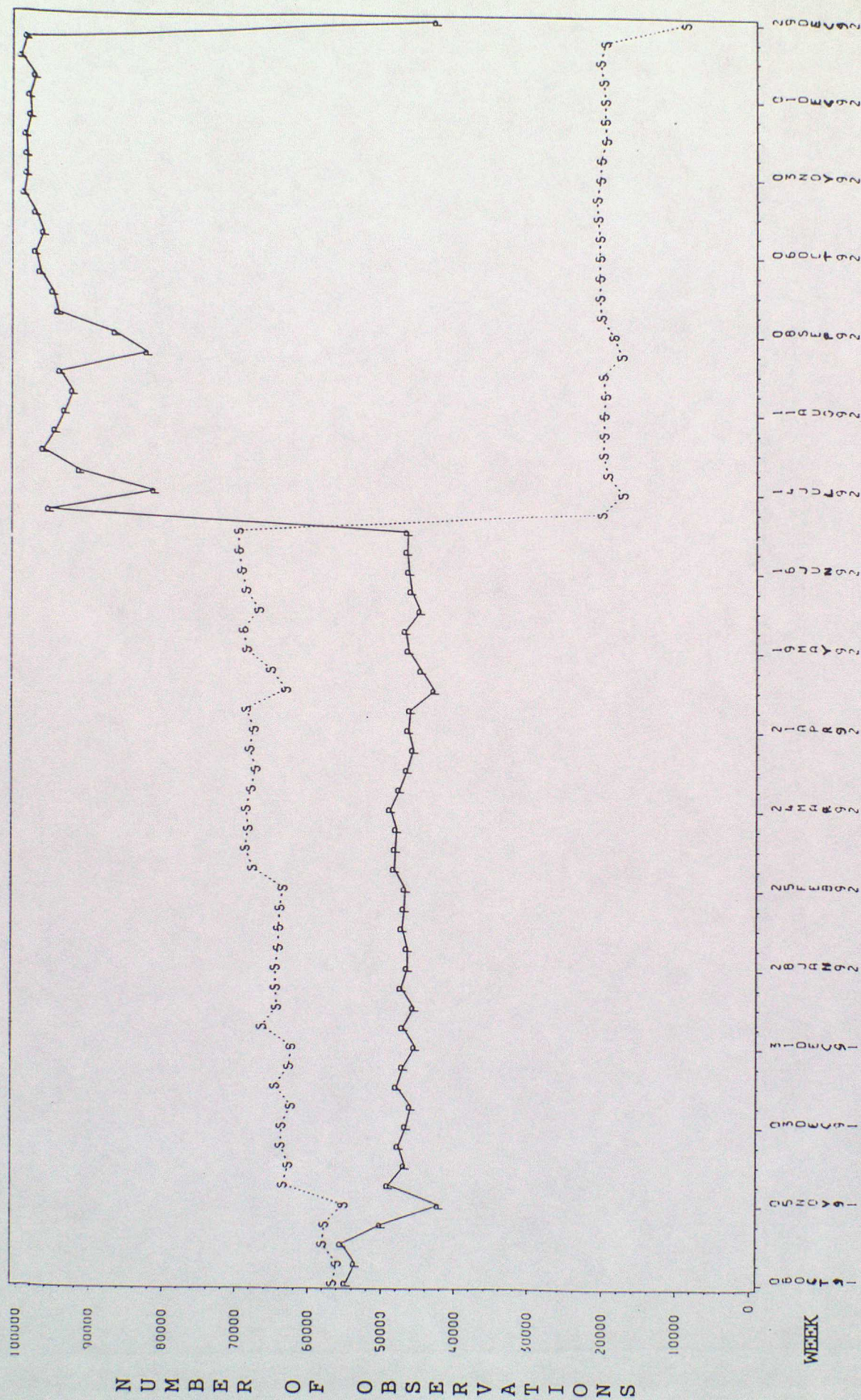
4. Acknowledgements

I would like to thank FR division for allowing the use of their graphical output.

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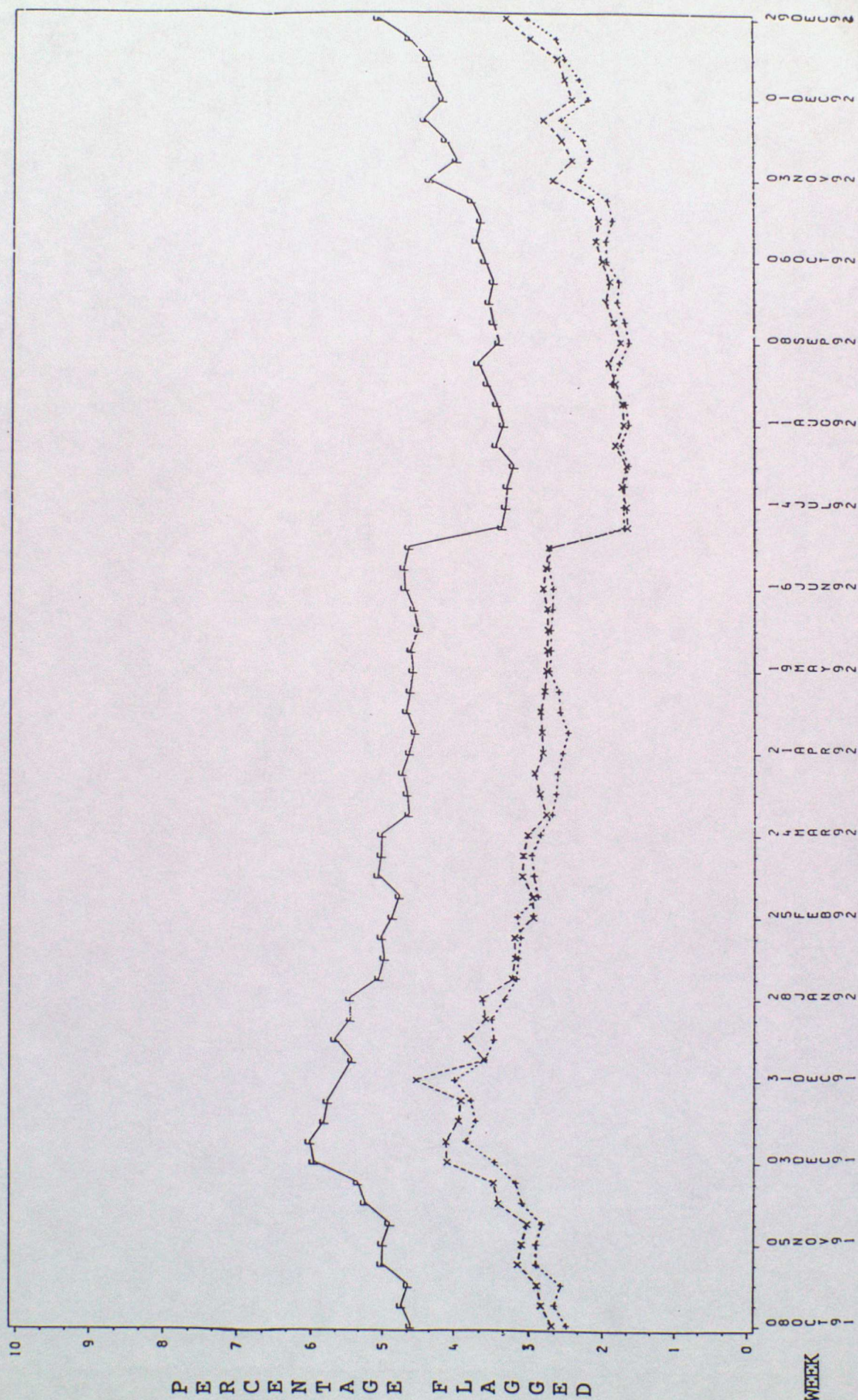
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FIGURE 1: NUMBER OF SYNOP MEAN SEA-LEVEL PRESSURE OBSERVATIONS USED IN THE MODEL, OCT 1991 - DEC 1992



P - OBTAINED FROM REPORTED MEAN SEA-LEVEL PRESSURE S - OBTAINED FROM REPORTED STATION-LEVEL PRESSURE

FIGURE 2: PERCENTAGE FLAGS ON ALL MEAN SEA-LEVEL PRESSURE OBSERVATIONS, OCT 1991 - DEC 1992



FLAGS: +--+ BACKGROUND x-x-x BUDDY f-f-f FINAL