

Doug Schuster, March 28, 2003

Wind Speed Problem at some SYNOP reporting stations in Scandinavia, Ireland, Eastern Europe, and Japan

This is a follow on study from discoveries during the *2x Wind Speed Problem* study (Doug Schuster, Mar. 2003, http://dss.ucar.edu/datasets/ds464.0/docs/2xwind_final.pdf). See this document for the strategies that define the stations libraries and wind speed unit types from the BUFR mnemonics (SUWS and TIWM). SYNOP and metar are two different report formats that are available in the surface observation data files. Stations can report in both formats, and sometimes use both formats at identical observation times. This study leverages this fact to investigate wind speed reporting errors outside the problem period 02/2001 to 07/2002 that was the focus in the *2x Wind Speed Problem* document.

Steps to Examine the Scandinavian Station Unit Problem Where Reporting Unit Indicator Switches From Knots in the SUWS Library, to m/s in the TIWM library:

- Find SYNOP and metar 6-month (Jul00 – Dec00, SUWS library data) avg. wind speed at 00z, 06z, 12z, and 18z for stations that changed units from unknown or knots in the 2000 library, to m/s in the 2002 library. Do the same over the 5-month (Aug02-Dec02) TIWM library data period.
- If a metar report is available at the same site as a SYNOP report, and the reports occur at the same times (00z, 06z, 12z, 18z), compute the ratio of (metar avg. wind speed)/(SYNOP avg. wind speed) for each of those hours.
- Since tests show no variance over the four synoptic hours, compute the average of the metar/SYNOP ratio over all hours (00z, 06z, 12z, 18z) for each station where the ratio is available.
- If the average of the metar/SYNOP ratio is greater than 1.5, the SYNOP station is actually reporting in m/s, while indicating that it reports in knots. The ratio of 1.94 is expected for one-to-one matching of all records. Examples of collocated wind speed at SYNOP and metar stations are shown in Figure 6.
- 580 of the 719 stations did not have metars available for comparison (Fig 1).
- 139 of the 719 stations did have metars available for comparison (Fig 2).
- 67 out of 139 stations satisfied the constraint: $(\text{#SYNOP reports} - \text{# metar reports}) < 4$ over the 6 and 5-month time periods examined (Qualifying stations, Fig3).
- 57 out of 67 qualifying stations were determined to be reporting in m/s, while indicating that they were reporting in knots during 2000 (Fig 4).

- Figure 5 displays qualifying stations that did not produce ratios greater than 1.5. All of these stations produced ratios greater than one, and in several cases, close to the 1.5 threshold. Eastern European, and Portuguese stations produced ratios between 1.3 and 1.5, while Eastern Mediterranean stations ranged from 1.05-1.21.
- All qualifying stations in Scandinavia, Ireland, and Japan were determined to have the problem. The majority of qualifying stations located in Eastern Europe and Portugal also had the problem.
- From these results, it could be inferred that the remaining SYNOP reporting stations had the same problem in these regions (All stations clustered in these regions that switched from reporting in knots or unknown units during the 2000 period, to m/s during the 2002 period).
- No problems were detected during 2002.
- Analysis was also completed in the same manner to examine stations that switched from m/s to knots, and no problems were detected.

2000 (SUWS kms) stations without metars

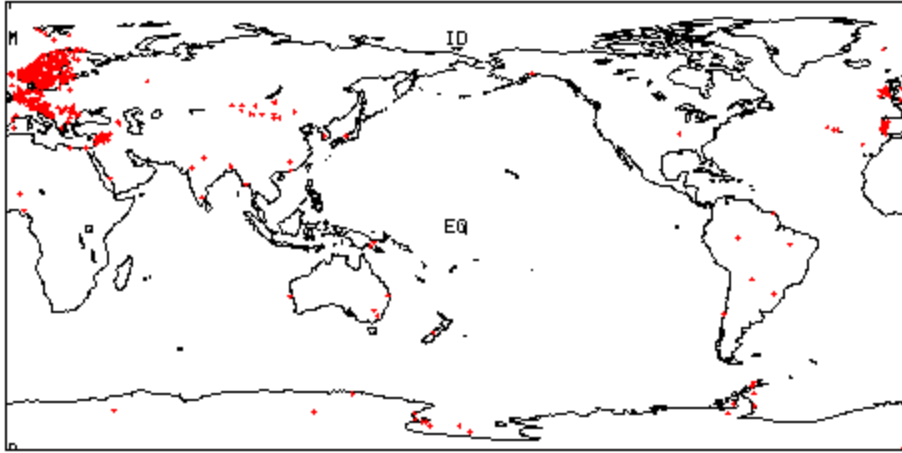


Figure 1. SYNOP reporting stations without collocated metars.

2000 (SUWS kms) stations with metars

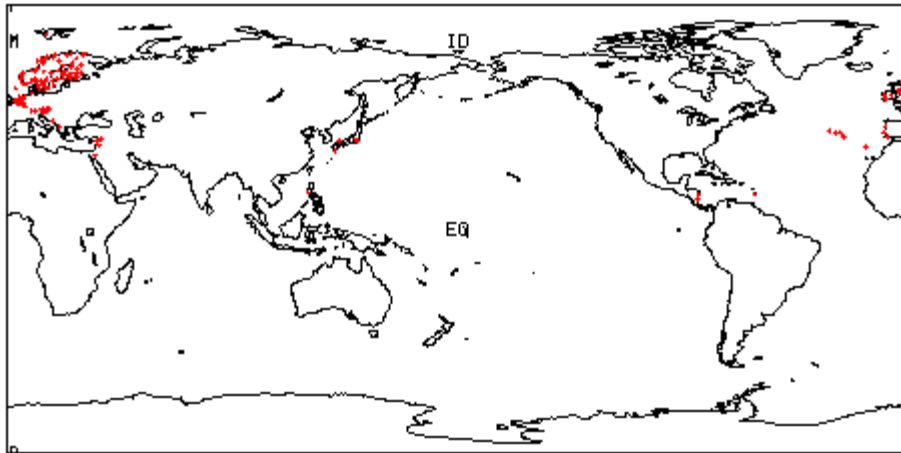


Figure 2. SYNOP reporting stations with collocated metars.

2000 (SUWS kts) stations with qual metars

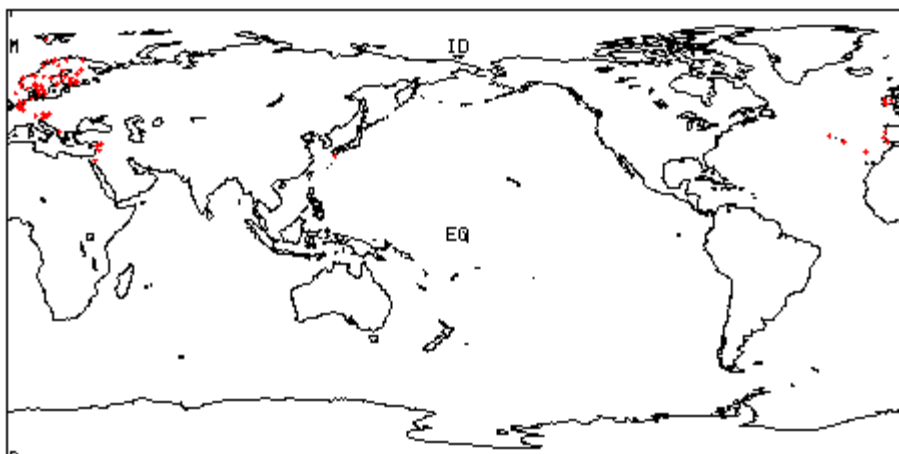


Figure 3. SYNOP reporting stations with qualifying collocated metars ($|\# \text{ SYNOP reports} - \# \text{ metar reports}| < 4$).

2000 (SUWS kts) kts, actually m/s stations

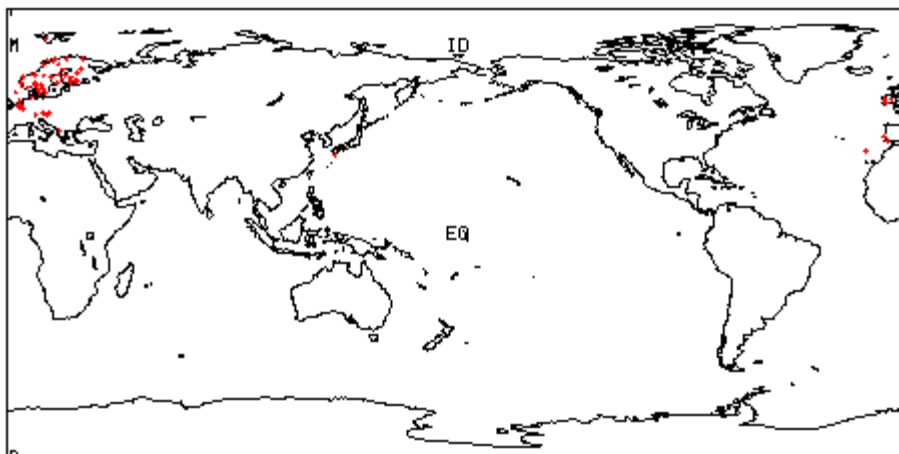


Figure 4. Stations indicated to be reporting in knots, while actually reporting in m/s From Jul 2000 – Dec 2000. $((6\text{-month avg metar ws}) / (6\text{-month avg SYNOP ws}) > 1.5)$

2000 (SUYS kms), remaining qualifying sta

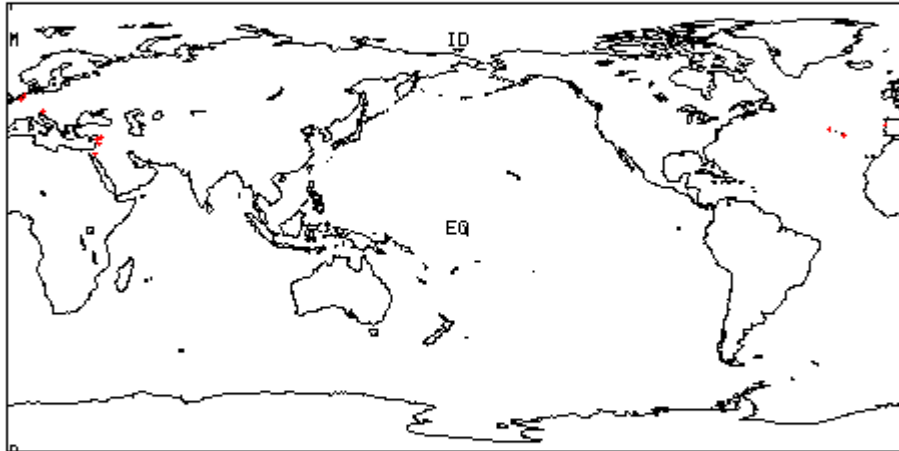
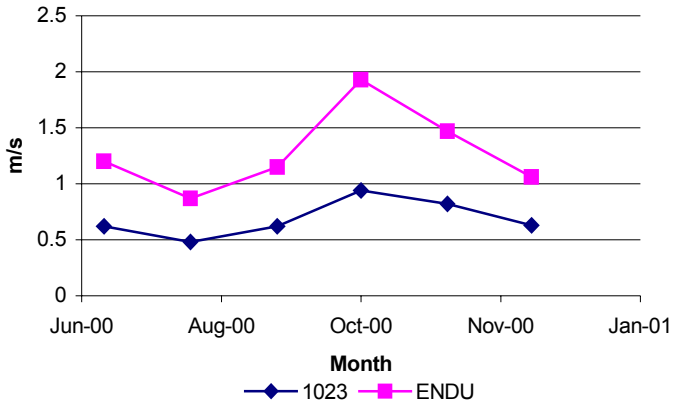
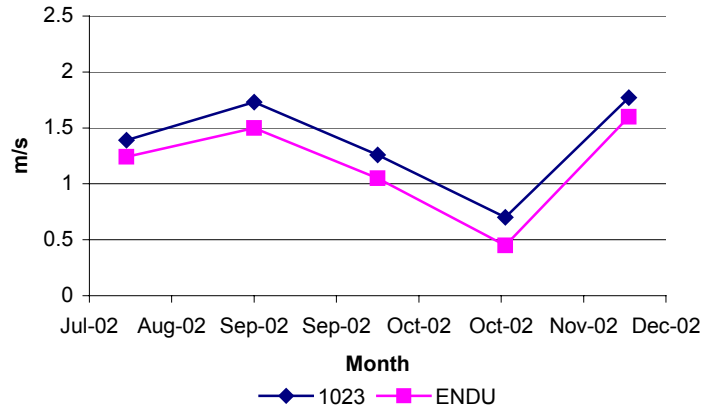


Figure 5. Remaining qualifying stations with undetermined units
((6-month avg metar ws)/(6-month avg SYNOP ws) < 1.5).

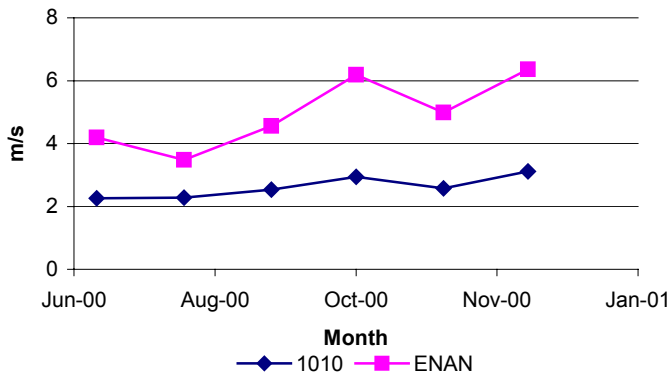
1023/ENDU 2000, 00Z Average Wind Speed



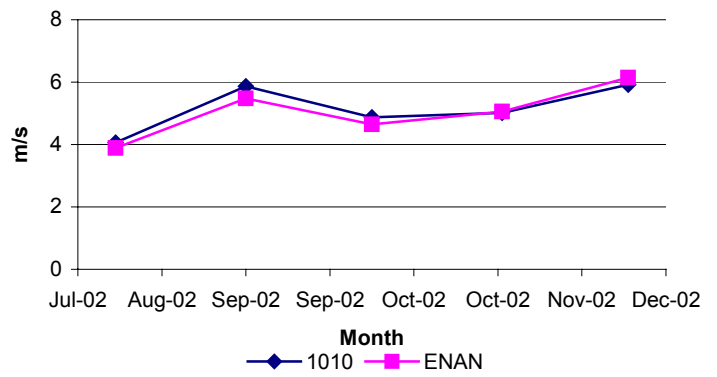
1023/ENDU 2002, 00Z Average Wind Speed



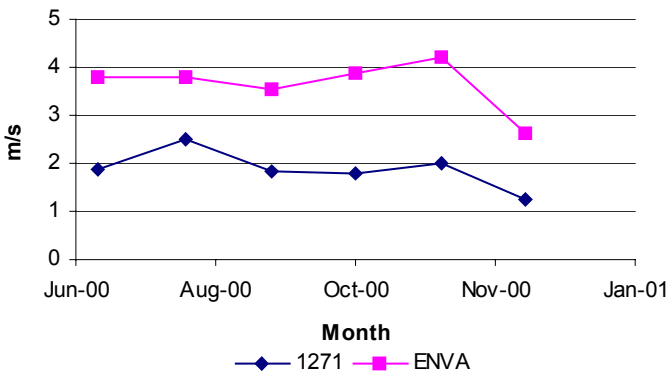
1010/ENAN 2000, 00Z Average Wind Speed



1010/ENAN 2002, 00Z Average Wind Speed



1071/ENVA 2000, 00Z Average Wind Speed



1071/ENVA 2002, 00Z Average Wind Speed

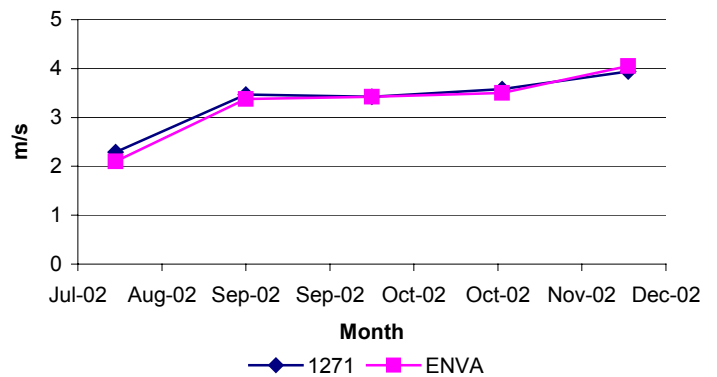


Figure 6. Plots of 00Z monthly average wind speed at collocated Scandinavian SYNOP/metar stations during 2000 and 2002. SYNOP call signs are identified by numbers. Metar call signs are identified by letters.