



Tarfala Research Station automatic weather station, 2001

Peter Jansson

Contents

1	Instrumentation	3
2	Notes on the station data	3
3	Data coverage	3
4	Notes on data storage	4
5	Data files and content	6
5.1	Likely program until 5 May (copy of fall 2000)	9
5.2	Program valid from 5 May (SR50 removed)	17

1 Instrumentation

The TRS met station consisted of the following instruments during 2001

Sensor	Serial number	Remark
Pt100		in Stevenson screen
Pt100		in Young screen
T/Rh		at 2 m (Young screen)
Young Wind Monitor		at 3 m
LiCor Li-200SB pyranometer		at 2 m
Tipping bucket precipitation gauge		at 2 m
SR50		at 1.5 m
Ventilated T/Rh		at 2 m
CR10 data logger		

2 Notes on the station data

- The SR 50, although not working properly (likely due to membrane failure), was attached to the station until 2001-05-05 18:00:00 when the precipitation gauge replaces SR50 data. The SR50 was not added in fall.
- Power failure occurred after 2001-01-31 00:00:00. Logger self started when power was restored at an unknown time. A floating segment of data from 2001-02-02 12:00:00 to 2001-02-26 15:00:00 exists based on the assumption that time was restored before 2001-02-26 16:00:00 from when time is correct. The power failure thus caused a loss of data spanning 2001-01-31 00:00:00 to 2001-02-02 12:00:00. This does not, however mean that the times specified in the floating data segment is correct. It could be as much as 1 hr off. The data still represents conditions during this period but has not been added to the main data file. Daily and ‘synoptic’ data from the period exist but are recorded at erroneous times. Judging by the raw data ‘synoptic data would be 1 hour off and daily data recorded at 12:00 instead of 24:00. No record of time adjustment constants have been recorded.
- A programming change was made 2001-05-05 18:00:00 when hourly maximum wind speed and and the time of the max was added as two additional columns in hourly data. These columns have been padded with NaN in the file until the onset of the program change.
- the ventilated T/Rh sensor misbehaves more frequently than other sensors.

3 Data coverage

- General data gap:
2001-01-31 00:00:00 to approx. 2001-02-02 12:00:00 due to power failure
2001-09-03 21:00:00 to 2001-09-04 17:00:00 (unknown reason)
- data time uncertainty:
approx. 2001-02-02 12:00:00 to 2001-02-26 15:00:00 (data not included in parameter files)
- Precipitation data missing from
2001-09-03 21:00:00 to 2001-09-04 17:00:00
- Radiation data missing from
2001-03-09 11:00:00
2001-03-30 11:00:00 to 2001-03-30 14:00:00
2001-09-03 21:00:00 to 2001-09-04 17:00:00

- Relative humidity (only ventilated unless stated otherwise) data missing from
 2001-03-09 10:00:00 to 2001-03-09 11:00:00
 2001-03-09 15:00:00 to 2001-03-09 16:00:00
 2001-03-10 13:00:00 to 2001-03-10 21:00:00
 2001-03-11 11:00:00 to 2001-03-11 15:00:00
 2001-03-30 11:00:00 to 2001-03-30 14:00:00
 2001-03-31 09:00:00 to 2001-03-31 15:00:00
 2001-04-02 16:00:00 to 2001-04-02 18:00:00
 2001-04-06 13:00:00 to 2001-04-06 17:00:00
 2001-04-07 12:00:00 to 2001-04-07 16:00:00
 2001-09-03 21:00:00 to 2001-09-04 17:00:00 (both sensors)
 2001-10-22 02:00:00 (unventilated sensor)
- Temperature data missing from
 2001-03-09 11:00:00 (2 Pt100 sensors)
 2001-03-10 13:00:00 (ventilated sensor)
 2001-03-11 12:00:00 to 2001-03-11 19:00:00 (ventilated sensor)
 2001-03-30 11:00:00 to 2001-03-30 14:00:00 (2 Pt100 sensors)
 2001-03-30 11:00:00 to 2001-03-31 00:00:00 (ventilated sensor)
 2001-03-31 09:00:00 to 2001-04-02 22:00:00 (ventilated sensor)
 2001-03-31 12:00:00 to 2001-03-31 13:00:00 (2 Pt100 sensors)
 2001-04-03 00:00:00 to 2001-04-03 04:00:00 (ventilated sensor)
 2001-04-03 06:00:00 to 2001-04-05 02:00:00 (ventilated sensor)
 2001-04-05 05:00:00 (ventilated sensor)
 2001-04-05 16:00:00 (ventilated sensor)
 2001-04-06 11:00:00 to 2001-04-06 16:00:00 (ventilated sensor)
 2001-04-06 20:00:00 to 2001-04-06 21:00:00 (ventilated sensor)
 2001-04-07 00:00:00 (ventilated sensor)
 2001-04-07 10:00:00 to 2001-04-07 11:00:00 (ventilated sensor)
 2001-04-07 14:00:00 to 2001-04-07 16:00:00 (ventilated sensor)
 2001-04-08 11:00:00 (ventilated sensor)
 2001-05-15 21:00:00 (ventilated sensor)
 2001-05-16 08:00:00 to 2001-05-20 05:00:00 (ventilated sensor)
 2001-05-20 07:00:00 to 2001-05-22 02:00:00 (ventilated sensor)
 2001-05-25 13:00:00 to 2001-05-25 16:00:00 (ventilated sensor)
 2001-05-26 12:00:00 to 2001-05-26 17:00:00 (ventilated sensor)
 2001-05-27 13:00:00 to 2001-05-27 17:00:00 (ventilated sensor)
 2001-09-03 21:00:00 to 2001-09-04 17:00:00 (all sensors)
- Wind data missing from
 2001-09-03 21:00:00 to 2001-09-04 17:00:00
- Daily data missing from
 2000-05-24 00:00:00 to 2000-05-25 00:00:00 (2 Pt100, ventilated T, battery voltage)
 2000-08-01 00:00:00 (2 Pt100, ventilated T, battery voltage)
- ‘Synoptic’ data missing from:
 2001-03-10 00:00:00
 2001-03-31 00:00:00 to 2001-04-01 00:00:00
 2001-09-04 00:00:00

4 Notes on data storage

Example of hourly data:

101, 2001, 185, 1300, 5.985, 5.807, 6.307, 65.38, 5.539, 330.7, 0.054, 420.5, 0, 7.1, 73.8, 12.91, 1225,

Column	Example data	Description
01:	101	ID
02:	2001	Year
03:	185	Day of Year
04:	1300	hour-minute (hhmm)
05:	5.985	2 Pt100 T in Stevenson screen)
06:	5.807	3 T in Young screen
07:	6.307	4 Pt100 in new Young screen
08:	65.38	5 Rh in Young screen
09:	5.539	6 Mean horizontal wind speed
10:	330.7	7 resultant mean wind direction
11:	0.054	8 Standard deviation of wind direction
12:	420.5	9 Global radiation
13:	0	10 Precipitation/SR50
14:	7.1	11 ventilated T
15:	73.8	12 ventilated Rh
16:	12.91	13 hourly max wind speed
17:	1225	14 time for max wind speed

Example of daily data summaries:
124,2001,185,2400,5.524,5.424,5.972,65.47,7.84,1355,3.455,318,17.51,420,4.992,322.6,
152.9,0.16,13.91,6.735,74.2

Column	Example data	Description
01:	124	ID
02:	2001	Year
03:	185	Day of Year
04:	2400	hour-minute (hhmm)
05:	5.524	2 Daily average T in Stevenson screen)
06:	5.424	3 Daily T from T/Rh in Young screen
07:	5.972	4 Daily T from T/Rh in Young screen
08:	65.47	5 daily average humidity in Young screen
08:	7.84	6 Daily maximum temperature in Young screen
10:	1355	7 hhmm for maximum daily temperature
11:	3.455	8 Daily minimum temperature in Young screen
12:	318	9 hhmm for minimum daily temperature
13:	15.51	10 Maximum wind speed
14:	420	11 hhmm for maximum wind speed
15:	4.992	12 Average wind speed
16:	322.6	13 Average wind direction
17:	152.9	14 Incoming radiation
18:	0.16	15 Totalized precipitation
19:	13.91	16 Battery voltage
20:	6.735	17 Average ventilated temperature
21:	74.2	18 Average ventilated relative humidity

Example of 'Synoptic' output:
103,2001,185,1300,6.471

Column	Example data	Description
01:	103	ID
02:	2001	Year
03:	185	Day of Year
04:	1300	hour-minute (hhmm)
05:	6.471	Pt100 in Young screen

5 Data files and content

TRSmets2001.csv Raw data file

TRSmets2001HourlyTimeAdjustedSegment.csv Floating segment raw data file

TRS_met_2001_Precipitation.csv

Date-time, Precipitation

2001-01-01 01:00:00,0.00

TRS_met_2001_Radiation.csv

Date-time, Global radiation

2001-01-01 01:00:00,0.33 2001-01-01 01:00:00,19.4,34.4

TRS_met_2001_Relative_humidity.csv

Date-time, hourly average Rh, ventilated Rh

2001-01-01 01:00:00,19.4,34.4

TRS_met_2001_Temperature.csv

Date-time, hourly average T (Stevenson), hourly average T (Young), hourly average T/Rh (Young), ventilated (T/Rh)

2001-01-01 01:00:00,-12.48,-11.69,-11.54,-11.20

TRS_met_2001_Wind.csv

Date-time, Mean horizontal wind speed, resultant mean wind direction, hourly max wind speed, time of max wind
spd

2001-01-01 01:00:00,2.8,350.8,0.0760,NaN,NaN

TRS_met_2001_Snow_depth.csv

Date-time, Snow depth

2000-01-01 01:00:00,0.193

TRS_met_2001_Daily_data.csv

Data columns follows description above

2001-01-02 00:00:00,-8.31,-7.96,-7.78,32.2,-3.04,1127,-14.37,12,11.5,
743,2.2,8.2,0.5,0.0,13.93

TRS_met_2001_Synop_data.csv

Date-time, sample temperature

2001-01-01 01:00:00,-10.06

The data collected during 2001 is summarized the figure 1 and Table 1.

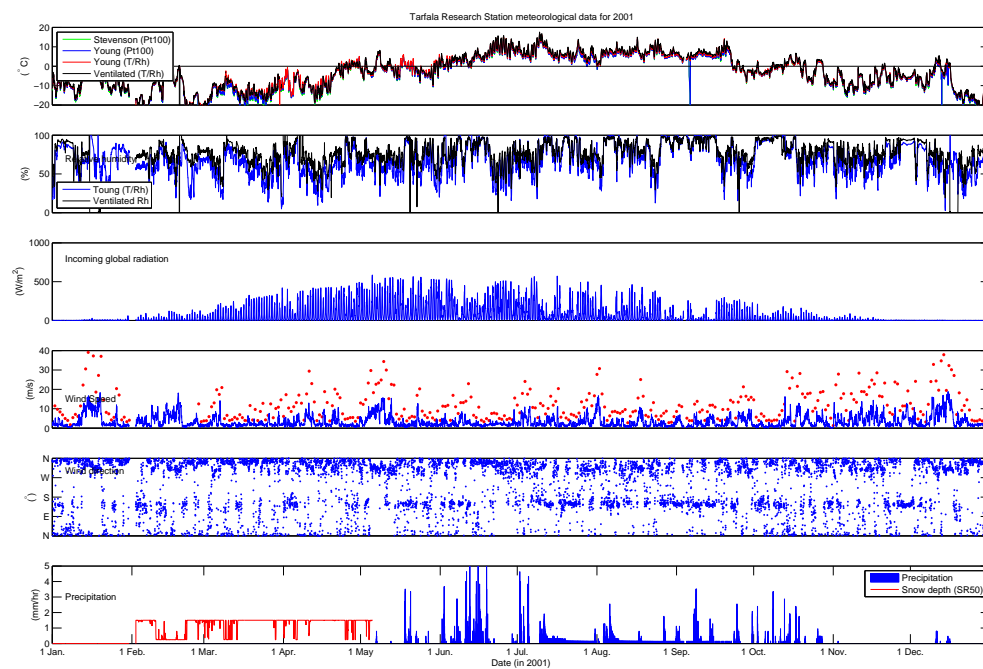


Figure. 1. Summary of meteorological data from Tarfala Research Station automatic weather station 2001.

Table. 1. Monthly averages of meteorological parameters from the Tarfala Research Station automatic weather station 2001.

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Average air temperature (Stevenson)												
(°C)	−8.6	−26.2	−14.6	−7.1	−1.8	4.8	6.2	6.2	3.0	−2.2	−7.6	−10.7
<i>n</i>	720	32	760	741	743	743	743	767	722	767	743	767
Average air temperature (Young)												
(°C)	−8.4	—	−14.3	−6.9	−1.8	4.9	6.2	6.2	3.0	−2.2	−7.6	−10.5
<i>n</i>	720	—	760	741	743	743	743	767	722	767	743	767
Average air temperature												
(°C)	−8.1	—	−12.9	−6.5	−1.2	5.4	7.0	6.8	3.8	−2.0	−7.2	−9.6
<i>n</i>	720	—	767	743	743	743	743	767	722	767	743	767
Positive degree sum												
(°C)	20	—	0	95	457	3699	4587	4738	—	542	3	101
<i>n</i>	39	—	0	96	199	666	738	761	—	276	10	66
Average relative humidity												
(%)	70.5	—	56.7	57.9	62.5	69.4	72.8	78.3	78.9	79.6	66.6	60.8
<i>n</i>	720	—	767	743	743	743	743	767	722	766	743	767
Average incoming global radiation												
(W m ^{−2})	2.5	—	54.8	110.5	158.8	136.8	99.5	63.5	35.4	18.1	4.6	0.7
<i>n</i>	720	—	762	743	743	743	743	767	722	767	743	767
Global incoming energy sum												
(W m ^{−2})	1823	—	—	82068	118009	101647	73957	48678	—	13897	3450	535
<i>n</i>	662	—	—	729	743	743	743	767	—	759	739	530
Totalized precipitation												
(mm)	0.00	—	1047.07	1039.70	193.21	197.76	159.52	108.80	94.08	85.60	0.16	7.04
<i>n</i>	720	—	767	743	743	743	743	767	722	767	743	767
Average wind speed												
(m s ^{−1})	4.2	—	2.3	2.9	4.1	2.3	3.3	2.9	3.1	2.8	4.3	4.7
<i>n</i>	720	—	767	743	743	743	743	767	722	767	743	767

Logger program

5.1 Likely program until 5 May (copy of fall 2000)

```
;{CR10}
;=====
; TARFALA MET STATION
; downloaded 6. August 1998, 15:21 wintertime
; NEW: VENTILATED TEMPERATURE SENSOR
; Regine Hock
;=====
;{CR10}
```

*Table 1 Program

01: 10.0000 Execution Interval (seconds)

1: Batt Voltage (P10)

1: 10 Loc [Batteri_V]

2: IF (X<=>F) (P89)

1: 10 X Loc [Batteri_V]

2: 4 <

3: 9.7 F

4: 0 Go to end of Program Table

;===== TEMPERATURE 1 - PT100 in weather hut =====

3: 3W Half Bridge (P7)

1: 1 Reps

2: 33 25 mV 50 Hz Rejection Range

3: 1 SE Channel

4: 2 Excite all reps w/Exchan 2

5: 2100 mV Excitation

6: 21 Loc [Rs_Ro_T1]

7: 100 Mult

8: 0.0000 Offset

;===== TEMPERATURE 2 - PT100 in radiation shield =====

4: 3W Half Bridge (P7)

1: 1 Reps

2: 33 25 mV 50 Hz Rejection Range

3: 3 SE Channel

4: 2 Excite all reps w/Exchan 2

5: 2100 mV Excitation

6: 22 Loc [Rs_Ro_T2]

7: 100.00 Mult

8: 0.0000 Offset

;=== calculate Temp 1 and Temp 2 from Rs/Ro =====

5: Temperature RTD (P16)

1: 2 Reps

2: 21 R/R0 Loc [Rs_Ro_T1]

3: 1 Loc [T1_bur__C]

4: 1 Mult

5: 0.0000 Offset

6: Do (P86)

1: 41 Set Port 1 High

```

;===== Temperature Rotronic =====

7: Volt (Diff) (P2)
  1: 1      Repts
  2: 35     2500 mV 50 Hz Rejection Range
  3: 3      DIFF Channel
  4: 3      Loc [ T3_Rot__C ]
  5: 0.1    Mult
  6: 0.0000 Offset

;===== RELATIVE HUMIDITY Rotronic =====

8: Volts (SE) (P1)
  1: 1      Repts
  2: 35     2500 mV 50 Hz Rejection Range
  3: 7      SE Channel
  4: 4      Loc [ rH_Rot___ ]
  5: 0.1    Mult
  6: 0.0    Offset

;===== VENTILATED TEMPERATURE SENSOR (Vaisala PT100) =====

9: 3W Half Bridge (P7)
  1: 1      Repts
  2: 33     25 mV 50 Hz Rejection Range
  3: 11     SE Channel
  4: 3      Excite all reps w/Exchan 3
  5: 2100   mV Excitation
  6: 23     Loc [ Rs_Ro_ven ]
  7: 100    Mult
  8: 0.0000 Offset

10: Temperature RTD (P16)
  1: 1      Repts
  2: 23     R/R0 Loc [ Rs_Ro_ven ]
  3: 11     Loc [ TempVent ]
  4: 1      Mult
  5: 0.0000 Offset

;===== RELATIVE HUMITY (VENTILATED SENSOR) =====

11: Volts (SE) (P1)
  1: 1      Repts
  2: 35     2500 mV 50 Hz Rejection Range
  3: 8      SE Channel
  4: 12     Loc [ HumVent ]
  5: 0.1    Mult
  6: 0.0    Offset

;===== WIND SPEED =====

12: Pulse (P3)
  1: 1      Repts
  2: 1      Pulse Input Channel
  3: 21     Low Level AC, Output Hz
  4: 5      Loc [ Vhast_m_s ]
  5: 0.098  Mult
  6: 0      Offset

```

```

;===== WIND DIRECTION =====
13: Excite-Delay (SE) (P4)
  1: 1      Reps
  2: 5      2500 mV Slow Range
  3: 9      SE Channel
  4: 1      Excite all reps w/Exchan 1
  5: 2      Delay (units 0.01 sec)
  6: 2500   mV Excitation
  7: 6      Loc [ Vrikt____ ]
  8: 0.142  Mult
  9: -135   Offset

14: IF (X<=>F) (P89)
  1: 6      X Loc [ Vrikt____ ]
  2: 4      <
  3: 0      F
  4: 30     Then Do

15: Z=X+F (P34)
  1: 6      X Loc [ Vrikt____ ]
  2: 360    F
  3: 6      Z Loc [ Vrikt____ ]

16: End (P95)

;===== GLOBAL RADIATION =====
17: Volts (SE) (P1)
  1: 1      Reps
  2: 33     25 mV 50 Hz Rejection Range
  3: 10     SE Channel
  4: 7      Loc [ Sol__W_m_ ]
  5: 116.55 Mult
  6: 0.0000 Offset

;===== PRECIPITATION =====
18: Pulse (P3)
  1: 1      Reps
  2: 2      Pulse Input Channel
  3: 2      Switch Closure, All Counts
  4: 8      Loc [ Nederb_mm ]
  5: 0.16   Mult
  6: 0.0    Offset

19: Internal Temperature (P17)
  1: 9      Loc [ Logtemp_C ]

; ===== OUTPUT =====

20: If time is (P92)
  1: 0      Minutes (Seconds --) into a
  2: 60     Interval (same units as above)
  3: 10     Set Output Flag High

21: Set Active Storage Area (P80)
  1: 1      Final Storage Area 1
  2: 101    Array ID

22: Real Time (P77)

```

```

1: 1220      Year,Day,Hour/Minute (midnight = 2400)

23: Average (P71)
1: 4        Reps
2: 1        Loc [ T1_bur__C ]

24: Wind Vector (P69)
1: 1        Reps
2: 1        Samples per Sub-Interval
3: 0        S, é1, & â(é1) Polar
4: 5        Wind Speed/East Loc [ Vhast_m_s ]
5: 6        Wind Direction/North Loc [ Vrikt____ ]

25: Average (P71)
1: 1        Reps
2: 7        Loc [ Sol__W_m_ ]

26: Totalize (P72)
1: 1        Reps
2: 8        Loc [ Nederb_mm ]

27: Average (P71)
1: 2        Reps
2: 11       Loc [ TempVent  ]

28: Serial Out (P96)
1: 71       SM192/SM716/CSM1

; ===== STORAGE DAILY MEANS AT MIDNIGHT =====

29: If time is (P92)
1: 0        Minutes (Seconds --) into a
2: 1440     Interval (same units as above)
3: 10       Set Output Flag High

30: Set Active Storage Area (P80)
1: 1        Final Storage Area 1
2: 124      Array ID

31: Real Time (P77)
1: 1220     Year,Day,Hour/Minute (midnight = 2400)

32: Average (P71)
1: 4        Reps
2: 1        Loc [ T1_bur__C ]

33: Maximize (P73)
1: 1        Reps
2: 10       Value with Hr-Min
3: 2        Loc [ T2_skyd_C ]

34: Minimize (P74)
1: 1        Reps
2: 10       Value with Hr-Min
3: 2        Loc [ T2_skyd_C ]

35: Maximize (P73)

```

```

1: 1      Reps
2: 10     Value with Hr-Min
3: 5      Loc [ Vhast_m_s ]

36: Wind Vector (P69)
1: 1      Reps
2: 1      Samples per Sub-Interval
3: 1      S, é1 Polar
4: 5      Wind Speed/East Loc [ Vhast_m_s ]
5: 6      Wind Direction/North Loc [ Vrikt_---- ]

37: Average (P71)
1: 1      Reps
2: 7      Loc [ Sol__W_m_ ]

38: Totalize (P72)
1: 1      Reps
2: 8      Loc [ Nederb_mm ]

39: Sample (P70)
1: 1      Reps
2: 10     Loc [ Batteri_V ]

40: Average (P71)
1: 2      Reps
2: 11     Loc [ TempVent  ]

41: Serial Out (P96)
1: 71     SM192/SM716/CSM1

42: If time is (P92)
1: 60     Minutes (Seconds --) into a
2: 1440   Interval (same units as above)
3: 10     Set Output Flag High

43: Set Active Storage Area (P80)
1: 1      Final Storage Area 1
2: 103    Array ID

44: Real Time (P77)
1: 1220   Year,Day,Hour/Minute (midnight = 2400)

; SAMPLE TEMP FOR COMPARISON WITH 3-HOURLY DATA OF OTHER STATIONS =====

45: Sample (P70)
1: 1      Reps
2: 2      Loc [ T2_skyd_C ]

46: If time is (P92)
1: 240    Minutes (Seconds --) into a
2: 1440   Interval (same units as above)
3: 10     Set Output Flag High

47: Set Active Storage Area (P80)
1: 1      Final Storage Area 1
2: 103    Array ID

48: Real Time (P77)

```

```

1: 1220      Year,Day,Hour/Minute (midnight = 2400)

49: Sample (P70)
   1: 1      Reps
   2: 2      Loc [ T2_skyd_C ]

50: If time is (P92)
   1: 420     Minutes (Seconds --) into a
   2: 1440    Interval (same units as above)
   3: 10      Set Output Flag High

51: Set Active Storage Area (P80)
   1: 1      Final Storage Area 1
   2: 103     Array ID

52: Real Time (P77)
   1: 1220    Year,Day,Hour/Minute (midnight = 2400)

53: Sample (P70)
   1: 1      Reps
   2: 2      Loc [ T2_skyd_C ]

; 3-HOURLY TEMP VALUES TO FILE =====0

54: If time is (P92)
   1: 600     Minutes (Seconds --) into a
   2: 1440    Interval (same units as above)
   3: 10      Set Output Flag High

55: Set Active Storage Area (P80)
   1: 1      Final Storage Area 1
   2: 103     Array ID

56: Real Time (P77)
   1: 1220    Year,Day,Hour/Minute (midnight = 2400)

57: Sample (P70)
   1: 1      Reps
   2: 2      Loc [ T2_skyd_C ]

58: If time is (P92)
   1: 780     Minutes (Seconds --) into a
   2: 1440    Interval (same units as above)
   3: 10      Set Output Flag High

59: Set Active Storage Area (P80)
   1: 1      Final Storage Area 1
   2: 103     Array ID

60: Real Time (P77)
   1: 1220    Year,Day,Hour/Minute (midnight = 2400)

61: Sample (P70)
   1: 1      Reps
   2: 2      Loc [ T2_skyd_C ]

62: If time is (P92)
   1: 960     Minutes (Seconds --) into a

```

```

2: 1440      Interval (same units as above)
3: 10        Set Output Flag High

63: Set Active Storage Area (P80)
1: 1         Final Storage Area 1
2: 103       Array ID

64: Real Time (P77)
1: 1220      Year,Day,Hour/Minute (midnight = 2400)

65: Sample (P70)
1: 1         Reps
2: 2         Loc [ T2_skyd_C ]

66: If time is (P92)
1: 1140      Minutes (Seconds --) into a
2: 1440      Interval (same units as above)
3: 10        Set Output Flag High

67: Set Active Storage Area (P80)
1: 1         Final Storage Area 1
2: 103       Array ID

68: Real Time (P77)
1: 1220      Year,Day,Hour/Minute (midnight = 2400)

69: Sample (P70)
1: 1         Reps
2: 2         Loc [ T2_skyd_C ]

70: If time is (P92)
1: 1320      Minutes (Seconds --) into a
2: 1440      Interval (same units as above)
3: 10        Set Output Flag High

71: Set Active Storage Area (P80)
1: 1         Final Storage Area 1
2: 103       Array ID

72: Real Time (P77)
1: 1220      Year,Day,Hour/Minute (midnight = 2400)

73: Sample (P70)
1: 1         Reps
2: 2         Loc [ T2_skyd_C ]

*Table 2 Program
01: 0.0000    Execution Interval (seconds)

*Table 3 Subroutines

End Program

1      [ T1_bur_C ]  RW--  2      1      Start ----- ---
2      [ T2_skyd_C ] RW--  12     1      ----- End
3      [ T3_Rot_C ]  RW--  2      1      Start ----- ---
4      [ rH_Rot_   ]  RW--  2      1      ----- ---

```

5	[Vhast_m_s]	RW--	3	1	-----	-----	---
6	[Vrikt_----]	RW--	4	2	-----	-----	---
7	[Sol__W_m_]	RW--	2	1	-----	-----	---
8	[Nederb_mm]	RW--	2	1	-----	-----	---
9	[Logtemp_C]	-W--	0	1	-----	-----	---
10	[Batteri_V]	RW--	2	1	-----	-----	---
11	[TempVent]	RW--	2	1	-----	-----	---
12	[HumVent]	RW--	2	1	-----	-----	---
13	[-----]	----	0	0	-----	-----	---
14	[-----]	----	0	0	-----	-----	---
15	[-----]	----	0	0	-----	-----	---
16	[-----]	----	0	0	-----	-----	---
17	[-----]	----	0	0	-----	-----	---
18	[-----]	----	0	0	-----	-----	---
19	[-----]	----	0	0	-----	-----	---
20	[-----]	----	0	0	-----	-----	---
21	[Rs_Ro_T1]	RW--	1	1	-----	-----	---
22	[Rs_Ro_T2]	RW--	1	1	-----	-----	---
23	[Rs_Ro_ven]	RW--	1	1	-----	-----	---
24	[-----]	----	0	0	-----	-----	---
25	[-----]	----	0	0	-----	-----	---
26	[_]	----	0	0	-----	-----	---
27	[Rs_lo2]	----	0	0	-----	-----	---
28	[Temp2m]	----	0	0	-----	-----	---
29	[RelHum2m]	----	0	0	-----	-----	---

5.2 Program valid from 5 May (SR50 removed)

```
;{CR10}
;=====
; TARFALA MET STATION
; based on program tarm0898 from 6. August 1998
; NEW: output hourly max wind
; Regine Hock, 5 May 2001
;=====
;{CR10}

*Table 1 Program
  01: 10.0000 Execution Interval (seconds)

1: Batt Voltage (P10)
  1: 10 Loc [ Batteri_V ]

2: IF (X<=>F) (P89)
  1: 10 X Loc [ Batteri_V ]
  2: 4 <
  3: 9.7 F
  4: 0 Go to end of Program Table

;===== TEMPERATURE 1 - PT100 in weather hut =====

3: 3W Half Bridge (P7)
  1: 1 Reps
  2: 33 25 mV 50 Hz Rejection Range
  3: 1 SE Channel
  4: 2 Excite all reps w/Exchan 2
  5: 2100 mV Excitation
  6: 21 Loc [ Rs_Ro_T1 ]
  7: 100 Mult
  8: 0.0000 Offset

;===== TEMPERATURE 2 - PT100 in radiation shield =====

4: 3W Half Bridge (P7)
  1: 1 Reps
  2: 33 25 mV 50 Hz Rejection Range
  3: 3 SE Channel
  4: 2 Excite all reps w/Exchan 2
  5: 2100 mV Excitation
  6: 22 Loc [ Rs_Ro_T2 ]
  7: 100.00 Mult
  8: 0.0000 Offset

;=== calculate Temp 1 and Temp 2 from Rs/Ro =====
5: Temperature RTD (P16)
  1: 2 Reps
  2: 21 R/R0 Loc [ Rs_Ro_T1 ]
  3: 1 Loc [ T1_bur__C ]
  4: 1 Mult
  5: 0.0000 Offset

6: Do (P86)
  1: 41 Set Port 1 High

;===== Temperature Rotronic =====
```

```

7: Volt (Diff) (P2)
  1: 1      Repts
  2: 35     2500 mV 50 Hz Rejection Range
  3: 3      DIFF Channel
  4: 3      Loc [ T3_Rot__C ]
  5: 0.1    Mult
  6: 0.0000 Offset

;===== RELATIVE HUMIDITY Rotronic =====

8: Volts (SE) (P1)
  1: 1      Repts
  2: 35     2500 mV 50 Hz Rejection Range
  3: 7      SE Channel
  4: 4      Loc [ rH_Rot___ ]
  5: 0.1    Mult
  6: 0.0    Offset

;===== VENTILATED TEMPERATURE SENSOR (Vaisala PT100) =====

9: 3W Half Bridge (P7)
  1: 1      Repts
  2: 33     25 mV 50 Hz Rejection Range
  3: 11     SE Channel
  4: 3      Excite all reps w/Exchan 3
  5: 2100   mV Excitation
  6: 23     Loc [ Rs_Ro_ven ]
  7: 100    Mult
  8: 0.0000 Offset

10: Temperature RTD (P16)
  1: 1      Repts
  2: 23     R/R0 Loc [ Rs_Ro_ven ]
  3: 11     Loc [ TempVent ]
  4: 1      Mult
  5: 0.0000 Offset

;===== RELATIVE HUMITY (VENTILATED SENSOR) =====

11: Volts (SE) (P1)
  1: 1      Repts
  2: 35     2500 mV 50 Hz Rejection Range
  3: 8      SE Channel
  4: 12     Loc [ HumVent ]
  5: 0.1    Mult
  6: 0.0    Offset

;===== WIND SPEED =====

12: Pulse (P3)
  1: 1      Repts
  2: 1      Pulse Input Channel
  3: 21     Low Level AC, Output Hz
  4: 5      Loc [ Vhast_m_s ]
  5: 0.098  Mult
  6: 0      Offset

;===== WIND DIRECTION =====

13: Excite-Delay (SE) (P4)

```

```

1: 1      Reps
2: 5      2500 mV Slow Range
3: 9      SE Channel
4: 1      Excite all reps w/Exchan 1
5: 2      Delay (units 0.01 sec)
6: 2500   mV Excitation
7: 6      Loc [ Vrikt____ ]
8: 0.142  Mult
9: -135   Offset

14: IF (X<=>F) (P89)
1: 6      X Loc [ Vrikt____ ]
2: 4      <
3: 0      F
4: 30     Then Do

15: Z=X+F (P34)
1: 6      X Loc [ Vrikt____ ]
2: 360    F
3: 6      Z Loc [ Vrikt____ ]

16: End (P95)

;===== GLOBAL RADIATION =====
17: Volts (SE) (P1)
1: 1      Reps
2: 33     25 mV 50 Hz Rejection Range
3: 10     SE Channel
4: 7      Loc [ Sol__W_m_ ]
5: 116.55 Mult
6: 0.0000 Offset

;===== PRECIPITATION =====
18: Pulse (P3)
1: 1      Reps
2: 2      Pulse Input Channel
3: 2      Switch Closure, All Counts
4: 8      Loc [ Nederb_mm ]
5: 0.16   Mult
6: 0.0    Offset

19: Internal Temperature (P17)
1: 9      Loc [ Logtemp_C ]

; ===== OUTPUT =====

20: If time is (P92)
1: 0      Minutes (Seconds --) into a
2: 60     Interval (same units as above)
3: 10     Set Output Flag High

21: Set Active Storage Area (P80)
1: 1      Final Storage Area 1
2: 101    Array ID

22: Real Time (P77)
1: 1220   Year,Day,Hour/Minute (midnight = 2400)

```

```

23: Average (P71)
  1: 4      Reps
  2: 1      Loc [ T1_bur__C ]

24: Wind Vector (P69)
  1: 1      Reps
  2: 1      Samples per Sub-Interval
  3: 0      S, é1, & â(é1) Polar
  4: 5      Wind Speed/East Loc [ Vhast_m_s ]
  5: 6      Wind Direction/North Loc [ Vrikt____ ]

25: Average (P71)
  1: 1      Reps
  2: 7      Loc [ Sol__W_m_ ]

26: Totalize (P72)
  1: 1      Reps
  2: 8      Loc [ Nederb_mm ]

27: Average (P71)
  1: 2      Reps
  2: 11     Loc [ TempVent  ]

28: Maximize (P73)
  1: 1      Reps
  2: 10     Value with Hr-Min
  3: 5      Loc [ Vhast_m_s ]

29: Serial Out (P96)
  1: 71     SM192/SM716/CSM1

; ===== STORAGE DAILY MEANS AT MIDNIGHT =====

30: If time is (P92)
  1: 0      Minutes (Seconds --) into a
  2: 1440   Interval (same units as above)
  3: 10     Set Output Flag High

31: Set Active Storage Area (P80)
  1: 1      Final Storage Area 1
  2: 124    Array ID

32: Real Time (P77)
  1: 1220   Year,Day,Hour/Minute (midnight = 2400)

33: Average (P71)
  1: 4      Reps
  2: 1      Loc [ T1_bur__C ]

34: Maximize (P73)
  1: 1      Reps
  2: 10     Value with Hr-Min
  3: 2      Loc [ T2_skyd_C ]

35: Minimize (P74)
  1: 1      Reps
  2: 10     Value with Hr-Min
  3: 2      Loc [ T2_skyd_C ]

```

```

36: Maximize (P73)
  1: 1      Reps
  2: 10     Value with Hr-Min
  3: 5      Loc [ Vhast_m_s ]

37: Wind Vector (P69)
  1: 1      Reps
  2: 1      Samples per Sub-Interval
  3: 1      S, é1 Polar
  4: 5      Wind Speed/East Loc [ Vhast_m_s ]
  5: 6      Wind Direction/North Loc [ Vrikt____ ]

38: Average (P71)
  1: 1      Reps
  2: 7      Loc [ Sol__W_m_ ]

39: Totalize (P72)
  1: 1      Reps
  2: 8      Loc [ Nederb_mm ]

40: Sample (P70)
  1: 1      Reps
  2: 10     Loc [ Batteri_V ]

41: Average (P71)
  1: 2      Reps
  2: 11     Loc [ TempVent  ]

42: Serial Out (P96)
  1: 71     SM192/SM716/CSM1

43: If time is (P92)
  1: 60     Minutes (Seconds --) into a
  2: 1440   Interval (same units as above)
  3: 10     Set Output Flag High

44: Set Active Storage Area (P80)
  1: 1      Final Storage Area 1
  2: 103    Array ID

45: Real Time (P77)
  1: 1220   Year,Day,Hour/Minute (midnight = 2400)

; SAMPLE TEMP FOR COMPARISON WITH 3-HOURLY DATA OF OTHER STATIONS =====

46: Sample (P70)
  1: 1      Reps
  2: 2      Loc [ T2_skyd_C ]

47: If time is (P92)
  1: 240    Minutes (Seconds --) into a
  2: 1440   Interval (same units as above)
  3: 10     Set Output Flag High

48: Set Active Storage Area (P80)
  1: 1      Final Storage Area 1
  2: 103    Array ID

```

```

49: Real Time (P77)
   1: 1220      Year,Day,Hour/Minute (midnight = 2400)

50: Sample (P70)
   1: 1        Reps
   2: 2        Loc [ T2_skyd_C ]

51: If time is (P92)
   1: 420      Minutes (Seconds --) into a
   2: 1440     Interval (same units as above)
   3: 10       Set Output Flag High

52: Set Active Storage Area (P80)
   1: 1        Final Storage Area 1
   2: 103      Array ID

53: Real Time (P77)
   1: 1220      Year,Day,Hour/Minute (midnight = 2400)

54: Sample (P70)
   1: 1        Reps
   2: 2        Loc [ T2_skyd_C ]

; 3-HOURLY TEMP VALUES TO FILE =====0

55: If time is (P92)
   1: 600      Minutes (Seconds --) into a
   2: 1440     Interval (same units as above)
   3: 10       Set Output Flag High

56: Set Active Storage Area (P80)
   1: 1        Final Storage Area 1
   2: 103      Array ID

57: Real Time (P77)
   1: 1220      Year,Day,Hour/Minute (midnight = 2400)

58: Sample (P70)
   1: 1        Reps
   2: 2        Loc [ T2_skyd_C ]

59: If time is (P92)
   1: 780      Minutes (Seconds --) into a
   2: 1440     Interval (same units as above)
   3: 10       Set Output Flag High

60: Set Active Storage Area (P80)
   1: 1        Final Storage Area 1
   2: 103      Array ID

61: Real Time (P77)
   1: 1220      Year,Day,Hour/Minute (midnight = 2400)

62: Sample (P70)
   1: 1        Reps
   2: 2        Loc [ T2_skyd_C ]

```

```

63:  If time is (P92)
    1: 960      Minutes (Seconds --) into a
    2: 1440     Interval (same units as above)
    3: 10       Set Output Flag High

64:  Set Active Storage Area (P80)
    1: 1        Final Storage Area 1
    2: 103      Array ID

65:  Real Time (P77)
    1: 1220     Year,Day,Hour/Minute (midnight = 2400)

66:  Sample (P70)
    1: 1        Reps
    2: 2        Loc [ T2_skyd_C ]

67:  If time is (P92)
    1: 1140     Minutes (Seconds --) into a
    2: 1440     Interval (same units as above)
    3: 10       Set Output Flag High

68:  Set Active Storage Area (P80)
    1: 1        Final Storage Area 1
    2: 103      Array ID

69:  Real Time (P77)
    1: 1220     Year,Day,Hour/Minute (midnight = 2400)

70:  Sample (P70)
    1: 1        Reps
    2: 2        Loc [ T2_skyd_C ]

71:  If time is (P92)
    1: 1320     Minutes (Seconds --) into a
    2: 1440     Interval (same units as above)
    3: 10       Set Output Flag High

72:  Set Active Storage Area (P80)
    1: 1        Final Storage Area 1
    2: 103      Array ID

73:  Real Time (P77)
    1: 1220     Year,Day,Hour/Minute (midnight = 2400)

74:  Sample (P70)
    1: 1        Reps
    2: 2        Loc [ T2_skyd_C ]

*Table 2 Program
  01: 0.0000     Execution Interval (seconds)

*Table 3 Subroutines

End Program

1      [ T1_bur_C ]  RW--   2      1      Start ----- ---
2      [ T2_skyd_C ] RW--   12      1      ----- End

```

3	[T3_Rot__C]	RW--	2	1	Start	-----	---
4	[rH_Rot___]	RW--	2	1	-----	-----	---
5	[Vhast_m_s]	RW--	4	1	-----	-----	---
6	[Vrikt_____]	RW--	4	2	-----	-----	---
7	[Sol__W_m_]	RW--	2	1	-----	-----	---
8	[Nederb_mm]	RW--	2	1	-----	-----	---
9	[Logtemp_C]	-W--	0	1	-----	-----	---
10	[Batteri_V]	RW--	2	1	-----	-----	---
11	[TempVent]	RW--	2	1	-----	-----	---
12	[HumVent]	RW--	2	1	-----	-----	---
13	[_____]	----	0	0	-----	-----	---
14	[_____]	----	0	0	-----	-----	---
15	[_____]	----	0	0	-----	-----	---
16	[_____]	----	0	0	-----	-----	---
17	[_____]	----	0	0	-----	-----	---
18	[_____]	----	0	0	-----	-----	---
19	[_____]	----	0	0	-----	-----	---
20	[_____]	----	0	0	-----	-----	---
21	[Rs_Ro_T1]	RW--	1	1	-----	-----	---
22	[Rs_Ro_T2]	RW--	1	1	-----	-----	---
23	[Rs_Ro_ven]	RW--	1	1	-----	-----	---
24	[_____]	----	0	0	-----	-----	---
25	[_____]	----	0	0	-----	-----	---
26	[_]	----	0	0	-----	-----	---
27	[Rs_lo2]	----	0	0	-----	-----	---
28	[Temp2m]	----	0	0	-----	-----	---
29	[RelHum2m]	----	0	0	-----	-----	---
101	[_____]	----	0	0	-----	-----	---
103	[_____]	----	0	0	-----	-----	---
124	[_____]	----	0	0	-----	-----	---