V.3.3-SNOW-17 HYDRO-17 SNOW MODEL OPERATION

Bookmarks

Contents

[Next] [Previous] [Bookmarks] [Top]

Identifier: SNOW-17

[Next] [Previous] [Bookmarks] [Top]

Application: All programs

[Next] [Previous] [Bookmarks] [Top]

Description: This Operation is the snow accumulation and ablation model first described in HYDRO-17 [Anderson (1973)]. This model uses air temperature as the only index to energy exchange at the snow-air interface. A complete description of the model is in Chapter II.2-SNOW-17 [Hyperlink].

The original HYDRO-17 model was programmed to use data and perform

computations on a 6 hour data time interval. This Operation is programmed so that the data time interval is variable. The computational time interval (i.e., the minimum period for which the Operation can be executed) is the data time interval of the air temperature data. Precipitation data can be supplied more frequently.

Rain+melt is calculated for the same time interval used for precipitation. More frequent computation of rain plus melt allows for simulating the response of high intensity rain on small headwater basins without having to supply temperature data at the same frequency. Observed data values for use in making updates or comparisons can be supplied at any multiple of the computational time interval.

The original HYDRO-17 model used a sinusoidal seasonal melt-factor variation when computing melt during non-rain periods. An alternative variation was later added for use in Alaska. This Operation also allows for a user specified seasonal melt-factor variation. This option was partly added for use in watersheds where glaciers have a major contribution to the amount of meltwater prior to the development of the GLACIER operation (see V.3.3-GLACIER).

The original HYDRO-17 model used air temperature to determine whether precipitation was in the form of rain or snow. This Operation has 3 ways to determine the form of the precipitation. The 3 methods, in their order of precedence, are as follows:

1. The percent of precipitation that is rain and snow can be specified directly for each data time interval. This is done by using a percent snowfall time series or by specifying the form of precipitation at run time when making operational forecasts.

2. The elevation that separates rain from snow can be input to the Operation for each data time interval. In this case the area-elevation curve must be specified so that the percent of the area receiving rain and the percent receiving snow can be computed. The rain-snow elevation can be generated by using the Rain-Snow Elevation Operation (see V.3.3-RSNWELEV [Hyperlink]).

3. Air temperature is used to determine the form of precipitation. If the temperature is greater than a threshold value (the PXTEMP parameter), the precipitation is rain, otherwise it is snow. This is the default method used when the other methods are not enabled or when the percent snowfall time series contains missing values.

The Operation contains procedures for updating water-equivalent and areal extent of snow cover in both operational and calibration applications. Some features of the updating procedures are:

1. The updating procedures can be turned 'on' or 'off' at run time by the user. When the update option is 'on', updating takes place only when observed data are available and the difference between computed and observed values exceeds a specified tolerance.

2. Observed data are always supplied in time series form in the Calibration System programs. In the Operational Forecast System programs observed data can be supplied in time series form or directly at run time. Time series are generally used when data are observed frequently and/or automatically processed. Direct entry is useful for infrequent or manually processed observations.

3. When updating water-equivalent, the areal extent of the snow cover is automatically adjusted when the water-equivalent is updated. This adjustment is based on the relationship described by the areal depletion curve. When updating the areal extent, the water-equivalent is not changed.

The Operation also includes melt adjustment factors. The melt correction factor can be used to increase or decrease melt during non-rain periods. A wind function adjustment factor can be used to increase or decrease the amount of turbulent transfer during rain-on-snow periods. These factors are supplied at run time.

[Next] [Previous] [Bookmarks] [Top]

References:

Anderson, Eric A., 1973, National Weather Service River Forecast System - Snow Accumulation and Ablation Model, NOAA Technical Memorandum NWS HYDRO-17, U.S. Dept. of Commerce, Silver Spring, MD.

[Next] [Previous] [Bookmarks] [Top]

Allowable Data Time Intervals: 1, 2, 3, 4, 6, 8, 12 and 24 hours

[Next] [Previous] [Bookmarks] [Top]

Time Series Used: Time series used in this Operation are as follows:

General Type	Dimn	Units	Use	Required	Form of Output T.S.	Data Time Interval	Missing Values Allowed
Precipitation	L	MM	I	yes	n/a	any	no
Air temperature	TEMP	DEGC	I	yes	n/a	any 1/	no
Rain+melt	L	MM	O	no	replaces	any 2/	no
Percent snowfall	DLES	PCTD	I	no	n/a	any 2/	yes
Rain-snow elevation	L	M	I	no	n/a	any 3/	no
Observed water-equivalent	L	MM	I	no	n/a	any 4/	yes

Simulated water-Equivalent	L	MM	O	no	replaces	any 4/	no
Observed areal cover	DLES	PCTD	I	no	n/a	any 4/	yes
Simulated areal cover	DLES	PCTD	O	no	replaces	any 4/	no
Simulated snow depth	L	CM	O	no	replaces	any 4/	no
Observed snow depth	L	CM	I	no	n/a	any 4/	yes

1/ Must be an even multiple of the data time interval for precipitation data.

2/ Must be the same as the data time interval for precipitation data.

3/ Must be the same as the data time interval for temperature data.

4/ Must be an even multiple of the data time interval for air temperature data.

[Next] [Previous] [Bookmarks] [Top]

Input Summary: The card input for this Operation is as follows:

Card	Format	Columns	Contents
1	5A4	1-20	Header information (e.g. name of the area or point)
	F5.0	21-25	Elevation of the area or point (units of M)
	F5.0	26-30	Latitude of the area or point in degrees; if greater than or equal to 54.0 then the Alaskan seasonal melt-factor variation is used
	1XA4	32-35	Printer output control; enter 'ALL ' for output on all days; enter 'NONE' for no output; default is output on last day of observed data, last day of run period and days when: o snow first appears o snow disappears o snowfall or rain-on-snow exceeds 5 MM o surface energy exchange exceeds 5 MM o observed data are available
	2X,A3	38-40	Observed time series indicator; default

Card	Format	Columns	Contents
			is no observed time series used; enter 'YES' if observed water-equivalent or areal snow cover time series are used
	2X,A3	43-45	Simulated time series indicator; default is no simulated time series produced; enter 'YES' if the Operation should generate simulated water-equivalent or areal snow cover time series
	1X,A4	47-50	Option to store sums of snow cover water balance variables; default is sums not stored; enter 'SUMS' to store water balance variables
	4X,A4,A2	55-60	Update option (only used for Calibration System programs); default is no updating; enter 'UPDATE' to update water-equivalent and areal snow cover when observed values are available
	1X,A4	62-65	Read carryover option; default is to set carryover values to indicate no snow cover exists; enter 'RDCO' to input initial snow conditions
	1X,A4	67-70	Rain-snow elevation option; default is to not use rain-snow elevation data; enter 'AVSE' to use an areal versus elevation curve and a rain-snow elevation time series to determine the form of precipitation
2	3X,I2	4-5	Data time interval in hours for precipitation, rain plus melt and percent snowfall time series; default is 6
	2X,2A4	8-15	Identifier of precipitation time series
	1X,A4	17-20	Data type code of precipitation time series
	F10.0	21-30	PXADJ; precipitation adjustment factor; applied to all precipitation
	7X,2A4	38-45	Identifier of rain plus melt time series; blank if not used
	1X,A4	47-50	Data type code of rain plus melt time

Card	Format	Columns	Contents
			series; blank if not used
	7X,2A4	58-65	Identifier of percent snowfall time series; blank if not used
	1X,A4	67-70	Data type code of percent snowfall time series; blank if not used
3	2X,2A4	3-10	Identifier of air temperature time series
	1X,A4	12-15	Data type code of air temperature time series
	3X,I2	19-20	Data time interval in hours of air temperature time series; must be a multiple of the data time interval of the precipitation time series; default is 6
	F10.0	21-30	Elevation associated with the air temperature time series in meters; default is elevation associated with temperature data is the same as the elevation of the area or point

Lapse rates only needed if the elevation of the temperature data differs from the elevation of the area or point where the model is being applied.

	F5.0	31-35	Lapse rate at time of maximum temperature (assumed to occur at 3 PM local standard time; units of DEGC/100M)
	F5.0	36-40	Lapse rate at time of minimum temperature (assumed to occur at 6 AM local standard time; units of DEGC/100M)

Card 3A only included if the rain-snow elevation option on card 1 is set to 'AVSE'.

3A	3X,I2	4-5	Number of points used to define the area-elevation curve; maximum is 12; does not include the maximum and minimum elevation points
	F10.0	6-15	Minimum elevation (units of FT or M)
	F10.0	16-25	Maximum elevation (units of FT or M)
	1X,A4	27-30	Elevation units for cards 3A and 3B:

Card	Format	Columns	Contents
			'ENGL' = English units (units of FT); default 'METR' = Metric units (units of M)
	2X,2A4	33-40	Identifier of the rain-snow elevation time series
	1X,A4	42-45	Data type code of rain-snow elevation time series

Card 3B included if the number of points used to define the area-elevation curve on card 3A is greater than zero. Card 3B can contain up to 4 points. Card 3B is repeated as necessary to input all points. Elevations must be in an increasing order.

3B	F10.0	1-10	Elevation of the 1st point on area-elevation curve (units of FT or M)
	2X,F3.2	13-15	Decimal fraction of area below the 1st elevation point
	F10.0,2X,F3.2	16-30	Second pair of elevation and fraction of area below points (if needed)
	F10.0,2X,F3.2	31-45	Third pair of points (if needed)
	F10.0,2X,F3.2	46-60	Fourth pair of points (if needed)

Card 4 only included if the observed time series indicator on Card 1 is set to 'YES'.

4	2X,2A4	3-10	Identifier of observed water-equivalent time series; blank if not used
	1X,A4	12-15	Data type code for observed water-equivalent time series; blank if not used
	3X,I2	19-20	Data time interval of observed water-equivalent time series; must be a multiple of the data time interval of the temperature time series; blank if not used
	12,2A4	33-40	Identifier of observed areal extent of snow cover time series; blank if not used
	1X,A4	42-45	Data type code of observed areal snow cover time series; blank if not used
	3X,I2	49-50	Data time interval of observed areal snow cover time series; must be a multiple of the data time interval of

Card	Format	Columns	Contents
			the temperature time series; blank if not used
	2X,2A4	53-60	Internal identifier for the observed snow depth time series; blank if none used
	1X,A4	62-65	Data type code for the observed snow depth time series; blank if none used
	3X,I2	69-70	Data time interval for the observed snow depth time series; blank if none used

Card 5 only included if the simulated time series indicator on Card 1 is set to 'YES'.

5	2X,2A4	3-10	Identifier of simulated water-equivalent time series; blank if not used
	1X,A4	12-15	Data type code of simulated water-equivalent time series
	3X,I2	19-20	Data time interval of simulated water-equivalent time series; must be a multiple of the data time interval of the temperature time series; blank if not used
	12X,2A4	33-40	Identifier of simulated areal extent of snow cover time series; blank if not used
	1X,A4	42-45	Data type code of simulated areal snow cover time series; blank if not used
	3X,I2	49-50	Data time interval of simulated areal snow cover time series; must be a multiple of the data time interval of the temperature time series; blank if not used
	2X,2A4	53-60	Internal identifier for the simulated snow depth time series; blank if none used
	1X,A4	62-65	Data type code for the simulated snow depth time series; blank if none used
	3X,I2	69-70	Data time interval for the simulated snow depth time series; blank if none used

Card 6 contains the major parameters for the snow model.

Card	Format	Columns	Contents
6	F5.0	1-5	SCF (snowfall correction factor)
	F5.0	6-10	MFMAX (maximum non-rain melt factor; units of MM/DEGC/6HR)
	F5.0	11-15	MFMIN (minimum non-rain melt factor; units of MM/DEGC/6HR)
	F5.0	16-20	UADJ (average value of the wind function during rain-on-snow events; units of MM/MB)
	F5.0	21-25	SI (areal water-equivalent above which there is always 100 percent snow cover; units of MM)
	4X,I1	30	Seasonal melt-factor variation indicator: 0 = use normal seasonal melt-factor variation (curve used is based on latitude) 1 = use user specified seasonal melt-factor variation

Card 6A is only needed if column 30 card 6 equals 1.

6A	12F5.0	1-60	Seasonal melt-factor variation (specified as decimal fraction of where the melt-factor lies between MFMIN and MFMAX on the 16th of each month; i.e. 0.0 = MFMIN, 1.0 = MFMAX, 0.5 = ((MFMIN+MFMAX)*0.5); this option is primarily intended for use in calculating melt from glaciers

Card 7 contains minor parameters for the snow model and updating parameters.

7	F5.0	1-5	NMF (maximum negative melt factor; units of MM/DEGC/6HR)
	F5.0	6-10	TIPM (antecedent snow temperature index parameter; range is 0.1 to 1.0)
	F5.0	11-15	MBASE (base temperature for non-rain melt factor; units of DEGC)
	F5.0	16-20	PXTEMP (temperature that separates rain from snow; units of DEGC; rain if temperature is greater than PXTEMP; snow if less than or equal to PXTEMP; not used if a valid percent snowfall time series value is available or if

Card	Format	Columns	Contents
			rain-snow elevation option is selected)
	F5.0	21-25	PLWHC (maximum amount of liquid-water held against gravity drainage-decimal fraction)
	F5.0	26-30	DAYGM (daily melt at the snow-soil interface; units of MM)
The next 2 values are always needed for Operational Forecast System programs and are only needed for Calibration System programs if the update option on Card 1 is turned on.			
	F5.0	31-35	Tolerance used when updating water-equivalent-decimal fraction; updating only occurs if |Simulated-Observed| is greater than tolerance times Observed
	F5.0	36-40	Tolerance used when updating areal extent of snow cover; decimal fraction; updating only occurs if |Simulated-Observed| is greater than the tolerance
8	9F5.0	1-45	Areal depletion curve; decimal fraction; areal snow cover at WE/Ai ratios of 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8 and 0.9; for WE/Ai = 0.0, areal cover = 0.05; for WE/Ai = 1.0, areal cover = 1.0
Card 9 only needed if read carryover option on Card 1 is set to 'RDCO'			
9	F5.0	1-5	Initial water-equivalent of solid (ice) portion of the snow cover (units of MM)
	F5.0	6-10	Initial heat deficit (units of MM)
	F5.0	11-15	Initial amount of liquid-water held against gravity drainage (units of MM)
	F5.0	16-20	TINDEX (initial antecedent snow temperature index; units of DEGC)
	F5.0	21-25	ACCMAX (maximum water-equivalent that has occurred since snow began to accumulate (units of MM)
	4X,I1	30	Read additional carryover option; default is do not input additional carryover values, but calculate them based on card 9 values: 1 = read additional carryover values
	F5.0	31-35	SNDPT (snow depth; units of CM); if

Card	Format	Columns	Contents
			blank, calculate based on density = 0.2
	F5.0	36-40	SNTMP (average snow cover temperature; units of DEGC); if blank, set equal to TINDEX if heat deficit greater than 0.0 and set equal to zero otherwise.
	F5.0	41-45	TAPREV (air temperature for the previous time interval; units of DEGC); if blank, set to missing and then set to current temperature when execution begins.

Card 10 only needed if the option to read the additional carryover values is set to 1 on card 9.

10	F5.0	1-5	SB (units of MM)
	F5.0	6-10	SBAESC (units of decimal fraction)
	F5.0	11-15	SBWS (units of MM)
	F5.0	16-20	STORGE (units of MM)
	F5.0	21-25	AEADJ (units of MM)
	7F5.0	26-60	Lagged excess water (units of MM); number of values is $5/\Delta t_p$ +2 where Δt_p is the precipitation data time interval

[Next] [Previous] [Bookmarks] [Top]

Sample Input and Output: Sample input is shown in Figure 1 [Bookmark]. Sample output from the parameter print routine is shown in Figure 2 [Bookmark]. Sample output from the execution routine is shown in Figure 3 [Bookmark].

[Next] [Previous] [Bookmarks] [Top]

Error and Warning Messages: The error and warning messages generated by this Operation and the corrective action to take when they occur are as follows:

A. Messages that can occur during setup:

1. **ERROR** TIME INTERVAL (XX HOURS) OF THE TEMPERATURE DATA IS NOT A MULTIPLE OF THE TIME INTERVAL (XX HOURS) OF THE PRECIPITATION.

   Action: Change one or the other data time interval so the data time interval of the temperature data is a multiple of that for precipitation.

2. **WARNING** AT LEAST ONE OF THE LAPSE RATES ARE NOT POSITIVE.

Card	Format	Columns	Contents

CHECK THAT VALUES ARE CORRECT.

Action: Temperature normally decreases with elevation, though in a few areas inversion conditions predominate, especially for minimum temperatures, during the snow season.

3. **ERROR** THE TIME INTERVAL OF A TIME SERIES (I.D.=XXXXXXXX TYPE=XXXX XX HOURS) IS NOT A MULTIPLE OF THE TIME INTERVAL (XX HOURS) OF THE TEMPERATURE DATA.

   Action: Change data time intervals so the data time interval is a multiple of that for the temperature data.

4. **ERROR** ONE OR MORE VALUES OF THE AREAL DEPLETION CURVE ARE LESS THAN THE PRECEDING VALUE.

   Action: Make sure each value of the areal depletion is greater than or equal to the preceding value.

5. **ERROR** THE NUMBER OF AREA-ELEVATION CURVE POINTS INPUT (XX) EXCEEDS 12.

   Action: Reduce the number of points used to define the area-elevation curve.

6. **ERROR** ONE OR MORE VALUES IN THE AREA-ELEVATION CURVE ARE LESS THAN THE PRECEDING VALUE.

   Action: Make sure that the elevations and fraction of area below each elevation are in increasing order.

B. Messages that occur during execution.

1. **WARNING** SNOW BALANCE RESIDUAL EXCEEDS 1 mm. RESIDUAL = XXXX.XX.

   Action: Operation is not executing properly, call for assistance.

[Next] [Previous] [Bookmarks] [Top]

Carryover Transfer Rules: The following adjustments are applied to carryover values when parameters are changed:

1. Liquid-water held against gravity drainage is reduced by the amount that it exceeds PLWHC multiplied by the ice portion of the snow cover.

2. SB and SBWS are decreased by the same amount that liquid-water is reduced.

3. SBAESC is recomputed if SI or the areal depletion curve are changed.

4. Lagged excess water is redistributed if the data time interval of the precipitation data is changed. If the data time interval is decreased, some of the excess water is lost.

5. Snow depth is computed based on a density of 0.2 if not available in the carryover file.

6. Snow cover temperature is set to the value of TINDEX if not available in the carryover file.

All other carryover values are not affected by changes to parameters.

[Next] [Previous] [Bookmarks] [Top]

Card Punch Limitations: The punched card formats for this Operation are as follows. No checks are made to determine if values exceed the specified range since this should seldom occur.

Parameters or Variables	Punch Format	Maximum Value	Minimum Value
PXADJ	F10.3	999999.999	0.001
Elevation of temperature data, elevations in area-elevation curve	F10.0	999999999.	-99999999.
Lapse rates	F5.2	99.99	-9.99
Elevation of area, SI, LIQW	F5.0	9999.	0.0 (Elev.=-999.)
Latitude, MBASE, PXTEMP, NEGHS, TINDEX, STORAGE, Lagged excess water, SNTMP, TAPREV	F5.1	999.9	0.0 (Temp.=-99.9)
MFMAX, MFMIN, SCF, NMF, TIPM, DAYGM,	F5.2	99.99	0.0
UADJ	F5.3	9.999	0.0
WE, ACCMAX, SB, SBWS, AEADJ, SNDPT	I5	99999	0
User specified seasonal melt-factor variation, depletion curve, SBAESC, PLWHC, updating tolerances	F5.2	1.00	0.0
Fraction of area below specified elevation	F3.2	.99	.01

Figure 1. Sample card input for Operation SNOW-17

```
                                    COLUMN
        10        20        30        40        50        60        70        80
----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+
ABOVE 2100 FT       1080. 67.8            YES SUMS                AVSE
    6  MFKA2UPR MAP       1.00       MFKA2UPR RAIM
  MFKA2UPR MAT     6     1080. 0.90 0.60
    4       638.      1968. METR  MFKA2UPR RSEL
      972.  .39      1304.  .80     1525.  .94     1745.  .99
  MFKA2UPR SWE    24            MFKA2UPR SASC    6  MFKA2UPR SNSG   24
 0.95 0.80 0.10 0.15 999.    0
 0.20 0.10  0.0  1.0 0.10 0.00
  .08  .14  .30  .37  .41  .47  .55  .67  .87
```


Figure 2. Sample output from Operation SNOW-17 print parameter routine

```
SNOW MODEL OPERATION FOR ABOVE 2100 FT            ELEV=1080. M   LAT.= 67.8
     COMPUTATIONAL TIME INTERVAL IS  6 HOURS.
          TIME SERIES USED BY THIS OPERATION.

     CONTENTS              I.D.       TYPE     TIME INTERVAL     OTHER
PRECIPITATION            MFKA2UPR     MAP         6 HOURS      PXADJ= 1.00
AIR TEMPERATURE          MFKA2UPR     MAT         6 HOURS      TAELEV=1080.
SIM-SNOW-DEPTH           MFKA2UPR     SNSG       24 HOURS
RAIN+MELT                MFKA2UPR     RAIM        6 HOURS
SIMULATED W.E.           MFKA2UPR     SWE        24 HOURS
SIM. AREAL COVER         MFKA2UPR     SASC        6 HOURS
RAIN-SNOW ELEVATION      MFKA2UPR     RSEL        6 HOURS
SUMS OF WATER BALANCE VARIABLES ARE STORED.
SNOW COVER VARIABLES DISPLAYED ON ALL SIGNIFICANT DAYS.
PARAMETER VALUES

     MAJOR PARAMETERS    SCF  MFMAX  MFMIN   UADJ     SI
                        0.95   0.80   0.10  0.150   999.
     MINOR PARAMETERS    NMF   TIPM  MBASE PXTEMP  PLWHC  DAYGM
                        0.20   0.10    0.0    1.0   0.10   0.00
     DEPLETION CURVE   WE/AI    0.0  0.1  0.2  0.3  0.4  0.5  0.6  0.7  0.8  0.9  1.0
                       COVER   0.05 0.08 0.14 0.30 0.37 0.41 0.47 0.55 0.67 0.87  1.0
     AREA-ELEVATION CURVE     ELEVATION UNITS=FT
          ELEV.  2093.  3189.  4278.  5003.  5725.  6457.
          BELOW   0.00   0.39   0.80   0.94   0.99   1.00
SNOW COVER CONDITIONS FOR ABOVE 2100 FT
     NO SNOW COVER EXISTS
```

Figure 3. Sample output from Operation SNOW-17 execution routine

'MFKA2UPR' SNOW-17 OUTPUT FOR ABOVE 2100 FT 5/1963 (UNITS ARE 'IN' EXCEPT - SNOW TEMP. 'DegF',
DAILY OUTPUT IS FOR HOUR 24 TIME ZONE=INTL DEPTH 'IN', ELEV 'FT', AND AREAL COVER 'DEC. FRAC')

DAY	SNOWFALL	RAIN ON SNOW	ENERGY EXCHANGE	SIM. COVER	PCT. LIQ. WATER	HEAT DEFICIT	SNOW TEMP.	SIM. DEPTH	OBS. DEPTH	SIM. WE	OBS. WE	OBS. COVER	RAIN-SNOW ELEVATION
13	0.00	0.01	0.22	1.00	3.9	0.00	14.4	30.15	-999.00	9.69	-999.00	-999.00	3955.
14	0.00	0.00	0.47	1.00	9.4	0.00	16.5	28.40	-999.00	9.69			
15	0.00	0.00	0.46	0.94	10.0	0.00	19.0	26.73	-999.00	9.33			
18	0.00	0.00	0.39	0.81	10.0	0.00	22.8	23.78	-999.00	8.57	-999.00	-999.00	5343.
19	0.00	0.00	0.53	0.69	10.0	0.00	25.7	21.97	-999.00	7.96			
20	0.00	0.03	0.37	0.63	10.0	0.00	28.6	20.66	-999.00	7.58	-999.00	-999.00	5342.
21	0.00	0.03	0.40	0.58	10.0	0.00	31.1	19.29	-999.00	7.16	-999.00	-999.00	6501.
22	0.00	0.00	0.49	0.52	10.0	0.00	32.0	17.67	-999.00	6.56	-999.00	-999.00	4841.
23	0.00	0.00	0.29	0.50	10.0	0.00	32.0	16.67	-999.00	6.22			
25	0.00	0.00	0.24	0.47	10.0	0.00	32.0	15.42	-999.00	5.85			
26	0.00	0.00	0.26	0.45	10.0	0.00	32.0	14.56	-999.00	5.57			
27	0.00	0.00	0.26	0.43	10.0	0.00	32.0	13.74	-999.00	5.29			
28	0.00	0.00	0.26	0.41	10.0	0.00	32.0	12.92	-999.00	4.98			
31	0.00	0.00	-0.01	0.40	10.0	0.02	30.6	12.08	-999.00	4.70	-999.00	-999.00	733.