MCB 5 AERMET version 14134 changes by change type.

Listed with each change are the affected AERMET stages.

BUG FIXES

Item	Modification	Stage
1	Modified subroutines SUBST and MPPBL to correct potential issues associated with the options that were introduced in version 13350 to substitute for missing cloud cover (CCVR) and/or temperature (TEMP) by linear interpolation across 1 or 2-hour gaps. This included an error that may have resulted in substituted CCVR values larger than 10 for hour 01, which may have resulted in 'NaN' (not a number) for some calculated variables. Issues with CCVR substitutions may also have occurred for applications using ONSITE meteorological data only, with ONSITE net radiation (NRAD) or with solar radiation (INSO) and delta-T (DT01) data using the Bulk Richardson Number (BULKRN) option. In these cases AERMET calculates equivalent cloud cover values that are included in the surface output file, but no substitutions for missing values should be included.	3
2	Modified subroutine SUBST to remove the initialization of the GOT_OSTMP logical variable to .FALSE. for the current hour. The GOT_OSTMP variable is assigned a value in subroutine GETTEMP prior to the call to subroutine SUBST. This error may have affected calculations of station pressure and relative humidity for applications with ONSITE data, including relative humidity values greater than 100 for applications with both SURFACE and ONSITE data.	3
3	Modified subroutine GETTEMP to reinitialize the LTZMAX4T variable to .TRUE. within the hour loop, indicating that the maximum height for ONSITE temperature had not been reached yet. The ONSITE temperature may have been incorrectly interpreted as being missing in version 13350 for some cases.	3
4	Modified subroutines GETTEMP and SUBST to ensure that substitutions for missing ONSITE temperature data are only based on values from the same measurement level if multiple levels of temperature are available.	3
5	Modified subroutine MPPBL to address issues associated with the selection of the appropriate upper air sounding time. This includes use the INT function instead of NINT when assigning 'MyZone' to determine the reference sounding time based on the longitude of the location for the default option. Subroutine MPPBL was also modified to use an integer variable (ICHRND_UASRISE) instead of a real variable (CHRND_UASRISE) for assigning the 'START_WINDOW' when the UASELECT SUNRISE option is used.	3
6	Modified subroutines FLOPEN and WRTCRD to use STATUS='REPLACE' instead of STATUS='SCRATCH' when opening the DEV70 and DEV75 "temporary" files to store the header records in the ".IQA", ".OQA", and MERGE data files that contain information for reprocessing of input options during subsequent stages of AERMET processing. This modification addresses issues that were encountered where AERMET was not able to locate the 'SCRATCH' files when applying a 64-bit version of AERMET.	All
7	Modified subroutines SUMHF and SUNDAT to eliminate integer/real mixed-mode calculations in summing the hourly heat fluxes, and in calculating sunrise/sunset times and solar elevation angles.	3

| 8 | Modified subroutine BULKRI to include the THSTAR adjustment for low solar elevation angles under the original BULKRN method and for the non-Default/BETA ADJ_U* option associated with the BULKRN option. Subroutine BULKRI was also modified to avoid an array subscript out-of-bounds error in cases where the iterative approach does not converge within the specified loop limits. | 3 |
| 9 | Modified subroutine MPFIN to include additional error handling and reporting associated with processing of surface characteristics | 3 |

ENHANCEMENTS

Item	Modification	Stage
1	Modified subroutines VRCARD, SUBST, MPPBL, and MPOUT to allow users to disable substitutions for missing CCVR and/or TEMP data that are based on persistence for hours 23 and 24. Additional flags have been added to the surface output file to identify when this option is applicable. These changes also allow users to specify either the NO_SUB or NOTSUB keyword to disable TEMP substitutions.	3
2	Subroutine OSDTCD was modified to include logical variables to identify the availability of ONSITE data for ambient temperature, solar radiation/insolation, cloud cover, net radiation, delta-T, and/or mixing heights. Several other subroutines were modified, including MPPBL, MPMET, MPFIN, and MPTEST to track whether substitutions for missing temperature and/or cloud cover should be implemented by default, based on whether only ONSITE data or only SURFACE data are available for a given parameter. Cloud cover and temperature substitutions were not implemented by default in v13350 if both SURFACE and ONSITE data were available, irrespective of whether the substituted parameter was included in both SURFACE and ONSITE data inputs. Version 14134 will apply CCVR and/or TEMP substitutions by default if the parameter is only included in the SURFACE or ONSITE data. However, the user options to disable substitutions are still available.	3
3	Modified subroutines MPPBL, SUBST, and EQ_CCVR to address potential issues with the use of ONSITE solar radiation and delta-T data in lieu of cloud cover (utilizing the delta-T based Bulk Richardson Number (BULKRN) method for stable conditions) or if delta-T/BULKRN is being applied with ONSITE or NWS cloud cover. These modifications were focused especially on the transition from nighttime stable conditions (controlled by delta-T/BULKRN) and daytime convective conditions (controlled by solar radiation data). The BULKRN/delta-T method will be used if valid delta-T and ONSITE wind data are available and if the delta-T lapse rate is stable, or if the cloud cover or insolation data is missing, or if the cloud cover is an "equivalent" cloud cover derived from solar radiation data when the solar elevation angle is less than the critical elevation angle for convective conditions. The critical solar elevation angle was also modified to use an average of the previous 24-hours of temperature data (with at least 75% data capture), instead of a default value of 288 K, for hours when the temperature is missing. An assumption of 5/10 cloud cover is also used in the calculation of critical solar elevation angle for hours when cloud cover is missing. Since the model will not compute concentrations for these hours due to missing temperature and/or cloud cover the effect of these changes on modeled concentrations is likely to be minimal. Furthermore, this approach should provide a reasonable estimate of early morning	3

	heat fluxes, and treating these hours as missing in terms of heat flux could result in the entire convective portion of the day being missing.	
4	Subroutine EQ_CCVR was modified to account for cases when the clear sky insolation value, QRNOT, is less than or equal to 0. The equivalent CCVR is set to 0 in these cases.	3
5	Modified subroutines MPMET, MPFIN, MPOUT, and AERSURF to track and report the use of MMIF-generated inputs, in the form of pseudo-ONSITE data alone (including "ONSITE" mixing heights) or as pseudo-ONSITE and UPPERAIR data. The use of MMIF-generated inputs is gleaned from information in the AERSURF input file of surface characteristics if it is used in Stage 3. The use of MMIF data is flagged in the header record of the surface file and by the use of the 'MMIF-OS' flag instead of the hourly NAD-OS, ADJ-SFC, etc., flags associated with ONSITE and/or SURFACE data. Subroutines MPMET, MPFIN, and MPOUT were also modified to track and report the use of the Bulk Richardson Number (BULKRN) option based on delta-T measurements, in lieu of cloud cover, for stable conditions. For applications using the BULKRN option, the header record of the surface file will include the 'BULKRN' flag. An additional 'MMIF' flag will be included if the BULKRN option is associated with use of MMIF data.	3
6	Modified subroutine GET620 to allow the user to specify a standard 5-digit WBAN, instead of an 8-digit number with 3 leading 0's, for processing upper air data in the 6201 format. Checks have also been included to identify issues that may occur when users specify the 6201VB (TD-6201 variable-length block) format for upper air data.	1
7	Modified subroutine GETFSL to read the WMO number from upper air data in the FSL format, in addition to reading the WBAN, and assign the WMO number to the BUF08(1) variable if WBAN = '99999' to support non-US applications.	1
8	Modified subroutines SETUP, MPPROC, OSCARD, MRCARD, WRTCRD, and HEADER to allow re-processing of the XDATES information from the MERGE file header records. This information is included in the Stage 3 report, unless the user has specified XDATES in the Stage 3 input file. Also modified subroutine MERGE to use a consistent form for reporting the extract dates in the report files across all three stages. Subroutine CHROND was modified to fully support 4-digit years and subroutine XDTCRD was modified to use 4-digit years for extract dates in the report files instead of 2-digit years.	3

MISCELLANEOUS

Item	Modification	Stage
1	Modified several subroutines with minor or cosmetic changes to the documentation of user options and error handling and reporting, including elimination of trailing blanks associated with filenames, etc., to minimize line wrap in the AERMET report files.	All
2	Modified several subroutines to replace the FLOAT Fortran function with the REAL function to convert integer variables to reals.	All