Model Change Bulletin (MCB) 11
AERMET version 21DRF (December 7, 2021), listed by change type

AERMET 21DRF represents a complete update of the AERMET code from version 21112. New subroutines have been written and all previous subroutines have been deleted. While most changes will fall under enhancements there have been two bugs corrected since AERMET 21112. Listed with each change are the affected AERMET stages and data types (Upper air, National Weather Service (NWS), ONSITE (site-specific observed), or PROG (prognostic data).

Bug Fixes

Item	Modification	Stage	Data Type
1	Correct hourly site-specific precipitation values. Previous versions of AERMET did not reset output hourly precipitation so hours that were missing had the precipitation value for the previous occurrence of the precipitation for the hour.	3	ONSITE or PROG
2	Smooth the mechanical mixing height for each based on the previous hour's mixing height. Previously, this was only done for calculated mixing heights and not site-specific mixing heights. The AERMOD Model Formulation and Evaluation document specifies that the mixing heights should be smoothed regardless of whether the mixing height is calculated or read from site-specific data.	3	ONSITE or PROG

Enhancements

Item	Modification	Stage	Data Type
1	AERMET is now a two-stage process instead of a three-stage process. The merge stage, stage 2 in previous versions of AERMET has been eliminated and the previous Stage 3 is now Stage 2. If the MERGE pathway is found in the AERMET control file, AERMET will ignore the associated keywords. Likewise, if AERMET encounters the DATA keyword with the METPREP pathway, AERMET will ignore the DATA keyword and associated file (old Stage 2 output)	2	All
2	AERMET can now run stage 1 and 2 in one single AERMET run instead of separate runs as with previous AERMET versions. Each stage can still be run separately.	All	All
3	EXTRACT and QAOUT files are now optional when running stage 1 and 2 in the same AERMET run	All	All
4	AERMET will now keep the case (lower or upper case) of any input or output files, instead of assuming all uppercase for filenames. This makes the code more portable for Linux operating systems as Linux systems are case sensitive while DOS systems are case insensitive.	All	All
5	A new averaging option for vector averaging of winds has been added to Stage 1 for sub-hourly site-specific data. The user invokes the option by specifying the word VECTOR after the number of observations per hour with the OBS_HOUR keyword. The default averaging is a scalar average	2	ONSITE or PROG
6	Surface data checked against XDATES after conversion from GMT to LST and hour 00-23 to 01-24	1	NWS
7	A new upper air data source, the Integrated Global Radiosonde Archive (IGRA), has been added in addition to the 6201 and FSL formats	1	Upper air
8	A debug option has been added to help in diagnosing calculated variables or report additional details on ISHD processing or upper-air calculated variables	All	All
9	Addition of a new pathway, PROG for prognostic data. The PROG pathway is analogous to the ONSITE pathway and uses the same keywords. The PROG pathway is utilized for prognostic data to allow for processing of certain variables when the application is overwater versus overland. When	All	PROG

	using the PROG pathway, AERMET will output a text string to the AERMET OUTPUT file in the header and for each hour denoting that the data is prognostic. This allows AERMOD to know the data is prognostic		
10	New ONSITE variables have been added as input variables for overwater processing for the PROG pathway	All	PROG
11	New optional parameter to denote overland or overwater data for DATA keyword for the ONSITE or PROG pathway. The optional parameter informs AERMET which input variables to use in calculations. Overland data is valid for both the ONSITE and PROG pathway, but overwater is only valid for the PROG pathway.	All	ONSITE or PROG
12	If using prognostic data over water, AERMET will use the Monin-Obukhov length to determine the stability for the hour. If overland or input Monin-Obukhov length is missing for the hour, the standard solar angle approach is used to determine stability	2	NWS, ONSITE or PROG
13	AERMET now allows for the specification of year specific surface characteristics via the FREQ_SECT, FREQ_SECT2, AERSURF, and AERSURF2 keywords. This allows for a multi-year AERMET run for stage 2 in one AERMET run instead of separate annual AERMET runs when surface characteristics change on an annual basis.	2	NWS, ONSITE or PROG
14	For seasonal surface characteristics only, AERMET uses the primary and secondary station coordinates to determine the hemisphere of the respective station. This is used to allocate the seasonal characteristics to the appropriate months based on the hemisphere.	2	NWS, ONSITE or PROG

Miscellaneous

Item	Modification	Stage	Data Type
1	Years associated with XDATES must be 4-digit years	All	All
2	Stage 1 EXTRACT and QAOUT files have different formats between AERMET 21DRF and previous versions. The ONSITE QAOUT file now has a consistent format whereas before the QAOUT file followed the format of the raw input file	1	All
3	The 3280 format for SURFACE data has been dropped due to being obsolete	1	NWS
4	The no persistence keyword, NOPERS, used for cloud cover and temperature substitution for hours 23 and 24 in METPREP are now obsolete. These keywords were present because previous versions of AERMET processed each day separately within the program and previous versions could not read ahead to the next day to allow for hours 23 and 24 interpolation. Based on the recoding of AERMET, AERMET can now read the next day's observations so hours 23 and 24 can be interpolated in the same manner as other hours in the day	2	NWS, ONSITE or PROG
5	In previous versions of AERMET, when processing NWS data, if hour 24 was completely missing from the stage 2 output, i.e., the hour was not in the raw data file in stage 1, AERMET would copy hour 23 (if available) to hour 24 for the day. This is no longer done in 21DRF AERMET so hour 24 may be missing in the final AERMET output or temperature and cloud cover may be substituted from hour 23 of the same day and hour 1 or 2 of the next day. This change could result in differences for hours 24, 1, and 2 when comparing 21DRF AERMET to previous versions of AERMET	2	NWS
6	Real variables are now processed as double precision variables	All	All
7	NWS wind speeds associated with variable wind directions are not corrected for truncation in Stage 2 as done in previous versions of AERMET	2	NWS