Appendix A4-2. AIRS-Suite Matchup Single-Swath Product Interface Specifications

The AIRS-Suite Clear Match-up file aids in verifying the calibration of AIRS, AMSU and VIS channels relative to truth on the earth's surface.

Each file covers a 24-hour period from midnight to midnight UTC, and for certain spots during that day extracts AIRS IR and VIS radiances, AMSU-A brightness temperatures, and predicted sea surface temperatures. AMSU-A data are interpolated to the location of the AIRS footprint. For the VIS data, only the mean and the standard deviation of the 8x9 pixel grid are saved.

The file contains information associated with AIRS footprints selected if they match any of three criteria:

1. A footprint is cloud-free according to a series of tests.
2. The center of a footprint lies within 30 km of a calibration site.
3. A footprint contains very high clouds and is within +/-60 degree latitude.

In addition, isolated near-nadir footprints are selected at random in such a way that a globally balanced coverage is achieved. (Regular sampling would over-represent polar regions.)

The output file is organized as a single pseudo-swath called "L1B_AIRS_ClearMatch". (It is not a true "swath" of complete scans, each containing a fixed number of footprints. Instead, individual footprints are selected, in time order, from scans covering multiple granules.)

Its dimensions, attributes and geolocation and data fields are described below.

Table 1. **Clear Match Dimensions**

Name	Value	Explanation
GeoTrack	variable	The number of Clear Match-up footprints contained in the pseudo-swath (equal to attribute "fp_count").
IR_Channel	2378	The number of AIRS IR channels. Frequencies are given in field nominal_freq.
VIS_Channel	3	The number of VIS channels. Channel 1: 0.4 micron Channel 2: 0.6 micron Channel 3: 0.8 micron (The VIS/NIR instrument also has a 4^{th} broadband channel, but that is not used here.)

AMSU_Channel	15	The number of AMSU-A channels. Channel 1: 23.8 GHz Channel 2: 31.4 GHz Channel 3: 50.3 GHz Channel 4: 52.8 GHz Channel 5: 53.596 +/- 0.115 GHz Channel 6: 54.4 GHz Channel 7: 54.94 GHz Channel 8: 55.5 GHz Channel 9: f0 Channel 10: f0 +/- 0.217 GHz; Channel 11: f0 +/- df +/- 48 MHz Channel 12: f0 +/- df +/- 22 MHz Channel 13: f0 +/- df +/- 10 MHz Channel 14: f0 +/- df +/- 4.5 MHz Channel 15: 89 GHz f0 = 57290.344 MHz df = 322.4 MHz

Table 2. **Clear Match Attributes**

Name	Number of Occurrences or Dimensions	Data Type	Explanation
CF_Version	1	char-8	Cloud Filter Version Identification Collectively identifies the set of thresholds used for cloud filtering and the distinction between day/night and land/water
start_year	1	int-32	Start Year (eg. 2007) This fields and the date and time fields following reflect the date/time of the earliest possible footprint that may be found in the output file.
start_month	1	int-32	Start Month (1-12)
start_day	1	int-32	Start Day of the Month (1-31)
start_hour	1	int-32	Start Hour
start_minute	1	int-32	Start Minute
start_sec	1	int-32	Start Second
fp_count	1	int-32	Footprint Count Total count of footprints
Clear	1	int-32	“Clear” Footprint Count Count of footprints selected by the “cloud-free” thresholds (Selection Algorithm #1) - total for day/night and land/water
Clear_DL	1	int-32	“Clear” Footprint Count - day/land

Clear_DW	1	int-32	"Clear" Footprint Count - day/water
Clear_NL	1	int-32	"Clear" Footprint Count - night/land
Clear_NW	1	int-32	"Clear" Footprint Count - night/water
CalSite	1	int-32	Calibration Site Footprint Count Count of footprints selected from calibration sites (Selection Algorithm #2) - total for day/night and land/water
CalSite_DL	1	int-32	CalSite Footprint Count - day/land
CalSite_DW	1	int-32	CalSite Footprint Count - day/water
CalSite_NL	1	int-32	CalSite Footprint Count - night/land
CalSite_NL	1	int-32	CalSite Footprint Count - night/oc'n
HiCloud	1	int-32	High Clouds Footprint Count Count of footprints viewing high clouds over non-polar regions (Selection Algorithm #3) - total for day/night and land/water
HiCloud_DL	1	int-32	High Clouds Count - day/land
HiCloud_DW	1	int-32	High Clouds Count - day/water
HiCloud_NL	1	int-32	High Clouds Count - night/land
HiCloud_NW	1	int-32	High Clouds Count - night/water
Random	1	int-32	Random Footprint Count Count of footprints selected at random (Algorithm #4) - total for day/night and land/water

Random_DL	1	int-32	Random Count - day/land
Random_DW	1	int-32	Random Count - day/water
Random_NL	1	int-32	Random Count - night/land
Random_NW	1	int-32	Random Count - night/water

Table 3. **Clear Match Geolocation Fields**

These fields exist for every footprint selected.

Name	**Data Type**	**Explanation**
Latitude	float-64	Footprint Latitude in degrees North (-90.0 to 90.0)
Longitude	float-64	Footprint Longitude in degrees East (-180.0 to 180.0)
Time	float-64	Footprint Time in TAI (elapsed seconds since January 1, 1993 00:00Z UTC)

Table 4. **Data Fields Appearing Once**

The following data fields are produced once:

Name	**Number of Occurrences or Dimensions**	**Data Type**	**Explanation**
NeN	IR_Channel	float-32	Noise-equivalent Radiances Obtained from first available AIRS granule at 250K. Given in units of mW / m**2 / cm**-1 / steradian

nominal_freq	IR_Channel	float-32	Nominal IR Channel “Frequencies” in cm**-1 units

Table 5. **Data Fields Associated with Every Footprint**

These fields exist for every footprint selected.

Name	Number of Occurrences or Dimensions	Data Type	Explanation
granule_number	GeoTrack	int-16	The granule from which the footprint was selected (range: 0 - 240). “0” identifies Granule 240 of the preceding day.
scan	GeoTrack	int-16	Scan number (range: 1 - 135)
footprint	GeoTrack	int-16	Footprint number (range: 1 - 90)
reason	GeoTrack	int-16	Footprint Selection Reason. Identifies the reason for the footprint’s selection as follows: 1 = Clear (cloud-free) location 2 = Calibration site identified by field “site”. 4 = High clouds 8 = Randomly selected location Note: Footprints may be selected for more than one reason. In that case the reason codes are combined (logically or’d).

site	GeoTrack	int-16	If the footprint was selected because it is near a calibration site (reason = 2), this field identifies the site as follows: 0 = footprint selection reason is not “calibration site” 1 = Egypt 1 Lat: 27.12°N, Lon: 026.10°E 2 = Simpson Desert Lat: 24.50°S, Lon: 137.00°E 3 = Dome Concordia Lat: 75.10°S, Lon: 123.40°E 4 = Mitu, Columbia Lat: 01.50°N, Lon: 069.50°W 5 = Boumba, Cameroon Lat: 03.50°N, Lon: 014.50°E 6 = Railroad Valley, NV Lat: 38.50°N, Lon: 15.70°W 7 = SPG/Arm-Cart, OK Lat: 36.60°N, Lon: 97.50°W 8 = Manus, Bismarck Archipelago Lat: 02.00°S, Lon: 147.40°E 9 = Nauru, Micronesia Lat: 00.50°S, Lon: 166.60°E 10 = North Pole Lat: 90.00°N, Lon: 000.00° 11 = South Pole Lat: 90.00°S, Lon: 000.00°
scan_node_type	GeoTrack	char	Node Type Consists of a single character: “A” = ascending node (day) “D” = descending node (night)
satzen	GeoTrack	float-32	Satellite Zenith Angle Angle between satellite and zenith at footprint location in degrees [0.0, 90.0] -9999.0 means “not available”.

solzen	GeoTrack	float-32	Solar Zenith Angle Angle between sun and zenith at footprint location in degrees [0 .0, 180.0] -9999.0 means “not available”.
topog	GeoTrack	float-32	Mean elevation or “topography” at the center of the reference ellipsoid, in units of meters above mean sea level. -9999.0 means “not available”.
satheight	GeoTrack	float-32	Satellite altitude above nadir in km. -9999.0 means “not available”.
sun_glint_distance	GeoTrack	int-16	Distance, in km, from footprint center to the location of the sun glint during the sunlit portion of the orbit. “30000” indicates the spacecraft is in the earth’s shadow. -9999.0 means “not available”.
LandFrac	GeoTrack	float-32	Land Fraction Fraction of surface identified to be land [0.0, 1.0] -9999.0 means “not available”.
radiances	GeoTrack * IR_Channel	float-32	AIRS IR radiances for each channel for the selected footprint. Given in units of mW / m**2 / cm**-1 / steradian -9999.0 means “not available”.
VisMean	GeoTrack * VIS_Channel	float-32	Mean Radiances - VIS Channels This is the mean of the 72 samples for VIS channels 1 - 3. Given in units of W / m**2 / μm / steradian -9999.0 means “not available”.

VisStdDev	GeoTrack * VIS_Channel	float-32	Standard Deviation - VIS Channels This is the standard deviation of the 72 samples for VIS channels 1 - 3. -9999.0 means “not available”.
avnsst	GeoTrack	float-32	Sea Surface Temperature derived from the nearest (in time) 2 of 6 3-hour Aviation Forecasts. The forecast times are T21Z of the previous day, T03A, T09Z, T15Z, T21Z, and T03Z of the next day. The forecasts give the temperatures for a 1-degree grid. The derived temperature is interpolated 1. for latitude 2. for longitude 3. for time and given in K. -9999.0 means “not available”.
cx2616	GeoTrack	float-32	Output of the spatial coherence test at 2616 cm-1. For cloud-free data cx2616 < 0.5K -9999.0 means “not available”.
cx1231	GeoTrack	float-32	Output of the spatial coherence test at 1231 cm-1 Given in K. -9999.0 means “not available”.
cx2395	GeoTrack	float-32	Output of the spatial coherence test at 2395 cm-1 Given in K. -9999.0 means “not available”.

cxq2	GeoTrack	float-32	Output of the spatial coherence test for total water vapor, using the bt2616 - bt2607 proxy Given in K. -9999.0 means “not available”.
cxlpn	GeoTrack	float-32	Output of the spatial coherence test for the lapse rate lp, where: lp = (bt2395-bt2392) * (cos sza)**0.3, where sza is the satellite zenith angle, Given in K. -9999.0 means “not available”.
bt1231	GeoTrack	float-32	Brightness Temperature - 1231 cm-1 in K. -9999.0 means “not available”.
sst1231r5	GeoTrack	float-32	Sea Surface Temp. - 1231 cm-1 Calculated per footprint as: sst1231r5 = bt1231 + 0.28 + (1.2 * q3) + (0.2962 * q3)**2 + (1.0489 * cos(sza)) where: q3=bt1231-bt1227 and sza is the scan zenith angle. Given in K. -9999.0 means “not available”. Validated to 0.5K over non-frozen ocean.

amsu_bt	GeoTrack * AMSU_Channel	float-32	AMSU-A antenna temperatures in K. (Note: When the AMSU-A L1B data set includes side-lobe corrected antenna temperatures, as planned for Version 5, this field will reflect those corrected temperatures.) -9999.0 means “not available”. Interpolated from 45 X 30 footprint AMSU-A swath to 135 X 90 footprint AIRS swath.
amsu_topog	GeoTrack	float-32	Mean elevation or “topography”, in units of meters above mean sea level. -9999.0 means “not available”. Interpolated from 45 X 30 footprint AMSU-A swath to 135 X 90 footprint AIRS swath.
amsu_landFrac	Geotrack	float-32	Land Fraction Fraction of surface identified to be land [0.0, 1.0] -9999.0 means “not available”. Interpolated from 45 X 30 footprint AMSU-A swath to 135 X 90 footprint AIRS swath.