ICON Data Product 1.1,1.2: MIGHTI Calibrated LOS Winds and Temperature Array

This document describes the data product for ICON MIGHTI-A Level 1.1, 1.2 Calibrated Science Image File, which is in NetCDF4 format.

This file contains MIGHTI phase deltas and IR brightnesses for temperature retrieval

NetCDF files contain **variables** and the **dimensions** over which those variables are defined. First, the dimensions are defined, then all variables in the file are described.

Dimensions

The dimensions used by the variables in this file are given below, along with nominal sizes. Note that the size may vary from file to file. For example, the "Epoch" dimension, which describes the number of time samples contained in this file, will likely have a varying size.

Dimension Name	Nominal Size
ICON_L1_MIGHTI-A_Green_Array_OPD	378
ICON_L1_MIGHTI-A_Vector_XYZ	3
ICON_L0_MIGHTI_A_Image_ROI_Columns	92
ICON_L1_MIGHTI-A_Vector_Roll	3
ICON_L1_MIGHTI-A_IR_Array_Altitudes	20
ICON_L1_MIGHTI-A_IR_Array_Pixel_Index	429
ICON_L1_MIGHTI-A_Red_Array_OPD	340
ICON_L1_MIGHTI-A_Green_Array_Altitudes	82
ICON_L1_MIGHTI-A_Time_Channel	3
Epoch	1
ICON_L0_MIGHTI_A_Image_ROI_Rows	929
ICON_L1_MIGHTI-A_Red_Array_Altitudes	60
ICON_L1_MIGHTI-A_Vector_LLA	3

Variables

Variables in this file are listed below. First, "data" variables are described, followed by the "support_data" variables, and finally the "metadata" variables. The variables classified as "ignore_data" are not shown.

data

Variable Name	Description	Units	Dimensions
ICON_L1_MIGHTI_A_IR_Array	Brightnesses corresponding to the five IR filters Brightnesses corresponding to the five IR filters	Rel. R	Epoch, ICON_L1_MIGHTI-A_IR_Array_Altitudes, ICON_L1_MIGHTI-A_IR_Array_Pixel_Index
ICON_L1_MIGHTI_A_Green_Phase	Phase difference between the green atmospheric line and the associtaed calibration line minus the corresponding Zero Wind delta - by pixel and altitude Phase difference between the green atmospheric line and the associtaed calibration line minus the corresponding Zero Wind delta - by pixel and altitude	rad	Epoch, ICON_L1_MIGHTI-A_Green_Array_Altitudes, ICON_L1_MIGHTI-A_Green_Array_OPD
ICON_L1_MIGHTI_A_Green_Envelope	Envelopes of the green atmospheric fringes by pixel and altitude Envelopes of the green atmospheric fringes by pixel and altitude	Counts	Epoch, ICON_L1_MIGHTI-A_Green_Array_Altitudes, ICON_L1_MIGHTI-A_Green_Array_OPD
ICON_L1_MIGHTI_A_Green_Phase_Uncertainties	Uncertainties of the phases of the green atmospheric line by pixel and altitude Uncertainties of the phase deltas of the green atmospheric line by pixel and altitude	rad	Epoch, ICON_L1_MIGHTI-A_Green_Array_Altitudes
ICON_L1_MIGHTI_A_Green_Envelope_Uncertainties	Uncertainties of the envelopes of the green atmospheric fringes by pixel and altitude Uncertainties of the envelopes of the green atmospheric fringes by pixel and altitude	Counts	Epoch, ICON_L1_MIGHTI-A_Green_Array_Altitudes
ICON_L1_MIGHTI_A_Green_Tangent_LatLonAlt	Tangent point longitudes, latitudes, and altitudes for green side - middle of FoV, all altitudes Tangent point longitudes, latitudes, and altitudes for green side - middle of FoV, all altitudes	Degrees, Degrees, km	Epoch, ICON_L1_MIGHTI-A_Time_Channel, ICON_L1_MIGHTI-A_Vector_LLA, ICON_L1_MIGHTI-A_Green_Array_Altitudes
ICON_L1_MIGHTI_A_Red_Phase	Phase difference between the red atmospheric line and the associtaed calibration line minus the corresponding Zero Wind delta - by pixel and altitude Phase difference between the red atmospheric line and the associtaed calibration line minus the corresponding Zero Wind delta - by pixel and altitude	rad	Epoch, ICON_L1_MIGHTI-A_Red_Array_Altitudes, ICON_L1_MIGHTI-A_Red_Array_OPD

Variable Name	Description	Units	Dimensions
ICON_L1_MIGHTI_A_Red_Envelope	Envelopes of the red atmospheric fringes by pixel and altitude Envelopes of the red atmospheric fringes by pixel and altitude	Counts	Epoch, ICON_L1_MIGHTI-A_Red_Array_Altitudes, ICON_L1_MIGHTI-A_Red_Array_OPD
ICON_L1_MIGHTI_A_Red_Phase_Uncertainties	Uncertainties of the phase deltas of the red atmospheric line by pixel and altitude Uncertainties of the phase deltas of the red atmospheric line by pixel and altitude	rad	Epoch, ICON_L1_MIGHTI-A_Red_Array_Altitudes
ICON_L1_MIGHTI_A_Red_Envelope_Uncertainties	Uncertainties of the envelopes of the red atmospheric fringes by pixel and altitude Uncertainties of the envelopes of the red atmospheric fringes by pixel and altitude	Counts	Epoch, ICON_L1_MIGHTI-A_Red_Array_Altitudes
ICON_L1_MIGHTI_A_Red_Tangent_LatLonAlt	Tangent point longitudes, latitudes, and altitudes for red side - middle of FoV, all altitudes Tangent point longitudes, latitudes, and altitudes for red side - middle of FoV, all altitudes	Degrees, Degrees, km	Epoch, ICON_L1_MIGHTI-A_Time_Channel, ICON_L1_MIGHTI-A_Vector_LLA, ICON_L1_MIGHTI-A_Red_Array_Altitudes
ICON_L1_MIGHTI_A_Green_ECEF_Unit_Vectors	ECEF Unit Vectors per pixel representing the green lines of sight ECEF Unit Vectors per pixel representing the green lines of sight		Epoch, ICON_L1_MIGHTI-A_Vector_XYZ, ICON_L1_MIGHTI-A_Green_Array_Altitudes, ICON_L1_MIGHTI-A_Green_Array_OPD
ICON_L1_MIGHTI_A_Red_ECEF_Unit_Vectors	ECEF Unit Vectors per pixel representing the red lines of sight ECEF Unit Vectors per pixel representing the red lines of sight		Epoch, ICON_L1_MIGHTI-A_Vector_XYZ, ICON_L1_MIGHTI-A_Red_Array_Altitudes, ICON_L1_MIGHTI-A_Red_Array_OPD
ICON_L0_MIGHTI_A_Image_ROI_Pixels	MIGHTI region of interest pixel values layed out [ROWS]x[COLUMNS].	Count	Epoch, ICON_L0_MIGHTI_A_Image_ROI_Rows, ICON_L0_MIGHTI_A_Image_ROI_Columns

support_data

Variable Name	Description	Units	Dimensions
Epoch	Milliseconds since 1970-01-01 00:00:00 UTC at middle of image integration Milliseconds since 1970-01-01 00:00:00 UTC at middle of image integration	ms	Epoch
ICON_L1_MIGHTI_A_IR_Array_Pixel_Index	Pixel indicies corresponding to the five IR filters Pixel indicies corresponding to the five IR filters		Epoch, ICON_L1_MIGHTI-A_IR_Array_Pixel_Index
ICON_L1_MIGHTI_A_IR_Array_Altitudes	Altitudes corresponding to the five IR filters Altitudes corresponding to the five IR filters	km	Epoch, ICON_L1_MIGHTI-A_IR_Array_Altitudes
ICON_L1_MIGHTI_A_Green_Quality_Factor	Data quality Factor by altitude for 557nm Data quality Factor by altitude for 557nm. 0 is untrusted data. 0.5 is usable with care. 1.0 is good data.		Epoch, ICON_L1_MIGHTI-A_Green_Array_Altitudes
ICON_L1_MIGHTI_A_Green_Array_OPD	Optical path differences corresponding to the green fringes Optical path differences corresponding to the green fringes	cm	Epoch, ICON_L1_MIGHTI-A_Green_Array_OPD
ICON_L1_MIGHTI_A_Green_Array_Altitudes	Altitudes corresponding to the green fringes - middle of integration, middle of FoV Altitudes corresponding to the green fringes - middle of integration, middle of FoV	km	Epoch, ICON_L1_MIGHTI-A_Green_Array_Altitudes
ICON_L1_MIGHTI_A_Red_Quality_Factor	Data quality Factor by altitude for 630nm Data quality Factor by altitude for 630nm. 0 is untrusted data. 0.5 is usable with care. 1.0 is good data.		Epoch, ICON_L1_MIGHTI-A_Red_Array_Altitudes
ICON_L1_MIGHTI_A_Red_Array_OPD	Optical path differences corresponding to the red fringes Optical path differences corresponding to the red fringes	cm	Epoch, ICON_L1_MIGHTI-A_Red_Array_OPD
ICON_L1_MIGHTI_A_Red_Array_Altitudes	Altitudes corresponding to the red fringes Altitudes corresponding to the red fringes	km	Epoch, ICON_L1_MIGHTI-A_Red_Array_Altitudes
ICON_L1_MIGHTI_A_SC_Position_ECEF	Spacecraft Position Vector in ECEF Spacecraft Position Vector in ECEF	km	Epoch, ICON_L1_MIGHTI-A_Time_Channel, ICON_L1_MIGHTI-A_Vector_XYZ
ICON_L1_MIGHTI_A_SC_Velocity_ECEF	ECEF Vector for spacecraft velocity ECEF Vector for spacecraft velocity	m/s	Epoch, ICON_L1_MIGHTI-A_Time_Channel, ICON_L1_MIGHTI-A_Vector_XYZ
ICON_L1_MIGHTI_A_Image_Times	Epochs corresponding to the Start, Middle, and Stop of the integration Epochs corresponding to the Start, Middle, and Stop of the integration	ms	Epoch, ICON_L1_MIGHTI-A_Time_Channel
ICON_L1_MIGHTI_A_Roll_Angles	Roll angles of the field of view Roll angles of the field of view	deg	Epoch, ICON_L1_MIGHTI-A_Vector_Roll

Variable Name	Description	Units	Dimensions
ICON_L1_MIGHTI_A_Quality_Flag_Near_Terminator	Quality Flag indicating that terminator is within field of view Quality Flag indicating that terminator is within field of view		Epoch
ICON_L1_MIGHTI_A_Quality_Flag_Low_Signal_To_Noise	Quality Flag indicating low signal to noise Quality Flag indicating low signal to noise		Epoch
ICON_L1_MIGHTI_A_Quality_Flag_SAA	Quality Flag indicating that the spacecraft is within the South Atlantic Anomoly Quality Flag indicating that the spacecraft is within the South Atlantic Anomoly		Epoch
ICON_L1_MIGHTI_A_Quality_Flag_Bad_Calibration	Quality Flag indicating an inappropriate calibration file has been used or was missing Quality Flag indicating an inappropriate calibration file has been used or was missing		Epoch
ICON_L1_MIGHTI_A_SC_Attitude_Control_Register	Spacecraft Attitude Control Register Spacecraft Attitude Control Register Bit 0: LVLH NORMAL Bit 1: LVLH Reverse Mode Bit 2: Earth Limb Pointing Bit 3: Inertial Pointing Bit 4: Stellar Pointing Bit 5: Attitude Slew Bit 6: Conjugate Maneuver Bit 7: Nadir Calibration Bit 8: Lunar Calibration Bit 9: Stellar Calibration		Epoch
ICON_L0_MIGHTI_A_Time_UTC	ISO 9601 formatted UTC timestamp (at middle of image integration). ISO 9601 formatted UTC timestamp (at middle of image integration). Derived from original GPS values reported from spacecraft (Time_GPS_Seconds and Time_GPS_Subseconds). Time calculation is offset by 615ms (flush time) for the first image in the series and for all other images are adjusted by subtracting (integration time + 308 milliseconds) from the reported GPS time then adding the difference between the readout FRT and the header FRT. Time may be delayed by up to 10 ms due to FSW polling delay. Maximum time is ~2150 UTC and minimum time is ~1970 UTC. All character arrays are NULL terminated (size includes NULL).		Epoch

Variable Name	Description	Units	Dimensions
ICON_L0_MIGHTI_A_Time_GPS	Milliseconds since 1980-01-06 00:00:00 TAI (coincident with UTC) at middle of image integration. Milliseconds since 1980-01-06 00:00:00 TAI (coincident with UTC) at middle of image integration. Derived from original GPS values reported from spacecraft (Time_GPS_Seconds and Time_GPS_Subseconds). Time calculation is offset by 615ms (flush time) for the first image in the series and for all other images are adjusted by subtracting (integration time + 308 milliseconds) from the reported GPS time then adding the difference between the readout FRT and the header FRT. Time may be delayed by up to 10 ms due to FSW polling delay. Maximum time is ~2150 UTC and minimum time is ~1970 UTC.	milliseconds	Epoch
ICON_L0_MIGHTI_A_Time_UTC_Start	Milliseconds since 1970-01-01 00:00:00 UTC at start of image integration. Milliseconds since 1970-01-01 00:00:00 UTC at start of image integration. Derived from original GPS values reported from spacecraft (Time_GPS_Seconds and Time_GPS_Subseconds). Time calculation is offset by 615ms (flush time) for the first image in the series and for all other images are adjusted by subtracting (integration time + 308 milliseconds) from the reported GPS time then adding the difference between the readout FRT and the header FRT. Time may be delayed by up to 10 ms due to FSW polling delay. Maximum time is ~2150 UTC and minimum time is ~1970 UTC.	milliseconds	Epoch
ICON_L0_MIGHTI_A_Time_UTC_Stop	Milliseconds since 1970-01-01 00:00:00 UTC at end of image integration. Milliseconds since 1970-01-01 00:00:00 UTC at end of image integration. Derived from original GPS values reported from spacecraft (Time_GPS_Seconds and Time_GPS_Subseconds). Time calculation is offset by 615ms (flush time) for the first image in the series and for all other images are adjusted by subtracting (integration time + 308 milliseconds) from the reported GPS time then adding the difference between the readout FRT and the header FRT. Time may be delayed by up to 10 ms due to FSW polling delay. Maximum time is ~2150 UTC and minimum time is ~1970 UTC.	milliseconds	Epoch

Variable Name	Description	Units	Dimensions
ICON_L0_MIGHTI_A_Time_GPS_Seconds	GPS seconds count when FSW received image packet header. GPS seconds count when FSW received image packet header. The FSW received the header of the first image in a series 615ms after start of image processing. Following headers are adjusted by subtracting (integration time + 308 milliseconds) from the reported GPS time then adding the difference between the readout FRT and the header FRT. Time may be delayed by up to 10 ms due to FSW polling delay.	Seconds	Epoch
ICON_L0_MIGHTI_A_Time_GPS_Subseconds	FSW 20MHz clock (50 nanosecond) offset from GPS seconds. FSW 20MHz clock (50 nanosecond) offset from GPS seconds. The FSW received the header of the first image in a series 615ms after start of image processing. Following headers are adjusted by subtracting (integration time + 308 milliseconds) from the reported GPS time then adding the difference between the readout FRT and the header FRT. The offset may be more than 1 second but never 2 or more seconds. Time may be delayed by up to 10 ms due to FSW polling delay.	50 Nanoseconds	Epoch
ICON_L0_MIGHTI_A_Time_Integration	Time to integrate MIGHTI-A region of interest (ROI) image.	milliseconds	Epoch
ICON_L0_MIGHTI_A_Time_Header_Free_Running_Timer	Free running timer reading for MIGHTI image header. The FRTs are millisecond free running timers used to calculate the time offset for this image's integration from the observatory GPS time tag. This is only used when it is not the first image in the integration sequence. When the prior image FRT is not known a timing error is generated as a calculation cannot be performed. The base GPS time is used as the start time.	milliseconds	Epoch
ICON_L0_MIGHTI_A_Time_Readout_Free_Running_Timer	Free running timer reading for MIGHTI image data readout start. The FRTs are millisecond free running timers used to calculate the time offset for this image's integration from the observatory GPS time tag. This is only used when it is not the first image in the integration sequence. When the prior image FRT is not known a timing error is generated as a calculation cannot be performed. The base GPS time is used as the start time.	milliseconds	Epoch

Variable Name	Description	Units	Dimensions
ICON_L0_MIGHTI_A_Time_Prior_Readout_Free_Running_Timer	Free running timer reading for MIGHTI prior image data readout start. The FRTs are millisecond free running timers used to calculate the time offset for this image's integration from the observatory GPS time tag. This is only used when it is not the first image in the integration sequence. When the prior image FRT is not known a timing error is generated as a calculation cannot be performed. The base GPS time is used as the start time.	milliseconds	Epoch
ICON_L0_MIGHTI_A_Time_Prior_Known	Flag indicating prior image's free running timer known. The FRTs are millisecond free running timers used to calculate the time offset for this image's integration from the observatory GPS time tag. This is only used when it is not the first image in the integration sequence. When the prior image FRT is not known a timing error is generated as a calculation cannot be performed. The base GPS time is used as the start time.	Flag	Epoch
ICON_L0_MIGHTI_A_MT_Device_ID	MIGHTI camera instrument ID (0=MIGHTI-A, 1=MIGHT-B).	Flag	
ICON_L0_MIGHTI_A_MT_Device_Current_Sense	MIGHTI camera current (power) monitor count.	Count	Epoch
ICON_L0_MIGHTI_A_Calibration_Lamp_1	MIGHTI camera calibration lamp 1 setting (0=OFF, 1=ON).	Flag	Epoch
ICON_L0_MIGHTI_A_Calibration_Lamp_2	MIGHTI camera calibration lamp 2 setting (0=OFF, 1=ON).	Flag	Epoch
ICON_L0_MIGHTI_A_Calibration_Lamp_Current	MIGHTI camera calibration lamp combined current monitor sense count.	Count	Epoch
ICON_L0_MIGHTI_A_Calibration_Lamp_Temperature	MIGHTI camera calibration lamp combined temperature monitor sense count.	Count	Epoch
ICON_L0_MIGHTI_A_Interferometer_1_Temperature_Sense	MIGHTI interferometer 1 fine temperature sense count.	Count	Epoch
ICON_L0_MIGHTI_A_Interferometer_2_Temperature_Sense	MIGHTI interferometer 2 fine temperature sense count.	Count	Epoch
ICON_L0_MIGHTI_A_Optics_Bench_Temperature_Forward	MIGHTI optics bench forward temperature sense count.	Count	Epoch
ICON_L0_MIGHTI_A_Optics_Bench_Temperature_Rear	MIGHTI optics bench rear temperature sense count.	Count	Epoch
ICON_L0_MIGHTI_A_Optics_Temperature_Aft	MIGHTI optics aft temperature sense count.	Count	Epoch

Variable Name	Description	Units	Dimensions
ICON_L0_MIGHTI_A_TEC_Current_Input_Count	MIGHTI thermo-electric cooler combined (TEC-A + TEC-B) input current count.	Count	Epoch
ICON_L0_MIGHTI_A_TEC_Temperature_Cold_Count	MIGHTI thermo-electric cooler cold-side temperature sense count.	Count	Epoch
ICON_L0_MIGHTI_A_TEC_Temperature_Hot_Count	MIGHTI thermo-electric cooler hot-side temperature sense count.	Count	Epoch
ICON_L0_MIGHTI_A_MTA_Aperture1_Position	MIGHTI-A camera aperture 1 position sense flag. 0=OPEN, 1=CLOSED, 2=15% OPEN, 3=UNKNOWN	Flag	Epoch
ICON_L0_MIGHTI_A_MTA_Aperture2_Position	MIGHTI-A camera aperture 2 position sense flag. 0=OPEN, 1=CLOSED, 2=15% OPEN, 3=UNKNOWN	Flag	Epoch
ICON_L0_MIGHTI_A_MTA_Aperture1	MIGHTI-A camera aperture 1 switch setting (0=OPEN, 1=CLOSED).	Flag	Epoch
ICON_L0_MIGHTI_A_MTA_Aperture2	MIGHTI-A camera aperture 2 switch setting (0=OPEN, 1=CLOSED).	Flag	Epoch
ICON_L0_MIGHTI_A_MTB_Aperture1_Position	MIGHTI-B camera aperture 1 position sense flag. 0=OPEN, 1=CLOSED, 2=15% OPEN, 3=UNKNOWN	Flag	Epoch
ICON_L0_MIGHTI_A_MTB_Aperture2_Position	MIGHTI-B camera aperture 2 position sense flag. 0=OPEN, 1=CLOSED, 2=15% OPEN, 3=UNKNOWN	Flag	Epoch
ICON_L0_MIGHTI_A_MTB_Aperture1	MIGHTI-B camera aperture 1 switch setting (0=OPEN, 1=CLOSED).	Flag	Epoch
ICON_L0_MIGHTI_A_MTB_Aperture2	MIGHTI-B camera aperture 2 switch setting (0=OPEN, 1=CLOSED).	Flag	Epoch
ICON_L0_MIGHTI_A_Error_Compression	Error count during compression (per packet). Error count during compression (per packet). Should be zero (for no error) but if it is a non-zero number then the number indicates the number of packets that contained an overflow in the delta bit field during compression.	Count	Epoch
ICON_L0_MIGHTI_A_Error_Time	Error finding prior image readout FRT (0=GOOD, 1=ERROR). Error finding prior image readout FRT (0=GOOD, 1=ERROR). The prior image read out FRT was missing so proper time offset couldn't be calculated correctly. The time will indicate later then the actual time. This only occurs when not the first image of the series.	Flag	Epoch

Variable Name	Description	Units	Dimensions
ICON_L0_MIGHTI_A_CCD_CS_Register	CCD CS register value from image header at end of integration. CCD CS register value from image header at end of integration. See ICN-ICD-002 (MIGHTI) for more details on this parameter.	Flag	Epoch
ICON_L0_MIGHTI_A_Horizontal_Charge_Transfer_Efficiency_Count	Horizontal charge transfer efficiency register count indicating the horizontal overscan pixel configuration per MIGHTI ICD. Horizontal charge transfer efficiency register count indicating the horizontal overscan pixel configuration per MIGHTI ICD. See ICN-ICD-002 (MIGHTI) for more details on this parameter.	Count	Epoch
ICON_L0_MIGHTI_A_Image_BIN_Parameters	MIGHTI binning parameters (BINCOUNTS). MIGHTI binning parameters (BINCOUNTS). See ICN-ICD-002 (MIGHTI) for more details on this parameter.	Flag	Epoch
ICON_L0_MIGHTI_A_Image_First	First image in MIGHTI integration sequence (0=NOT FIRST, 1=FIRST).	Flag	Epoch
ICON_L0_MIGHTI_A_Image_ROI_Column_Count	MIGHTI region of interest (ROI) pixel column count.	Count	Epoch
ICON_L0_MIGHTI_A_Image_ROI_Column_Start	MIGHTI region of interest (ROI) pixel starting column.	Count	Epoch
ICON_L0_MIGHTI_A_Image_ROI_Row_Count	MIGHTI region of interest (ROI) pixel row count.	Count	Epoch
ICON_L0_MIGHTI_A_Image_ROI_Row_Start	MIGHTI region of interest (ROI) pixel starting row.	Count	Epoch

metadata

Variable Name	Description	Units	Dimensions
ICON_L1_MIGHTI_A_Vector_LLA	Vector labels corresponding to the tangent lat, lon, and alt Vector labels corresponding to the tangent lat, lon, and alt		ICON_L1_MIGHTI-A_Vector_LLA
ICON_L1_MIGHTI_A_Vector_XYZ	Vector labels corresponding to the ECEF lines of sight Vector labels corresponding to the ECEF lines of sight		ICON_L1_MIGHTI-A_Vector_XYZ
ICON_L1_MIGHTI_A_Vector_Roll	Vector labels corresponding to the field of view roll angles Vector labels corresponding to the field of view roll angles		ICON_L1_MIGHTI-A_Vector_Roll

Variable Name	Description	Units	Dimensions
ICON_L1_MIGHTI_A_Time_Channel	Vector labels corresponding to the time channels Vector labels corresponding to the time channels		ICON_L1_MIGHTI-A_Time_Channel

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