

# ICON Data Product 1.7: IVM Engineering Parameters

This document describes the data product for IVM L1 file, which is in NetCDF4 format.

This is a preliminary release of the NASA Ionospheric Connections Explorer Ion Velocity Meter (IVM) Level-1 file. This file contains a calibrated translation of the raw IVM engineering parameters into relevant raw physical values. For example, digital counts transmitted by the instrument are translated into actual voltages, or measured currents. This file also contains the fusion of the IVM parameters with satellite ephemeris and other ancillary data provided by the satellite team. The values within this file are not immediately valuable for scientific research however they may be useful for researchers seeking to perform their own translations of raw physical measurements into geophysical characterizations of the ionosphere.

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 have a varying size.

Dimension Name	Nominal Size
Epoch	unlimited
ICON_L1_IVM_A_RPA	32
ICON_L1_IVM_A_DM	32
ICON_L1_IVM_A_LLA	16
ICON_L1_IVM_A_LLB	16
ICON_L1_IVM_A_RV_MEM	32
ICON_L1_IVM_A_RV_MON	32

# 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
Epoch	<p>Universal Time (UTC)</p> <p>Time at the midpoint of the IVM measurements.</p>	<p>Milliseconds since 1970-01-01 00:00:00</p>	Epoch
ICON_L1_IVM_A_RPA_currents	<p>RPA Ion Current</p> <p>The value of RPA currents varies as a function of plasma parameters (density, composition, temperature, motion) and the value of the Retarding Voltage (RV). The RV setting creates an energy barrier such that only ions with energy above the barrier are measured. By varying the RV setting in time the energy distribution of the ions is recorded in the changing value of the RPA currents.</p>	A	Epoch, ICON_L1_IVM_A_RPA
ICON_L1_IVM_A_RPA_digval	<p>RPA Ion current A/D sample value</p> <p>Sample value is used with lab determined range parameters to reconstruct the value of currents recorded by the RPA.</p>		Epoch, ICON_L1_IVM_A_RPA
ICON_L1_IVM_A_RPA_range	<p>Instrument measurement range (index) used to digitize current sample</p> <p>To maintain accuracy and precision the RPA employs multiple current measurement scales. These scales are indicated by number (0-7). The smallest currents are recorded on range 0, the largest currents on range 7.</p>		Epoch, ICON_L1_IVM_A_RPA
ICON_L1_IVM_A_RPA_src	<p>Bipolar/Unipolar transistor flag</p> <p>The RPA employs two different transistor types. Setting 0, for the bipolar transistor, allows for a determination of both positive and negative currents. This setting is limited to range 0. The unipolar setting is restricted to positive currents only. The unipolar setting is typical for currents interpreted geophysically.</p>		Epoch, ICON_L1_IVM_A_RPA
ICON_L1_IVM_A_RPA_v	<p>Electrometer voltage value recorded by RPA</p> <p>The ion plasma currents produced in the RPA are converted into measurable voltages using an electrometer. The range of voltages produced is controlled by the range setting. This voltage is digitized, and used to reconstruct the measured current in ground software.</p>	V	Epoch, ICON_L1_IVM_A_RPA

Variable Name	Description	Units	Dimensions
ICON_L1_IVM_A_RPA	<p>RPA Voltages</p> <p>Dimension variable for storing Retarding Potential Analyzer (RPA) measurements. The RPA is one half of the Ion Velocity Meter (IVM), and provides information on ion density, composition (O+/H+ fractions), ion temperature, and ion motion along the look direction of the instrument. The RPA uses a variable Retarding Voltage (RV) to create an energy barrier that limits the collection of ions to those with an energy greater than the barrier. The RV values used for a given sweep are stored here.</p>	V	Epoch, ICON_L1_IVM_A_RPA
ICON_L1_IVM_A_DM_angle	<p>DM arrival angle determined from current ratio</p> <p>The Drift Meter (DM) has an entrance aperture that projects an ion beam onto a collector plate divided into 4 equal sections. The angle of the beam determines the beam location, and thus the amount of current recorded by each collector plate. The ratio of currents is recorded on-orbit by the DM. The value of this angle can be reconstructed using the measured ratio of currents. The angle reported here is reconstructed using current ratios measured on-orbit.</p>	Degrees	Epoch, ICON_L1_IVM_A_DM
ICON_L1_IVM_A_DM_axis	<p>Direction (axis) of measurement</p> <p>The DM is capable of measuring ion drifts along two orthogonal directions. The axis flag (0,1) indicates direction. At a hardware level, the axis flag indicates which pairings of collector plates are used when measuring currents and forming a current ratio. For collector plates labeled 1,2,3, and 4, the groupings could be 1,2 and 3,4 or 1,3 and 2,4.</p>		Epoch, ICON_L1_IVM_A_DM
ICON_L1_IVM_A_DM_digital	<p>DM measurement A/D sample value</p> <p>Digital value corresponding to the current ratios across pairs of collector plates.</p>		Epoch, ICON_L1_IVM_A_DM
ICON_L1_IVM_A_DM_polarity	<p>Electrical polarity of measurement</p> <p>The DM operates by measuring collector plate current ratios. The ratio may be formed as current levels A/B (0 polarity) or B/A (1 polarity).</p>		Epoch, ICON_L1_IVM_A_DM
ICON_L1_IVM_A_DM_ratio	<p>Ratio of plasma currents recorded by DM</p> <p>The ratio of currents between two pairs of collector plates within the DM is driven by the arrival angle of plasma within the instrument.</p>		Epoch, ICON_L1_IVM_A_DM
ICON_L1_IVM_A_DM_voltage	<p>Voltage value recorded by log difference amp</p> <p>The DM current ratios are electronically determined by measuring the currents with log electrometers and then forming the difference between two log electrometers. <math>\log(A)/\log(B) = \log(A) - \log(B)</math>. This is the difference between the two electrometers.</p>	V	Epoch, ICON_L1_IVM_A_DM

Variable Name	Description	Units	Dimensions
ICON_L1_IVM_A_DM	<p>DM Measurements</p> <p>Dimension variable for storing measurements from the Drift Meter (DM). The DM measures the cross-track velocities of ions, the ion motion perpendicular to the satellite track. The DM varies between measuring two orthogonal directions over its 1-second measurement cadence. The DM produces geophysical ion velocities by directly measuring the arrival angle of plasma and using knowledge of spacecraft motion and orientation to produce a measure of ion motion relative to co-rotation. Stores the times at native DM sampling rate. Each 32 sample sweep is donwsampled onto a 1-Hz sampling rate reporting drifts in two directions. Times are UTC milliseconds since 1970-01-01 00:00:00.</p>	<p>Millisecons since 1970-1-1 00:00:00</p>	<p>Epoch, ICON_L1_IVM_A_DM</p>
ICON_L1_IVM_A_LLA_axis	<p>LLA Direction (axis) of measurement</p> <p>The direction of the DM measurement is determined by the grouping of collector plates used in forming the current ratio. The two possible combinations are indicated by a 0 and 1.</p>		<p>Epoch, ICON_L1_IVM_A_LLA</p>
ICON_L1_IVM_A_LLA_digval	<p>LLA measurement A/D sample value</p> <p>Sample reflects A/D value of the voltage produced by a plasma current flowing through a log electrometer. Half of the collector plates (two) are hooked up to a given electrometer. This sample value is converted on the ground back to a voltage using a lab calibration.</p>		<p>Epoch, ICON_L1_IVM_A_LLA</p>
ICON_L1_IVM_A_LLA_i	<p>Currents entering DM onto collector plate pairs measured by LLA</p> <p>Plasma entering the Drift Meter (DM) is projected onto a collector plate divided into 4 equal segments. The currents recorded here reflect the signal produced by half of these plates.</p>	A	<p>Epoch, ICON_L1_IVM_A_LLA</p>
ICON_L1_IVM_A_LLA_polarity	<p>Electrical polarity of LLA measurement</p> <p>The DM operates by measuring collector plate current ratios. The ratio may be formed as current levels A/B (0 polarity) or B/A (1 polarity).</p>		<p>Epoch, ICON_L1_IVM_A_LLA</p>
ICON_L1_IVM_A_LLA_v	<p>Voltage value recorded by log A electrometer</p> <p>Sample reflects the voltage produced by a plasma current flowing through a log electrometer. Half of the collector plates (two) are hooked up to a given electrometer. This reconstructed data is produced on the ground using a lab calibration to translate a digital sample made on-orbit into a voltage value.</p>	V	<p>Epoch, ICON_L1_IVM_A_LLA</p>
ICON_L1_IVM_A_LLA_currents	<p>Lab calibrated currents obtained from log electrometer A.</p> <p>The internal IVM temperature is used along with a lab calibration over temperature to construct a temperature compensated description of measured ion plasma currents.</p>	A	<p>Epoch, ICON_L1_IVM_A_LLA</p>

Variable Name	Description	Units	Dimensions
ICON_L1_IVM_A_LLA	<p>Log Level A Measurement Times</p> <p>Dimension variable for LLA measurements. The LLA is a log electrometer that performs the conversion from plasma generated currents within the Drift Meter (DM) to a measureable voltage. Times are UTC milliseconds since 1970-1-1 00:00:00.</p>	Milliseconds since 1970-1-1 00:00:00	Epoch, ICON_L1_IVM_A_LLA
ICON_L1_IVM_A_LLB_axis	<p>LLB Direction (axis) of measurement</p> <p>The direction of the DM measurement is determined by the grouping of collector plates used in forming the current ratio. The two possible combinations are indicated by a 0 and 1.</p>		Epoch, ICON_L1_IVM_A_LLB
ICON_L1_IVM_A_LLB_digitalval	<p>LLB measurement A/D sample value</p> <p>Sample reflects A/D value of the voltage produced by a plasma current flowing through a log electrometer. Half of the collector plates (two) are hooked up to a given electrometer. This sample value is converted on the ground back to a voltage using a lab calibration.</p>		Epoch, ICON_L1_IVM_A_LLB
ICON_L1_IVM_A_LLB_i	<p>Currents entering DM along axis measured by LLB</p> <p>Plasma entering the Drift Meter (DM) is projected onto a collector plate divided into 4 equal segments. The currents recorded here reflect the signal produced by half of these plates.</p>	A	Epoch, ICON_L1_IVM_A_LLB
ICON_L1_IVM_A_LLB_polarity	<p>Electrical polarity of LLB measurement</p> <p>The DM operates by measuring collector plate current ratios. The ratio may be formed as current levels A/B (0 polarity) or B/A (1 polarity).</p>		Epoch, ICON_L1_IVM_A_LLB
ICON_L1_IVM_A_LLB_v	<p>Voltage value recorded by log B electrometer</p> <p>Sample reflects the voltage produced by a plasma current flowing through a log electrometer. Half of the collector plates (two) are hooked up to a given electrometer. This reconstructed data is produced on the ground using a lab calibration to translate a digital sample made on-orbit into a voltage value.</p>	V	Epoch, ICON_L1_IVM_A_LLB
ICON_L1_IVM_A_LLB_currents	<p>Lab calibrated currents obtained from log electrometer B.</p> <p>The internal IVM temperature is used along with a lab calibration over temperature to construct a temperature compensated description of measured ion plasma currents.</p>	A	Epoch, ICON_L1_IVM_A_LLB
ICON_L1_IVM_A_LLB	<p>Log Level B Measurement Times</p> <p>Dimension variable for LLB measurements. The LLB is a log electrometer that performs the conversion from plasma generated currents within the Drift Meter (DM) to a measureable voltage. Times are UTC milliseconds since 1970-1-1 00:00:00.</p>	Milliseconds since 1970-1-1 00:00:00	Epoch, ICON_L1_IVM_A_LLB

Variable Name	Description	Units	Dimensions
ICON_L1_IVM_A_RV_MEM_digval	RV sample value used for measurement.  The Retarding Voltage (RV) is monitored onboard. This is the A/D output value from that monitoring.		Epoch, ICON_L1_IVM_A_RV_MEM
ICON_L1_IVM_A_RV_MEM_v	Retarding voltage value obtained from memory lookup based on digval.  The voltages produced by the Retarding Voltage (RV) circuitry were measured in the lab before launch and are used here to construct the nominally applied RV values.	V	Epoch, ICON_L1_IVM_A_RV_MEM
ICON_L1_IVM_A_RV_MEM	Retarding Voltage Memory Values  Dimension variable for the Retarding Voltage (RV) memory values. The RV is varied to change the energy of plasma allowed within the RPA instrument. The RV values corresponding to the assigned state, as measured in the lab, are reported using this dimension. RV settings are fixed for a given 4-second instrument packet. Dimension data is a simple index.		Epoch, ICON_L1_IVM_A_RV_MEM
ICON_L1_IVM_A_RV_MON_digval	RV monitor measurement A/D sample value  The Retarding Voltage (RV) value is monitored onboard the RPA. This monitor digitizes a voltage proportional to the RV. This variable stores the output of the D/A process.		Epoch, ICON_L1_IVM_A_RV_MON
ICON_L1_IVM_A_RV_MON_ppos	Location within IVM packet		Epoch, ICON_L1_IVM_A_RV_MON
ICON_L1_IVM_A_RV_MON_scaled_v	RV monitored voltage, obtained by scaling raw measurement.  The Retarding Voltage (RV) value is monitored onboard the RPA. This monitor digitizes a voltage proportional to the RV. This variable reconstructs the applied RV value from the raw measurement voltage.	V	Epoch, ICON_L1_IVM_A_RV_MON
ICON_L1_IVM_A_RV_MON_src	Source of RV Monitored Voltage  The Retarding Voltage (RV) value is monitored with one of two monitor circuits, based on its value. One circuit is for high RVs and one is for low RVs. This field indicates which monitor circuit was used. 1 = low RV, 0 = high RV		Epoch, ICON_L1_IVM_A_RV_MON
ICON_L1_IVM_A_RV_MON_v	Raw voltage value recorded by monitor  The Retarding Voltage (RV) value is monitored onboard the RPA. This monitor digitizes a voltage proportional to the RV. This variable reconstructs the raw measured voltage as determined from the digital sample value.	V	Epoch, ICON_L1_IVM_A_RV_MON

Variable Name	Description	Units	Dimensions
ICON_L1_IVM_A_RV_MON	<p>Retarding Voltage Monitor Index</p> <p>Dimension variable for the Retarding Voltage (RV) Monitored values. The RV is varied to change the energy of plasma allowed within the RPA instrument. The RV values corresponding to the assigned state, as monitored on the s/c, are reported using this dimension. Dimension data is a simple index.</p>		Epoch, ICON_L1_IVM_A_RV_MON
ICON_L1_IVM_A_SENPOT	<p>Floating potential of instrument aperture sensor with respect to the plasma</p> <p>The SenPot reference surface is allowed to float electrically with respect to the spacecraft. The flux of ions (driven by s/c motion) must be balanced by the flux of electrons (driven by electron temperature). The value of the SenPot surface potential limits the collection of electrons such the net flux is zero.</p>	V	Epoch
ICON_L1_IVM_A_ALTITUDE	<p>WGS84 Altitude of Spacecraft Position (geodetic)</p> <p>Geodetic Altitude of Spacecraft in WGS84.</p>	km	Epoch
ICON_L1_IVM_A_COROTATION_X	<p>ECI Earth Corotation Velocity Components in IVM Coordinates</p> <p>Component of Earth's corotation velocity vector projected into the IVM instrument axes by taking the dot product of the corotation vector with the instrument's axes and multiplying the Y and Z components by negative 1 (but not the X component by convention).</p>	m/s	Epoch
ICON_L1_IVM_A_COROTATION_Y	<p>ECI Earth Corotation Velocity Components in IVM Coordinates</p> <p>Component of Earth's corotation velocity vector projected into the IVM instrument axes by taking the dot product of the corotation vector with the instrument's axes and multiplying the Y and Z components by negative 1 (but not the X component by convention).</p>	m/s	Epoch
ICON_L1_IVM_A_COROTATION_Z	<p>ECI Earth Corotation Velocity Components in IVM Coordinates</p> <p>Component of Earth's corotation velocity vector projected into the IVM instrument axes by taking the dot product of the corotation vector with the instrument's axes and multiplying the Y and Z components by negative 1 (but not the X component by convention).</p>	m/s	Epoch
ICON_L1_IVM_A_LATITUDE	<p>WGS84 Latitude of Spacecraft Position (geodetic)</p> <p>Geodetic latitude of spacecraft in WGS84</p>	degrees North	Epoch
ICON_L1_IVM_A_LONGITUDE	<p>WGS84 Longitude of Spacecraft Position (geodetic)</p> <p>Geodetic longitude of spacecraft in WGS84</p>	degrees East	Epoch

<b>Variable Name</b>	<b>Description</b>	<b>Units</b>	<b>Dimensions</b>
ICON_L1_IVM_A_SC_ML T	Magnetic Local Time at Spacecraft  Magnetic Local Time at the spacecraft.	hour	Epoch
ICON_L1_IVM_A_SC_PO SITION_X	ECEF Spacecraft Position  Position of spacecraft in ECEF coordinates.	km	Epoch
ICON_L1_IVM_A_SC_PO SITION_Y	ECEF Spacecraft Position  Position of spacecraft in ECEF coordinates.	km	Epoch
ICON_L1_IVM_A_SC_PO SITION_Z	ECEF Spacecraft Position  Position of spacecraft in ECEF coordinates.	km	Epoch
ICON_L1_IVM_A_SC_VE LOCITY_X	ECI Spacecraft Velocity  Velocity of spacecraft in ECI, J2000, coordinates.	m/s	Epoch
ICON_L1_IVM_A_SC_VE LOCITY_Y	ECI Spacecraft Velocity  Velocity of spacecraft in ECI, J2000, coordinates.	m/s	Epoch
ICON_L1_IVM_A_SC_VE LOCITY_Z	ECI Spacecraft Velocity  Velocity of spacecraft in ECI, J2000, coordinates.	m/s	Epoch
ICON_L1_IVM_A_SC_XH AT_X	Instrument X Unit Vector in ECEF (Ram Direction)  IVM x-axis (nominal Ram direction) unit vector in ECEF.	dimensi onless	Epoch
ICON_L1_IVM_A_SC_XH AT_Y	Instrument X Unit Vector in ECEF (Ram Direction)  IVM x-axis (nominal Ram direction) unit vector in ECEF.	dimensi onless	Epoch
ICON_L1_IVM_A_SC_XH AT_Z	Instrument X Unit Vector in ECEF (Ram Direction)  IVM x-axis (nominal Ram direction) unit vector in ECEF.	dimensi onless	Epoch
ICON_L1_IVM_A_SC_YH AT_X	Instrument Y Unit Vector in ECEF (Starboard Direction)  IVM y-axis (nominal Starboard direction) unit vector in ECEF.	dimensi onless	Epoch
ICON_L1_IVM_A_SC_YH AT_Y	Instrument Y Unit Vector in ECEF (Starboard Direction)  IVM y-axis (nominal Starboard direction) unit vector in ECEF.	dimensi onless	Epoch
ICON_L1_IVM_A_SC_YH AT_Z	Instrument Y Unit Vector in ECEF (Starboard Direction)  IVM y-axis (nominal Starboard direction) unit vector in ECEF.	dimensi onless	Epoch
ICON_L1_IVM_A_SC_ZH AT_X	Instrument Z Unit Vector in ECEF (Nadir Direction)  IVM z-axis (nominal Nadir direction) unit vector in ECEF.	dimensi onless	Epoch
ICON_L1_IVM_A_SC_ZH AT_Y	Instrument Z Unit Vector in ECEF (Nadir Direction)  IVM z-axis (nominal Nadir direction) unit vector in ECEF.	dimensi onless	Epoch
ICON_L1_IVM_A_SC_ZH AT_Z	Instrument Z Unit Vector in ECEF (Nadir Direction)  IVM z-axis (nominal Nadir direction) unit vector in ECEF.	dimensi onless	Epoch



<b>Variable Name</b>	<b>Description</b>	<b>Units</b>	<b>Dimensions</b>
ICON_L1_IVM_A_SUN_XY_PLANE_ANGLE	<p>Angle Between Sun and IVM XY Plane</p> <p>Angle between the Sun and IVM instrument XY plane.</p>	degrees	Epoch
ICON_L1_IVM_A_SUN_XZ_PLANE_ANGLE	<p>Angle Between Sun and IVM XZ Plane</p> <p>Angle between the Sun and IVM instrument XZ plane.</p>	degrees	Epoch
ICON_L1_IVM_A_ANGLE_0	<p>DM determined angle along axis 0</p> <p>The Drift Meter (DM) has an entrance aperture that projects an O+ ion beam onto a collector plate divided into 4 equal sections. The angle of the beam determines the beam location, and thus the amount of current recorded by each collector plate. The ratio of currents is recorded on-orbit by the DM. The value of this angle can be reconstructed using the measured ratio of currents. The angle reported here is reconstructed using current ratios measured on-orbit and downsampled onto 1-Hz cadence.</p>	degrees	Epoch
ICON_L1_IVM_A_ANGLE_1	<p>DM determined angle along axis 1</p> <p>The Drift Meter (DM) has an entrance aperture that projects an O+ ion beam onto a collector plate divided into 4 equal sections. The angle of the beam determines the beam location, and thus the amount of current recorded by each collector plate. The ratio of currents is recorded on-orbit by the DM. The value of this angle can be reconstructed using the measured ratio of currents. The angle reported here is reconstructed using current ratios measured on-orbit and downsampled onto 1-Hz cadence.</p>	degrees	Epoch
ICON_L1_IVM_A_LST	<p>Local Solar Time at Spacecraft</p> <p>Local Solar Time at spacecraft.</p>	hour	Epoch
ICON_L1_IVM_A_SZA	<p>Solar Zenith Angle at Spacecraft</p> <p>Solar Zenith Angle at the spacecraft.</p>	degrees	Epoch
ICON_L1_IVM_A_IVM_TEMPERATURE	<p>Internal IVM temperature</p> <p>Internally monitored temperature taken at board level.</p>	C	Epoch

Variable Name	Description	Units	Dimensions
ICON_L1_IVM_A_A_STATUS	<p><b>IVM-A Status</b></p> <p>Binary Coded Integer where</p> <ul style="list-style-type: none"> <li>1: Earth Day View</li> <li>2: Earth Night View</li> <li>4: Calibration Target View</li> <li>8: Off-target View</li> <li>16: Sun Proximity View</li> <li>32: Moon Proximity View</li> <li>64: North Magnetic Footpoint View</li> <li>128: South Magnetic Footpoint View</li> <li>256: Science Data Collection View</li> <li>512: Calibration Data Collection View</li> <li>1024: RAM Proximity View</li> <li>2048-32768: SPARE</li> </ul> <p>Activity is what the spacecraft was commanded to do while status is the spacecraft's natural state of operations. This means that activity should always be used over status if they differ, but will almost always be the same.</p>	binary	Epoch
ICON_L1_IVM_A_B_STATUS	<p><b>IVM-B Status</b></p> <p>Binary Coded Integer where</p> <ul style="list-style-type: none"> <li>1: Earth Day View</li> <li>2: Earth Night View</li> <li>4: Calibration Target View</li> <li>8: Off-target View</li> <li>16: Sun Proximity View</li> <li>32: Moon Proximity View</li> <li>64: North Magnetic Footpoint View</li> <li>128: South Magnetic Footpoint View</li> <li>256: Science Data Collection View</li> <li>512: Calibration Data Collection View</li> <li>1024: RAM Proximity View</li> <li>2048-32768: SPARE</li> </ul> <p>Activity is what the spacecraft was commanded to do while status is the spacecraft's natural state of operations. This means that activity should always be used over status if they differ, but will almost always be the same.</p>	binary	Epoch

Variable Name	Description	Units	Dimensions
ICON_L1_IVM_A_A_ACTIVITY	<p>IVM-A Activity</p> <p>Binary Coded Integer where:</p> <ul style="list-style-type: none"> <li>1: Earth Day View</li> <li>2: Earth Night View</li> <li>4: Calibration Target View</li> <li>8: Off-target View</li> <li>16: Sun Proximity View</li> <li>32: Moon Proximity View</li> <li>64: North Magnetic Footpoint View</li> <li>128: South Magnetic Footpoint View</li> <li>256: Science Data Collection View</li> <li>512: Calibration Data Collection View</li> <li>1024: RAM Proximity View</li> <li>2048-32768: SPARE</li> </ul> <p>Activity is what the spacecraft was commanded to do while status is the spacecraft's natural state of operations. This means that activity should always be used over status if they differ, but will almost always be the same.</p>	binary	Epoch
ICON_L1_IVM_A_B_ACTIVITY	<p>IVM-A Activity</p> <p>Binary Coded Integer where:</p> <ul style="list-style-type: none"> <li>1: Earth Day View</li> <li>2: Earth Night View</li> <li>4: Calibration Target View</li> <li>8: Off-target View</li> <li>16: Sun Proximity View</li> <li>32: Moon Proximity View</li> <li>64: North Magnetic Footpoint View</li> <li>128: South Magnetic Footpoint View</li> <li>256: Science Data Collection View</li> <li>512: Calibration Data Collection View</li> <li>1024: RAM Proximity View</li> <li>2048-32768: SPARE</li> </ul> <p>Activity is what the spacecraft was commanded to do while status is the spacecraft's natural state of operations. This means that activity should always be used over status if they differ, but will almost always be the same.</p>	binary	Epoch
ICON_L1_IVM_A_MTB_STATUS	<p>Magnetic Torquer Bar Firing Status</p> <p>If the magnetic torquers are active during any part of the measurement, it is recorded as active for whole measurement. Decoded from spacecraft housekeeping file: ICON_L0_Spacecraft_Housekeeping-MTB_2020-10-31_v01r000.CSV</p>	binary	Epoch
ICON_L1_IVM_A_SLEW_STATUS			Epoch
ICON_L1_IVM_A_SUN_STATUS	<p>Spacecraft Sun/Shadow Status Code</p> <p>Data is from predictive ephemeris. 0 = spacecraft in Sun, 1 = spacecraft in Earth Shadow.</p>	binary	Epoch

Variable Name	Description	Units	Dimensions
ICON_L1_IVM_A_ORBIT_NUMBER	Orbit Number  Integer Orbit Number.	integer	Epoch
ICON_L1_IVM_A_ATTITUDE_STATUS	Slew or Off-Point Status Code  Binary Coded Integer where 1: LVLH Normal Mode 2: LVLH Reverse Mode 4: Earth Limb Pointing 8: Inertial Pointing 16: Stellar Pointing 32: Attitude Slew 64: Conjugate Maneuver 128: Nadir Calibration 256: Lunar Calibration 512: Stellar Calibration 1024: Zero Wind Calibration 2048-32768: SPARE	binary	Epoch
ICON_L1_IVM_A_SPACE_ENVIRONMENT_REGION_STATUS	Space Environment Region Status  Standardized for several missions, not all codes are relevant for ICON where 1: Earth Shadow 2: Lunar Shadow 4: Atmospheric Absorption Zone 8: South Atlantic Anomaly 16: Northern Auroral Zone 32: Southern Auroral Zone 64: Periapsis Passage 128: Inner & Outer Radiation Belts 256: Deep Plasma Sphere 512: Foreshock Solar Wind 1024: Solar Wind Beam 2048: High Magnetic Field 4096: Average Plasma Sheet 8192: Bowshock Crossing 16384: Magnetopause Crossing 32768: Ground Based Observatories 65536: 2-Day Conjunctions 131072: 4-Day Conjunctions 262144: Time Based Conjunctions 524288: Radial Distance Region 1 1048576: Orbit Outbound 2097152: Orbit Inbound 4194304: Lunar Wake 8388608: Magnetotail 16777216: Magnetosheath 33554432: Science 67108864: Low Magnetic Latitude 134217728: Conjugate Observation	binary	Epoch

Variable Name	Description	Units	Dimensions
ICON_L1_IVM_A_MAGNETIC_LATITUDE	<p>Magnetic Latitude of Spacecraft Position</p> <p>Quasi-dipole magnetic latitude of the spacecraft position. These values are obtained from passing the geodetic latitudes, longitudes, and altitudes from ICON Ancillary IVM Latitude, ICON Ancillary IVM Longitude, and ICON Ancillary IVM Altitude into apexpy Python module. For details on apexpy see: <a href="https://apexpy.readthedocs.org/">https://apexpy.readthedocs.org/</a></p>	degrees North	Epoch
ICON_L1_IVM_A_MAGNETIC_LONGITUDE	<p>Magnetic Longitude of Spacecraft Position</p> <p>Quasi-dipole magnetic longitude of the spacecraft position. These values are obtained from passing the geodetic latitudes, longitudes, and altitudes from ICON Ancillary IVM Latitude, ICON Ancillary IVM Longitude, and ICON Ancillary IVM Altitude into apexpy Python module. For details on apexpy see: <a href="https://apexpy.readthedocs.org/">https://apexpy.readthedocs.org/</a></p>	degrees East	Epoch
ICON_L1_IVM_A_TIME_UTC	<p>ISO 9601 formatted UTC timestamp (at middle of reading).</p> <p>ISO 9601 formatted UTC timestamp (at middle of reading).</p> <p>Time is generated from the time-code at byte 1015 of the IVM packet minus the time sync at byte 1019 of the IVM packet. This is the GPS time at the start of the integration period. The integration period is assumed to be 4 seconds so the center time is 2 seconds after that. The formula is <math>(\text{time-code} * 1000\text{ms}) + 2000\text{ms} - (16 * \text{time sync} / 1000)</math> in GPS milliseconds then converted to UTC time. See the UTD 206-024 Rev A document.</p> <p>Time may be delayed by up to 10 ms due to FSW polling delay.</p> <p>Maximum time is ~2150 UTC and minimum time is ~1970 UTC.</p>		Epoch
ICON_L1_IVM_A_TIME_UTC_START	<p>Milliseconds since 1970-01-01 00:00:00 UTC at start of reading.</p> <p>Milliseconds since 1970-01-01 00:00:00 UTC at start of reading.</p> <p>Time is generated from the time-code at byte 1015 of the IVM packet minus the time sync at byte 1019 of the IVM packet. This is the GPS time at the start of the integration period. The integration period is assumed to be 4 seconds so the center time is 2 seconds after that. The formula is <math>(\text{time-code} * 1000\text{ms}) + 2000\text{ms} - (16 * \text{time sync} / 1000)</math> in GPS milliseconds then converted to UTC time. See the UTD 206-024 Rev A document.</p> <p>Time may be delayed by up to 10 ms due to FSW polling delay.</p> <p>Maximum time is ~2150 UTC and minimum time is ~1970 UTC.</p>	milliseconds	Epoch

Variable Name	Description	Units	Dimensions
ICON_L1_IVM_A_TIME_UTC_STOP	<p>Milliseconds since 1970-01-01 00:00:00 UTC at end of reading.</p> <p>Milliseconds since 1970-01-01 00:00:00 UTC at end of reading.</p> <p>Time is generated from the time-code at byte 1015 of the IVM packet minus the time sync at byte 1019 of the IVM packet. This is the GPS time at the start of the integration period. The integration period is assumed to be 4 seconds so the center time is 2 seconds after that. The formula is (time-code * 1000ms) + 2000ms - (16 * time sync / 1000) in GPS milliseconds then converted to UTC time. See the UTD 206-024 Rev A document.</p> <p>Time may be delayed by up to 10 ms due to FSW polling delay.</p> <p>Maximum time is ~2150 UTC and minimum time is ~1970 UTC.</p>	milliseconds	Epoch
ICON_L1_IVM_A_NORTH_FOOTPOINT_ALT	<p>Altitude of North Footpoint of Geomagnetic Line at 150 km from IGRF</p> <p>Altitude location of the magnetic footpoint in the Northern Hemisphere at 150 km. These data were interpolated using a tricubic algorithm from IGRF and ephemeris data then linearly interpolated to IVM times.</p>	km	Epoch
ICON_L1_IVM_A_NORTH_FOOTPOINT_LAT	<p>Latitude of North Footpoint of Geomagnetic Line at 150 km from IGRF</p> <p>Latitude location of the magnetic footpoint in the Northern Hemisphere at 150 km. These data were interpolated using a tricubic algorithm from IGRF and ephemeris data then linearly interpolated to IVM times.</p>	degrees	Epoch
ICON_L1_IVM_A_NORTH_FOOTPOINT_LON	<p>Longitude of North Footpoint of Geomagnetic Line at 150 km from IGRF</p> <p>Longitude location of the magnetic footpoint in the Northern Hemisphere at 150 km. These data were interpolated using a tricubic algorithm from IGRF and ephemeris data then linearly interpolated to IVM times.</p>	degrees	Epoch
ICON_L1_IVM_A_NORTH_FOOTPOINT_FA_ECEF_X	<p>ECEF X-Component of Field Aligned Drift Direction at Northern Footpoint</p> <p>At the northern footpoint this is the x-component of the unit vector for field aligned ion drifts expressed in the ECEF frame.</p>	dimensionless	Epoch
ICON_L1_IVM_A_NORTH_FOOTPOINT_FA_ECEF_Y	<p>ECEF Y-Component of Field Aligned Drift Direction at Northern Footpoint</p> <p>At the northern footpoint this is the y-component of the unit vector for field aligned ion drifts expressed in the ECEF frame.</p>	dimensionless	Epoch
ICON_L1_IVM_A_NORTH_FOOTPOINT_FA_ECEF_Z	<p>ECEF Z-Component of Field Aligned Drift Direction at Northern Footpoint</p> <p>At the northern footpoint this is the z-component of the unit vector for field aligned ion drifts expressed in the ECEF frame.</p>	dimensionless	Epoch

Variable Name	Description	Units	Dimensions
ICON_L1_IVM_A_NORTH _FOOTPOINT_MER_DRIFT	Translating Scalars of Meridional Ion Drifts at Northern Footpoint  Scalars for translating meridional ion drifts (zonal E fields) measured at the spacecraft down to the northern footpoint.	dimensionless	Epoch
ICON_L1_IVM_A_NORTH _FOOTPOINT_ZON_DRIFT	Translating Scalars of Zonal Ion Drifts at Northern Footpoint  Scalars for translating zonal ion drifts (meridional E fields) measured at the spacecraft down to the northern footpoint.	dimensionless	Epoch
ICON_L1_IVM_A_NORTH _FOOTPOINT_QD_LAT	Quasi-dipole Latitude of Northern Footpoint  Calculated value of quasi-dipole latitude of northern footpoint from IGRF.	degrees	Epoch
ICON_L1_IVM_A_NORTH _FOOTPOINT_QD_LON	Quasi-dipole Longitude of Northern Footpoint  Calculated value of quasi-dipole longitude of northern footpoint from IGRF	degrees	Epoch
ICON_L1_IVM_A_NORTH _FOOTPOINT_MER_ECEF_X	ECEF X-Component of Meridional Drift Direction at Northern Footpoint  At the northern footpoint this is the x-component of the unit vector for meridional ion drifts expressed in the ECEF frame.	dimensionless	Epoch
ICON_L1_IVM_A_NORTH _FOOTPOINT_MER_ECEF_Y	ECEF Y-Component of Meridional Drift Direction at Northern Footpoint  At the northern footpoint this is the y-component of the unit vector for meridional ion drifts expressed in the ECEF frame.	dimensionless	Epoch
ICON_L1_IVM_A_NORTH _FOOTPOINT_MER_ECEF_Z	ECEF Z-Component of Meridional Drift Direction at Northern Footpoint  At the northern footpoint this is the z-component of the unit vector for meridional ion drifts expressed in the ECEF frame.	dimensionless	Epoch
ICON_L1_IVM_A_NORTH _FOOTPOINT_ZON_ECEF_X	ECEF X-Component of Zonal Drift Direction at Northern Footpoint  At the northern footpoint this is the x-component of the unit vector for zonal ion drifts expressed in the ECEF frame.	dimensionless	Epoch
ICON_L1_IVM_A_NORTH _FOOTPOINT_ZON_ECEF_Y	ECEF Y-Component of Zonal Drift Direction at Northern Footpoint  At the northern footpoint this is the y-component of the unit vector for zonal ion drifts expressed in the ECEF frame.	dimensionless	Epoch
ICON_L1_IVM_A_NORTH _FOOTPOINT_ZON_ECEF_Z	ECEF Z-Component of Zonal Drift Direction at Northern Footpoint  At the northern footpoint this is the z-component of the unit vector for zonal ion drifts expressed in the ECEF frame.	dimensionless	Epoch

Variable Name	Description	Units	Dimensions
ICON_L1_IVM_A_SOUTH _FOOTPOINT_ALT	Altitude of South Footpoint of Geomagnetic Line at 150 km from IGRF  Altitude location of the magnetic footpoint in the Northern Hemisphere at 150 km. These data were interpolated using a tricubic algorithm from IGRF and ephemeris data then linearly interplotted to IVM times.	km	Epoch
ICON_L1_IVM_A_SOUTH _FOOTPOINT_LAT	Latitude of South Footpoint of Geomagnetic Line at 150 km from IGRF  Latitude location of the magnetic footpoint in the Southern Hemisphere at 150 km. These data were interpolated using a tricubic algorithm from IGRF and ephemeris data then linearly interplotted to IVM times.	degrees	Epoch
ICON_L1_IVM_A_SOUTH _FOOTPOINT_LON	Longitude of South Footpoint of Geomagnetic Line at 150 km from IGRF  Longitude location of the magnetic footpoint in the Southern Hemisphere at 150 km. These data were interpolated using a tricubic algorithm from IGRF and ephemeris data then linearly interplotted to IVM times.	degrees	Epoch
ICON_L1_IVM_A_SOUTH _FOOTPOINT_FA_ECEF_X	ECEF X-Component of Field Aligned Drift Direction at Southern Footpoint  At the Southern footpoint this is the x-component of the unit vector for field aligned ion drifts expressed in the ECEF frame.	dimensionless	Epoch
ICON_L1_IVM_A_SOUTH _FOOTPOINT_FA_ECEF_Y	ECEF Y-Component of Field Aligned Drift Direction at Southern Footpoint  At the Southern footpoint this is the y-component of the unit vector for field aligned ion drifts expressed in the ECEF frame.	dimensionless	Epoch
ICON_L1_IVM_A_SOUTH _FOOTPOINT_FA_ECEF_Z	ECEF Z-Component of Field Aligned Drift Direction at Southern Footpoint  At the Southern footpoint this is the z-component of the unit vector for field aligned ion drifts expressed in the ECEF frame.	dimensionless	Epoch
ICON_L1_IVM_A_SOUTH _FOOTPOINT_MER_DRIFT	Translating Scalars of Meridional Ion Drifts at Southern Footpoint  Scalars for translating meridional ion drifts (zonal E fields) measured at the spacecraft down to the southern footpoint.	dimensionless	Epoch
ICON_L1_IVM_A_SOUTH _FOOTPOINT_ZON_DRIFT	Translating Scalars of Zonal Ion Drifts at Southern Footpoint  Scalars for translating zonal ion drifts (meridional E fields) measured at the spacecraft down to the southern footpoint.	dimensionless	Epoch
ICON_L1_IVM_A_SOUTH _FOOTPOINT_QD_LAT	Quasi-dipole Latitude of Southern Footpoint  Calculated value of quasi-dipole latitude of southern footpoint from IGRF	degrees	Epoch



Variable Name	Description	Units	Dimensions
ICON_L1_IVM_A_SOUTH _FOOTPOINT_QD_LON	Quasi-dipole Longitude of Southern Footpoint  Calculated value of quasi-dipole longitude of southern footpoint from IGRF	degrees	Epoch
ICON_L1_IVM_A_SOUTH _FOOTPOINT_MER_ECEF _X	ECEF X-Component of Meridional Drift Direction at Southern Footpoint  At the Southern footpoint this is the x-component of the unit vector for meridional ion drifts expressed in the ECEF frame.	dimensionless	Epoch
ICON_L1_IVM_A_SOUTH _FOOTPOINT_MER_ECEF _Y	ECEF Y-Component of Meridional Drift Direction at Southern Footpoint  At the Southern footpoint this is the y-component of the unit vector for meridional ion drifts expressed in the ECEF frame.	dimensionless	Epoch
ICON_L1_IVM_A_SOUTH _FOOTPOINT_MER_ECEF _Z	ECEF Z-Component of Meridional Drift Direction at Southern Footpoint  At the Southern footpoint this is the z-component of the unit vector for meridional ion drifts expressed in the ECEF frame.	dimensionless	Epoch
ICON_L1_IVM_A_SOUTH _FOOTPOINT_ZON_ECEF _X	ECEF X-Component of Zonal Drift Direction at Southern Footpoint  At the Southern footpoint this is the x-component of the unit vector for zonal ion drifts expressed in the ECEF frame.	dimensionless	Epoch
ICON_L1_IVM_A_SOUTH _FOOTPOINT_ZON_ECEF _Y	ECEF Y-Component of Zonal Drift Direction at Southern Footpoint  At the Southern footpoint this is the y-component of the unit vector for zonal ion drifts expressed in the ECEF frame.	dimensionless	Epoch
ICON_L1_IVM_A_SOUTH _FOOTPOINT_ZON_ECEF _Z	ECEF Z-Component of Zonal Drift Direction at Southern Footpoint  At the Southern footpoint this is the z-component of the unit vector for zonal ion drifts expressed in the ECEF frame.	dimensionless	Epoch
ICON_L1_IVM_A_SC_B_ X	X Component of the Magnetic Field at the Spacecraft  X-component of the magnetic field from IGRF at the spacecraft position, expressed in the ECEF frame.	nT	Epoch
ICON_L1_IVM_A_SC_B_ Y	Y Component of the Magnetic Field at the Spacecraft  Y-component of the magnetic field from IGRF at the spacecraft position, expressed in the ECEF frame.	nT	Epoch
ICON_L1_IVM_A_SC_B_ Z	Z Component of the Magnetic Field at the Spacecraft  Z-component of the magnetic field from IGRF at the spacecraft position, expressed in the ECEF frame.	nT	Epoch
ICON_L1_IVM_A_APEX_ HEIGHT	Modified APEX Height  Modified APEX height of the spacecraft position.	km	Epoch

Variable Name	Description	Units	Dimensions
ICON_L1_IVM_A_EQU_MER_DRIFT	<p>Translating Scalars of Meridional Ion Drifts at Equator</p> <p>Scalars for translating meridional ion drifts (zonal E fields) measured at the spacecraft down to the magnetic equator.</p>	dimensionless	Epoch
ICON_L1_IVM_A_EQU_ZON_DRIFT	<p>Translating Scalars of Zonal Ion Drifts at Equator</p> <p>Scalars for translating zonal ion drifts (meridional E fields) measured at the spacecraft down to the magnetic equator.</p>	dimensionless	Epoch
ICON_L1_IVM_A_TIME_GPS	<p>Milliseconds since 1980-01-06 00:00:00 TAI (coincident with UTC) at middle of reading.</p> <p>Milliseconds since 1980-01-06 00:00:00 TAI (coincident with UTC) at middle of reading.</p> <p>Time is generated from the time-code at byte 1015 of the IVM packet minus the time sync at byte 1019 of the IVM packet. This is the GPS time at the start of the integration period. The integration period is assumed to be 4 seconds so the center time is 2 seconds after that. The formula is (time-code * 1000ms) + 2000ms - (16 * time sync / 1000) in GPS milliseconds then converted to UTC time. See the UTD 206-024 Rev A document.</p> <p>Time may be delayed by up to 10 ms due to FSW polling delay.</p> <p>Maximum time is ~2150 UTC and minimum time is ~1970 UTC.</p>	milliseconds	Epoch
ICON_L1_IVM_A_DM_ANGLE_0	<p>DM determined angle along axis 0</p> <p>The Drift Meter (DM) has an entrance aperture that projects an O+ ion beam onto a collector plate divided into 4 equal sections. The angle of the beam determines the beam location, and thus the amount of current recorded by each collector plate. The ratio of currents is recorded on-orbit by the DM. The value of this angle can be reconstructed using the measured ratio of currents. The angle reported here is reconstructed using current ratios measured on-orbit and downsampled onto 1-Hz cadence.</p>	degrees	Epoch
ICON_L1_IVM_A_DM_ANGLE_1	<p>DM determined angle along axis 1</p> <p>The Drift Meter (DM) has an entrance aperture that projects an O+ ion beam onto a collector plate divided into 4 equal sections. The angle of the beam determines the beam location, and thus the amount of current recorded by each collector plate. The ratio of currents is recorded on-orbit by the DM. The value of this angle can be reconstructed using the measured ratio of currents. The angle reported here is reconstructed using current ratios measured on-orbit and downsampled onto 1-Hz cadence.</p>	degrees	Epoch
ICON_L1_IVM_A_DM_RATIO_0	<p>DM measured ratio along axis 0</p>	degrees	Epoch
ICON_L1_IVM_A_DM_RATIO_1	<p>DM measured ratio along axis 1</p>	degrees	Epoch

Variable Name	Description	Units	Dimensions
ICON_L1_IVM_A_LL_ANGLE_0	LL determined angle along axis 0  The Drift Meter (DM) has an entrance aperture that projects an O+ ion beam onto a collector plate divided into 4 equal sections. The angle of the beam determines the beam location, and thus the amount of current recorded by each collector plate. The ratio of collector plate currents is generated using the individual current levels recorded by the log level monitor. The angle reported here is generated using the log level current ratios. Generally speaking, the dm_ratios area a better source.	degrees	Epoch
ICON_L1_IVM_A_LL_ANGLE_1	LL determined angle along axis 0  The Drift Meter (DM) has an entrance aperture that projects an O+ ion beam onto a collector plate divided into 4 equal sections. The angle of the beam determines the beam location, and thus the amount of current recorded by each collector plate. The ratio of collector plate currents is generated using the individual current levels recorded by the log level monitor. The angle reported here is generated using the log level current ratios. Generally speaking, the dm_ratios area a better source.	degrees	Epoch
ICON_L1_IVM_A_LL_RATIO_0	Log level measured ratio along axis 0	degrees	Epoch
ICON_L1_IVM_A_LL_RATIO_1	Log level measured ratio along axis 1	degrees	Epoch
ICON_L1_IVM_A_LLA_MEDIAN_0	Log level A median ratio along axis 0  The log levels are used as an internal monitor of instrument performance. This is the median value of LLA over a packet.	A	Epoch
ICON_L1_IVM_A_LLA_MEDIAN_1	Log level A median ratio along axis 1  The log levels are used as an internal monitor of instrument performance. This is the median value of LLA over a packet.	A	Epoch
ICON_L1_IVM_A_LL_B_MEDIAN_0	Log level B median current level along axis 0  The log levels are used as an internal monitor of instrument performance. This is the median value of LLB over a packet.	A	Epoch
ICON_L1_IVM_A_LL_B_MEDIAN_1	Log level B median current level along axis 1  The log levels are used as an internal monitor of instrument performance. This is the median value of LLB over a packet.	A	Epoch
ICON_L1_IVM_A_RATIO_0	DM measured ratio along axis 0	degrees	Epoch
ICON_L1_IVM_A_RATIO_1	DM measured ratio along axis 1	degrees	Epoch

Variable Name	Description	Units	Dimensions
ICON_L1_IVM_A_ORIG_ANGLE_0	DM determined angle along axis 0  The Drift Meter (DM) has an entrance aperture that projects an O+ ion beam onto a collector plate divided into 4 equal sections. The angle of the beam determines the beam location, and thus the amount of current recorded by each collector plate. The ratio of currents is recorded on-orbit by the DM. The value of this angle can be reconstructed using the measured ratio of currents. The angle reported here is reconstructed using current ratios measured on-orbit and downsampled onto 1-Hz cadence.	degrees	Epoch
ICON_L1_IVM_A_ORIG_ANGLE_1	DM determined angle along axis 1  The Drift Meter (DM) has an entrance aperture that projects an O+ ion beam onto a collector plate divided into 4 equal sections. The angle of the beam determines the beam location, and thus the amount of current recorded by each collector plate. The ratio of currents is recorded on-orbit by the DM. The value of this angle can be reconstructed using the measured ratio of currents. The angle reported here is reconstructed using current ratios measured on-orbit and downsampled onto 1-Hz cadence.	degrees	Epoch
ICON_L1_IVM_A_ORIG_RATIO_0	DM measured ratio along axis 0	degrees	Epoch
ICON_L1_IVM_A_ORIG_RATIO_1	DM measured ratio along axis 1	degrees	Epoch
ICON_L1_IVM_A_DM_CURRENT_POSITIVE_0	Currents to plate pair along positive axis direction.		Epoch
ICON_L1_IVM_A_DM_CURRENT_NEGATIVE_0	Currents to plate pair along negative axis direction.		Epoch
ICON_L1_IVM_A_DM_CURRENT_POSITIVE_1	Currents to plate pair along positive axis direction.		Epoch
ICON_L1_IVM_A_DM_CURRENT_NEGATIVE_1	Currents to plate pair along negative axis direction.		Epoch
ICON_L1_IVM_A_ORIG_DM_CURRENT_POSITIVE_0	Currents to plate pair along positive axis direction.		Epoch
ICON_L1_IVM_A_ORIG_DM_CURRENT_NEGATIVE_0	Currents to plate pair along negative axis direction.		Epoch
ICON_L1_IVM_A_ORIG_DM_CURRENT_POSITIVE_1	Currents to plate pair along positive axis direction.		Epoch
ICON_L1_IVM_A_ORIG_DM_CURRENT_NEGATIVE_1	Currents to plate pair along negative axis direction.		Epoch

Variable Name	Description	Units	Dimensions
ICON_L1_IVM_A_DM_GRID_PHOTO_FLAG	Indicator for presence of illumination. 1 - area illuminated, 0 - no illumination. There are multiple indicators with a consistent naming scheme. inst_surface, where inst is dm or rpa, and the surface is either an internal grid or the instrument collector plate.		Epoch
ICON_L1_IVM_A_DM_COLLECTION_PHOTO_FLAG	Indicator for presence of illumination. 1 - area illuminated, 0 - no illumination. There are multiple indicators with a consistent naming scheme. inst_surface, where inst is dm or rpa, and the surface is either an internal grid or the instrument collector plate.		Epoch
ICON_L1_IVM_A_RPA_GRID_PHOTO_FLAG	Indicator for presence of illumination. 1 - area illuminated, 0 - no illumination. There are multiple indicators with a consistent naming scheme. inst_surface, where inst is dm or rpa, and the surface is either an internal grid or the instrument collector plate.		Epoch
ICON_L1_IVM_A_RPA_COLLECTION_PHOTO_FLAG	Indicator for presence of illumination. 1 - area illuminated, 0 - no illumination. There are multiple indicators with a consistent naming scheme. inst_surface, where inst is dm or rpa, and the surface is either an internal grid or the instrument collector plate.		Epoch
ICON_L1_IVM_A_RPA_RING_PHOTO_FLAG	Flag for when the ring on the edge of collector is illuminated. 0 - not illuminated. 1 - illuminated.	A	Epoch
ICON_L1_IVM_A_RPA_GRID_RING_PHOTO_FLAG	Flag for when the ring holder on the edge of a grid is illuminated. 0 - not illuminated. 1 - illuminated.	A	Epoch
ICON_L1_IVM_A_PHOTO_DM_GRID_AREA_0_POSITIVE	Fractional illuminated area along collector plate axis. Positive (negative) refers to collector half along positive (negative) axis direction.		Epoch
ICON_L1_IVM_A_PHOTO_DM_GRID_AREA_0_NEGATIVE	Fractional illuminated area along collector plate axis. Positive (negative) refers to collector half along positive (negative) axis direction.		Epoch
ICON_L1_IVM_A_PHOTO_DM_GRID_AREA_1_POSITIVE	Fractional illuminated area along collector plate axis. Positive (negative) refers to collector half along positive (negative) axis direction.		Epoch
ICON_L1_IVM_A_PHOTO_DM_GRID_AREA_1_NEGATIVE	Fractional illuminated area along collector plate axis. Positive (negative) refers to collector half along positive (negative) axis direction.		Epoch

Variable Name	Description	Units	Dimensions
ICON_L1_IVM_A_PHOTO_DM_GRID_CURRENT_0_POSITIVE	Photoemission estimated to be present on collector plate pair along axis (0,1). Positive (negative) refers to collector half along positive (negative) axis direction. Estimate obtained by scaling the observed negative currents at high RV in the RPA, illuminated areas, as well as the ratio of illuminated DM and RPA areas.	A	Epoch
ICON_L1_IVM_A_PHOTO_DM_GRID_CURRENT_0_NEGATIVE	Photoemission estimated to be present on collector plate pair along axis (0,1). Positive (negative) refers to collector half along positive (negative) axis direction. Estimate obtained by scaling the observed negative currents at high RV in the RPA, illuminated areas, as well as the ratio of illuminated DM and RPA areas.	A	Epoch
ICON_L1_IVM_A_PHOTO_DM_GRID_CURRENT_1_POSITIVE	Photoemission estimated to be present on collector plate pair along axis (0,1). Positive (negative) refers to collector half along positive (negative) axis direction. Estimate obtained by scaling the observed negative currents at high RV in the RPA, illuminated areas, as well as the ratio of illuminated DM and RPA areas.	A	Epoch
ICON_L1_IVM_A_PHOTO_DM_GRID_CURRENT_1_NEGATIVE	Photoemission estimated to be present on collector plate pair along axis (0,1). Positive (negative) refers to collector half along positive (negative) axis direction. Estimate obtained by scaling the observed negative currents at high RV in the RPA, illuminated areas, as well as the ratio of illuminated DM and RPA areas.	A	Epoch
ICON_L1_IVM_A_PHOTO_DM_ANLY_GRID_CURRENT_0_POSITIVE	Photoemission estimated to be present on collector plate pair along axis (0,1). Positive (negative) refers to collector half along positive (negative) axis direction. Estimate obtained by a simple first-order analytic model that uses the calculated illuminated DM areas, as well as the solar incidence angles.	A	Epoch
ICON_L1_IVM_A_PHOTO_DM_ANLY_GRID_CURRENT_0_NEGATIVE	Photoemission estimated to be present on collector plate pair along axis (0,1). Positive (negative) refers to collector half along positive (negative) axis direction. Estimate obtained by a simple first-order analytic model that uses the calculated illuminated DM areas, as well as the solar incidence angles.	A	Epoch
ICON_L1_IVM_A_PHOTO_DM_ANLY_GRID_CURRENT_1_POSITIVE	Photoemission estimated to be present on collector plate pair along axis (0,1). Positive (negative) refers to collector half along positive (negative) axis direction. Estimate obtained by a simple first-order analytic model that uses the calculated illuminated DM areas, as well as the solar incidence angles.	A	Epoch

Variable Name	Description	Units	Dimensions
ICON_L1_IVM_A_PHOTO_DM_ANLY_GRID_CURRENT_1_NEGATIVE	Photoemission estimated to be present on collector plate pair along axis (0,1). Positive (negative) refers to collector half along positive (negative) axis direction. Estimate obtained by a simple first-order analytic model that uses the calculated illuminated DM areas, as well as the solar incidence angles.	A	Epoch
ICON_L1_IVM_A_PHOTO_RPA_ANLY_GRID_CURRENT	Photoemission estimated to be present on RPA collector. Estimate obtained by a simple first-order analytic model that uses the calculated illuminated RPA areas, as well as the solar incidence angles.	A	Epoch
ICON_L1_IVM_A_PHOTO_SCALAR	Scalar maps the most negative of the modeled photoemission currents to the same current value measured by the RPA at high RV at the same time.		Epoch
ICON_L1_IVM_A_PHOTO_FLAG_Y	0 - no difference, 1 - small correction, 2 - medium correction, 3 - large correction		Epoch
ICON_L1_IVM_A_PHOTO_FLAG_Z	0 - no difference, 1 - small correction, 2 - medium correction, 3 - large correction		Epoch
ICON_L1_IVM_A_DM_GRID_ILLUMINATED_AREA	The net illuminated area that is incident upon all quadrants within the DM.	m <sup>2</sup>	Epoch
ICON_L1_IVM_A_RPA_GRID_ILLUMINATED_AREA	The total illuminated area based upon projecting illumination from the aperture and accounting for the fact that portions of the projected aperture will travel off the projected surface, reducing the illuminated area.	m <sup>2</sup>	Epoch
ICON_L1_IVM_A_DM_COLL_ILLUMINATED_AREA	The net illuminated area that is incident upon all quadrants within the DM.	m <sup>2</sup>	Epoch
ICON_L1_IVM_A_RPA_COLL_ILLUMINATED_AREA	The total illuminated area based upon projecting illumination from the aperture and accounting for the fact that portions of the projected aperture will travel off the projected surface, reducing the illuminated area.	m <sup>2</sup>	Epoch
ICON_L1_IVM_A_PHOTO_DM_RPA_RATIO	Ratio of the illuminated DM and RPA grid areas.		Epoch
ICON_L1_IVM_A_RPA_OFFSET_CURRENT	RPA negative current at maximum RV	A	Epoch
ICON_L1_IVM_A_PHOTO_DM_COLL_CURRENT_0_POSITIVE	Net photoemission estimated on each pair of DM collector plates due to inter-plate electrons, along with currents from lost electrons. The IVM axis is denoted by 0 or 1, and the plate pair along the positive or negative directions is also indicated. 0_positive is comprised of TR and TL currents.	A	Epoch

Variable Name	Description	Units	Dimensions
ICON_L1_IVM_A_PHOTO_DM_COLL_CURRENT_0_NEGATIVE	Net photoemission estimated on each pair of DM collector plates due to inter-plate electrons, along with currents from lost electrons. The IVM axis is denoted by 0 or 1, and the plate pair along the positive or negative directions is also indicated. 0_positive is comprised of TR and TL currents.	A	Epoch
ICON_L1_IVM_A_PHOTO_DM_COLL_CURRENT_1_POSITIVE	Net photoemission estimated on each pair of DM collector plates due to inter-plate electrons, along with currents from lost electrons. The IVM axis is denoted by 0 or 1, and the plate pair along the positive or negative directions is also indicated. 0_positive is comprised of TR and TL currents.	A	Epoch
ICON_L1_IVM_A_PHOTO_DM_COLL_CURRENT_1_NEGATIVE	Net photoemission estimated on each pair of DM collector plates due to inter-plate electrons, along with currents from lost electrons. The IVM axis is denoted by 0 or 1, and the plate pair along the positive or negative directions is also indicated. 0_positive is comprised of TR and TL currents.	A	Epoch
ICON_L1_IVM_A_SUN_TOTAX_ANGLE	Net solar incidence angle with respect to the IVM-X (boresight) axis, positive from IVM towards space	degrees	Epoch
ICON_L1_IVM_A_LOW_LOG_LEVEL_CURRENTS_0	When flag is 1, currents in the DM are too low for the measurement hardware to function.  Currents in the DM are measured using log amps.		Epoch
ICON_L1_IVM_A_LOW_LOG_LEVEL_CURRENTS_1	When flag is 1, currents in the DM are too low for the measurement hardware to function.  Currents in the DM are measured using log amps.		Epoch



## Acknowledgement

This is a data product from the NASA Ionospheric Connection Explorer mission, an Explorer launched at 21:59:45 EDT on October 10, 2019. Guidelines for the use of this product are described in the ICON Rules of the Road (<https://icon.ssl.berkeley.edu/Data>)

Responsibility for the mission science falls to the Principal Investigator, Dr. Thomas Immel at UC Berkeley: Immel, T.J., England, S.L., Mende, S.B. et al. Space Sci Rev (2018) 214: 13. <https://doi.org/10.1007/s11214-017-0449-2>

Responsibility for the validation of the L1 data products falls to the instrument lead investigators/scientists.

- \* EUV: Dr. Eric Korpela : <https://doi.org/10.1007/s11214-017-0384-2>
- \* FUV: Dr. Harald Frey : <https://doi.org/10.1007/s11214-017-0386-0>
- \* MIGHTI: Dr. Christoph Englert : <https://doi.org/10.1007/s11214-017-0358-4>, and <https://doi.org/10.1007/s11214-017-0374-4>
- \* IVM: Dr. Roderick Heelis : <https://doi.org/10.1007/s11214-017-0383-3>

Responsibility for the validation of the L2 data products falls to those scientists responsible for those products.

- \* Daytime O and N2 profiles: Dr. Andrew Stephan : <https://doi.org/10.1007/s11214-018-0477-6>
- \* Daytime (EUV) O+ profiles: Dr. Andrew Stephan : <https://doi.org/10.1007/s11214-017-0385-1>
- \* Nighttime (FUV) O+ profiles: Dr. Farzad Kamalabadi : <https://doi.org/10.1007/s11214-018-0502-9>
- \* Neutral Wind profiles: Dr. Jonathan Makela : <https://doi.org/10.1007/s11214-017-0359-3>
- \* Neutral Temperature profiles: Dr. Christoph Englert : <https://doi.org/10.1007/s11214-017-0434-9>
- \* Ion Velocity Measurements : Dr. Russell Stoneback : <https://doi.org/10.1007/s11214-017-0383-3>

Responsibility for Level 4 products falls to those scientists responsible for those products.

- \* Hough Modes : Dr. Chihoko Yamashita : <https://doi.org/10.1007/s11214-017-0401-5>
- \* TIEGCM : Dr. Astrid Maute : <https://doi.org/10.1007/s11214-017-0330-3>
- \* SAMI3 : Dr. Joseph Huba : <https://doi.org/10.1007/s11214-017-0415-z>

Pre-production versions of all above papers are available on the ICON website. <http://icon.ssl.berkeley.edu/Publications>

Overall validation of the products is overseen by the ICON Project Scientist, Dr. Scott England.

NASA oversight for all products is provided by the Mission Scientist, Dr. Jeffrey Klenzing.

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These data are openly available as described in the ICON Data Management Plan available on the ICON website (<http://icon.ssl.berkeley.edu/Data>).

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