

Geometry Library: The Concept

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The Geometry Index Concept



- PSA Generic Geometry Index provides:
 - Geometry and Position Information
 - Look-up table for data products for geometry searches
- Mission and Instrument Independent format:
 - Same format for all missions and all instruments
 - Two generic types of instruments considered:
 - Mapping Instruments
 - Space/Spacecraft Environment Measurement Instruments (i.e. Plasma Instruments).
- Flexibility to define more than one index line for each data product.



The 'Line' Concept



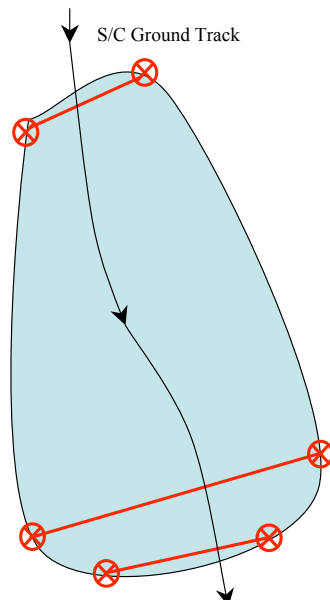
- Provides a instrument independent way of describing instrument observations/measurements.
- Index Lines describe samples of the data products:
 - A physical line in the footprint of a mapping instrument.
 - A point in time when a measurement was acquired
 - A projected line on the surface of a body for limb-atmospheric measurements.
- For mapping instruments:
 - Simple way to describe a footprint in an instrument independent way
 - Possibility of reconstructing the footprint by joining all the left-hand points and all the right-hand points.
- For non-mapping instruments:
 - Simple way to describe a continuous measurement (i.e. along one orbit)



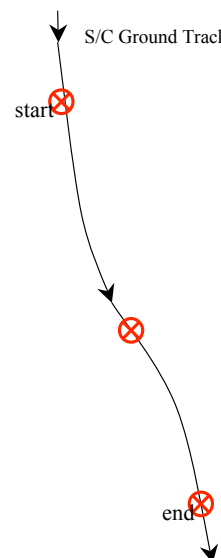
- The Number of lines:
 - Variable:
 - Between data sets
 - Between data products
 - Between observations within a data product
 - Related with the Sampling frequency:
 - Constant in time;
 - Variable: to keep the same distance between to consecutive physical lines in the footprint.
- Center of a line (mapping instruments):
 - Geometrical center point in latitude and longitude, as seen from the Instrument.
 - Depends on the orientation of the spacecraft/instrument.
 - This center time has a time associated (needs to be computed)



(a) Mapping Instruments



(b) Non-mapping Instruments





- 'Line' Description Parameters:
 - N and I: Maximum and Current Line Number
- Non-Geometrical Parameters:
 - CHANGE_MODE, RELEASE_ID, REVISION_ID
 - PATH_NAME, FILE_NAME, PRODUCT_ID, DATA_SET_ID
- Geometrical Parameters:

GEOMETRY_EPOCH	START_POINT_LATITUDE
ORBIT_NUMBER	START_POINT_LONGITUDE
	END_POINT_LATITUDE
SOLAR_LONGITUDE	END_POINT_LONGITUDE
SUB_SOLAR_LATITUDE	CENTER_LATITUDE
SUB_SOLAR_LONGITUDE	CENTER_LONGITUDE
	PHASE_ANGLE
SC_SUN_DISTANCE	INCIDENCE_ANGLE
X/Y/Z_SC_SUN_POSITION_VECTOR	EMISSION_ANGLE
X/Y/Z_SC_SUN_VELOCITY_VECTOR	SLANT_DISTANCE
X/Y/Z_SC_TARGET_POSITION_VECTOR	NORTH_POLE_AZIMUTH_ANGLE
X/Y/Z_SC_TARGET_VELOCITY_VECTOR	SUB_SC_AZIMUTH_ANGLE
SPACECRAFT_ALTITUDE	SUB_SOLAR_AZIMUTH_ANGLE
SUB_SPACECRAFT_LATITUDE	HORIZONTAL_PIXEL_SCALE
SUB_SPACECRAFT_LONGITUDE	VERTICAL_PIXEL_SCALE
LOCAL_TRUE_SOLAR_TIME	



- Library based on CSPICE that provides a common set of routines to compute the required geometry parameters of the PSA Geometry Index File (see table)
- Additionally, GeoLib provides writing routines for formatting and PDS label generation for the Geometry Index File.
- Before using GeoLib, it is required to be familiar with CSPICE
- The use of GeoLib implies determining the footprint of your instrument (if any):
 - Extract data product information from the data product's label (release and revision information, dataset ID, product ID)
 - Extract time information about each single observation in the data product.
 - Compute the corner points of each line or the 'sampling' time:
 - For mapping instruments: compute the corner points of each of the lines that will describe the footprint
 - For non-mapping instruments: determine the succession of times that will represent the 'sampling' of the measurement.
- Only available for MEX; mission independent in the future



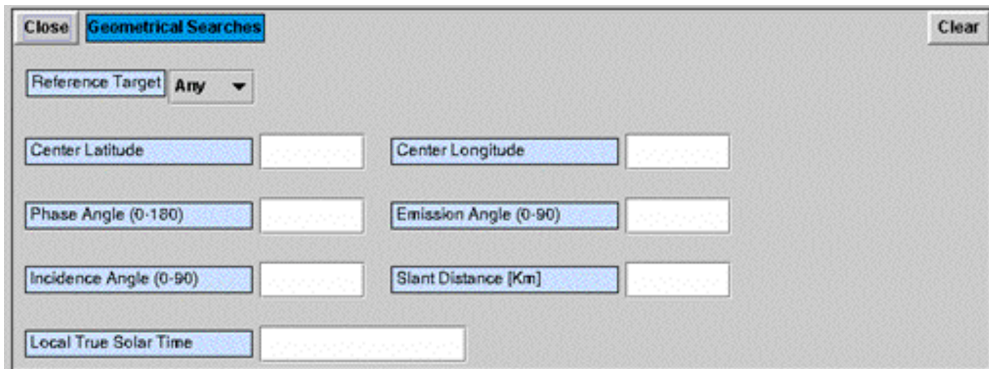
<code>clnblank</code>	Clean blank columns + gmaxlengths functionality
<code>gmaxlengths</code>	Maximum length of columns & records. No Lines.
<code>writeln</code>	Write a line in the Geometry Index File
<code>wrtidxobj</code>	Write Geometry Index Table Object (PDS)
<code>orbit_number</code>	ORBIT_NUMBER
<code>solar_longitude</code>	SOLAR_LONGITUDE
<code>sub_solar_point</code>	SUB_SOLAR_LATITUDE SUB_SOLAR_LONGITUDE
<code>sc_sun_distance</code>	SC_SUN_DISTANCE
<code>sc_sun_state_vector</code>	X/Y/Z_SC_SUN_POSITION_VECTOR X/Y/Z_SC_SUN_VELOCITY_VECTOR
<code>sc_target_state_vector</code>	X/Y/Z_SC_TARGET_POSITION_VECTOR X/Y/Z_SC_TARGET_VELOCITY_VECTOR
<code>spacecraft_altitude</code>	SPACECRAFT_ALTITUDE
<code>sub_spacecraft_point</code>	SUB_SPACECRAFT_LATITUDE SUB_SPACECRAFT_LONGITUDE
<code>local_true_solar_time</code>	LOCAL_TRUE_SOLAR_TIME



<code>center_point</code>	CENTER_LATITUDE CENTER_LONGITUDE
<code>illumination_angles</code>	PHASE_ANGLE INCIDENCE_ANGLE EMISSION_ANGLE
<code>slant_distance</code>	SLANT_DISTANCE
<code>azimuth_angles (tbw)</code>	NORTH_POLE_AZIMUTH_ANGLE SUB_SC_AZIMUTH_ANGLE SUB_SOLAR_AZIMUTH_ANGLE
<code>pixel_scale (tbw)</code>	HORIZONTAL_PIXEL_SCALE VERTICAL_PIXEL_SCALE
<code>pointing_mode (tbw)</code>	Returns the pointing modes.



- GeoLib is used in Mars Express to generate the Geometry Index files that are used in the geometrical search engine:



Close **Geometrical Searches** Clear

Reference Target **Any** ▾

Center Latitude Center Longitude

Phase Angle (0-180) Emission Angle (0-90)

Incidence Angle (0-90) Slant Distance [Km]

Local True Solar Time