



SOLAR SYSTEM TREKS

<https://trek.nasa.gov>

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PDS DATA SERVICES WORKSHOP

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Overview

- Sponsors: NASA SMD PSD, SMD Partnership/Engagement, HEOMD AES
- Interactive Trek portals
 - Visualization (2D, 3D, interactive flyover, VR, 3D print)
 - Analysis (Elevation profile, Lighting, Hazard, Slope, ...)
- Diverse use cases
 - mission planning, scientific research and public engagement
- Publicly available: Moon, Mars, Mercury , Vesta, Ceres, Titan, IcyMoons
- Under development: Earth (Water, Methane), Bennu, Ryugu, Phobos

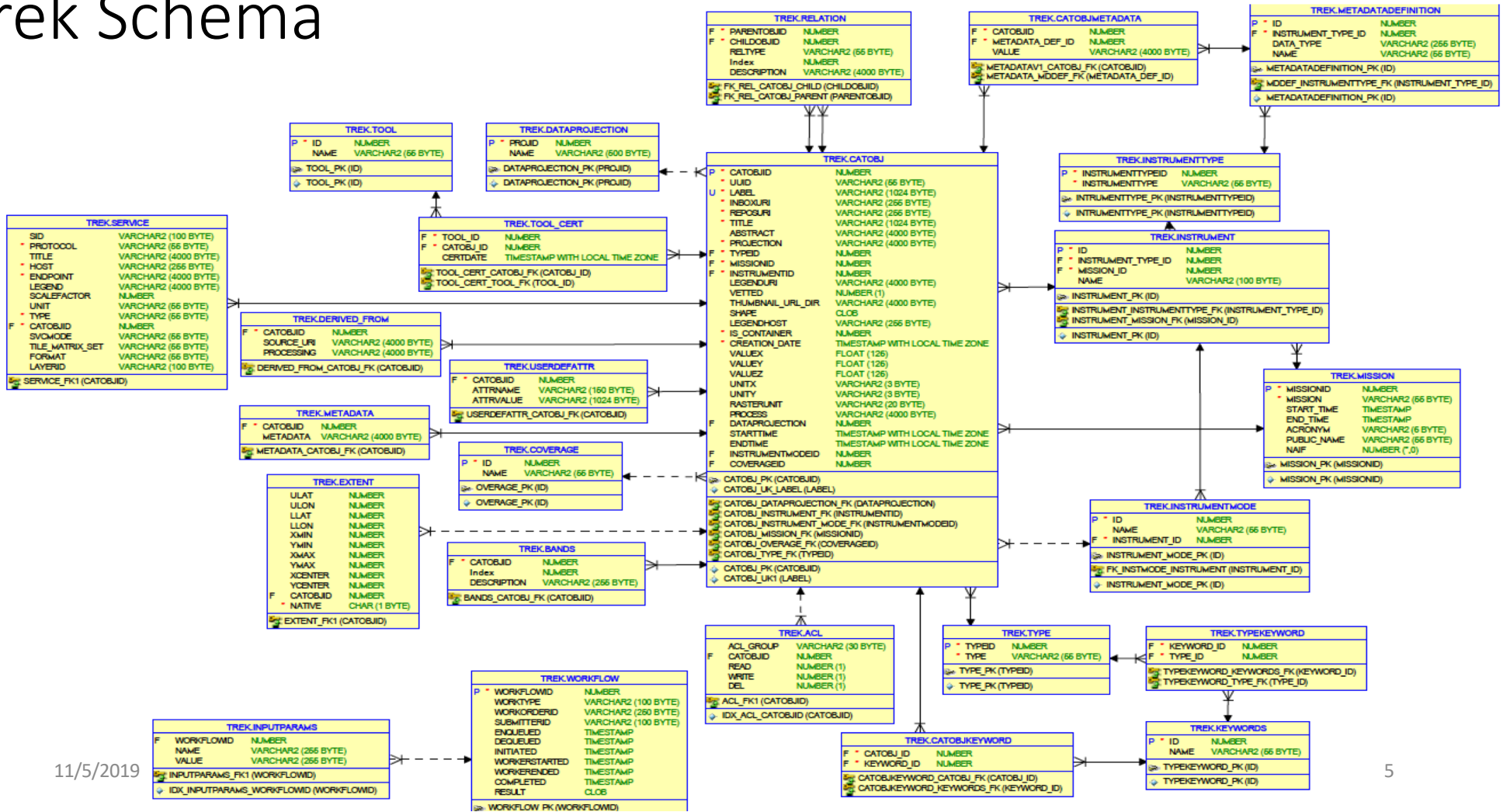
Trek Platform

- Discovery, Distribution and Usability – NASA big data interactive visualization and analytics for diverse audience
- Analytic - Allow for a user defined function to operate on Terabytes of data from diverse data sources
- Ultimate goal - Advance science, exploration and engagement

Data

- High level geospatial products
 - Different instruments on board of past and current missions
- Data Sets
 - Raster
 - Vector
 - Time Series
- Models

Trek Schema



11/5/2019

Example Trek Web Service APIs

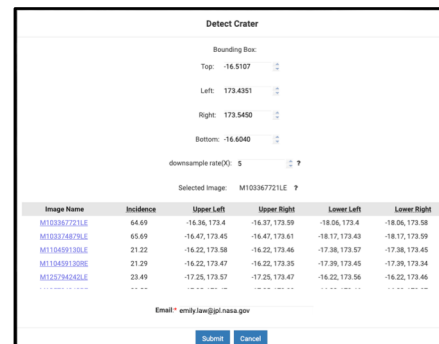
- https://trek.nasa.gov/tiles/Moon/EQ/LRO_NAC_RockDen_20N010E_2mp
- [https://trek.nasa.gov/titan/TrekServices/ws/index/eq/searchItems?facetKeys=productType&facetValues=Spectral%20\(VIMS\)](https://trek.nasa.gov/titan/TrekServices/ws/index/eq/searchItems?facetKeys=productType&facetValues=Spectral%20(VIMS))
- [https://trek.nasa.gov/titan/TrekServices/ws/index/eq/searchItems?shape=POLYGON\(\(-69.2578112080948%20-81.12304536176583,36.03515557781581%20-81.12304536176583,36.03515557781581%2077.25585793390269,-69.2578112080948%2077.25585793390269,-69.2578112080948%20-81.12304536176583\)\)&&&proj=urn:ogc:def:crs:IAU2000::60600&start=0&rows=30&facetKeys=instrument&facetValues=VIMS](https://trek.nasa.gov/titan/TrekServices/ws/index/eq/searchItems?shape=POLYGON((-69.2578112080948%20-81.12304536176583,36.03515557781581%20-81.12304536176583,36.03515557781581%2077.25585793390269,-69.2578112080948%2077.25585793390269,-69.2578112080948%20-81.12304536176583))&&&proj=urn:ogc:def:crs:IAU2000::60600&start=0&rows=30&facetKeys=instrument&facetValues=VIMS)

PDS to Trek

- Data
 - Majority of products are based on PDS data
 - Download from nodes and subnodes
 - Transform PDS data to GIS ready and analytics ready valued added products
 - ISIS and custom scripts for georeferencing, mosaicking, color balancing
 - Ames Stereo Pipeline and custom scripts for digital evaluation
 - Database
 - Immediate and final products
 - Enhanced metadata for geospatial search
 - Tiling
- Tool Registry
- Analysis tools
 - Slope, Lighting, Surface Electrostatic Potential analysis based on DEMs
 - Rock, rockfall, crater detection based on image data
 - Laser Reflector tool based on image metadata

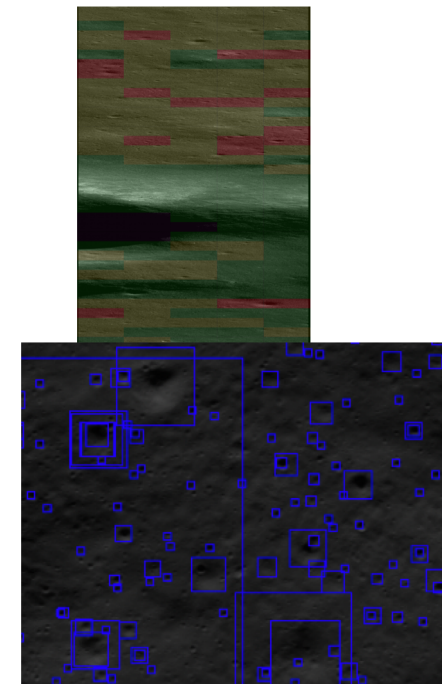
Tool example: Crater detection

- User specified area
- Select available PDS image
- Results include a table of crater details, an image of cratered detected and a map of crater distribution

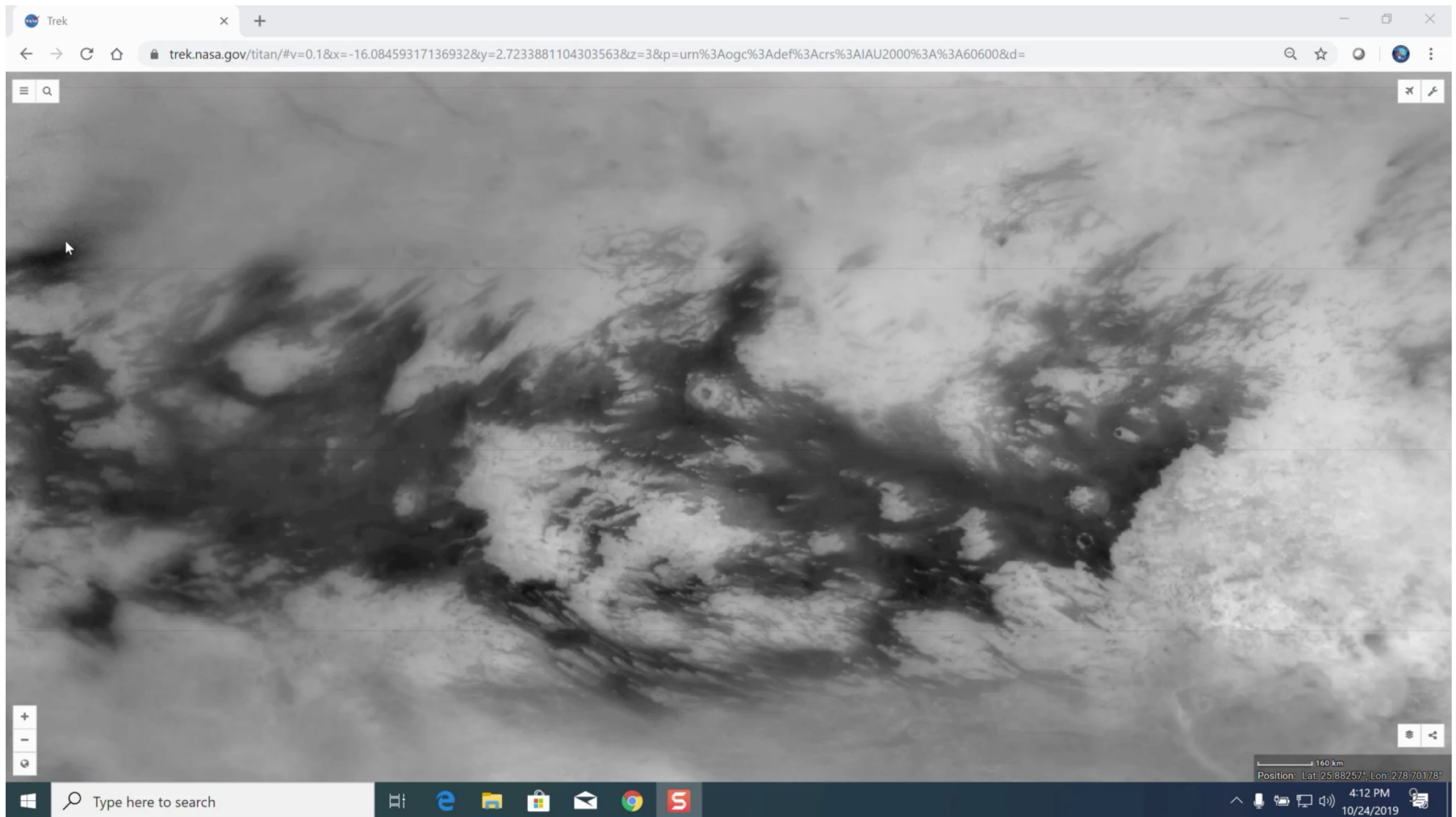


```
Sun_Incidence : null
SubSolarAzimuth: null
Generated: JPL/Caltech
Axes, depth, diameter are in meters
```

Id	NACx	NACy	Conf	Depth	Diameter
2	2373.000000	2576.000000	1.000000	9.342824	84.968000
3	2341.000000	5024.000000	1.000000	8.454129	84.968000
4	2197.500000	6576.000000	1.000000	8.532318	112.395000
5	2102.000000	8672.000000	1.000000	13.304134	141.600000
6	2118.000000	6944.000000	1.000000	1.301181	113.280000
7	2118.000000	512.000000	1.000000	8.454129	113.280000
8	2038.500000	4976.000000	1.000000	7.517181	84.975000
9	1592.500000	13288.000000	1.000000	16.247438	148.715000
10	1592.500000	13288.000000	1.000000	3.668343	225.675000
11	1679.500000	1584.000000	1.000000	15.536937	169.635000
12	1863.000000	6784.000000	1.000000	8.988259	84.968000
13	1751.500000	7889.000000	1.000000	15.739698	112.395000
14	1353.500000	7564.000000	1.000000	6.502145	84.975000
15	1386.000000	5728.000000	1.000000	8.988259	113.280000
16	1289.500000	2112.000000	1.000000	18.786991	197.355000
17	1276.000000	1184.000000	1.000000	14.813777	84.968000
18	2078.000000	47712.000000	1.000000	8.238901	84.968000
19	2822.500000	48272.000000	1.000000	2.951842	84.975000
20	1911.000000	44784.000000	1.000000	7.517181	84.968000
21	1751.500000	48728.000000	1.000000	14.813777	112.395000
22	1688.000000	47656.000000	1.000000	17.668184	196.478000
23	1688.000000	45296.000000	1.000000	12.498625	141.600000
24	1337.500000	47656.000000	1.000000	2.378626	148.715000
25	1290.000000	47648.000000	1.000000	5.694755	84.968000
26	1497.000000	33264.000000	1.000000	11.881367	84.968000



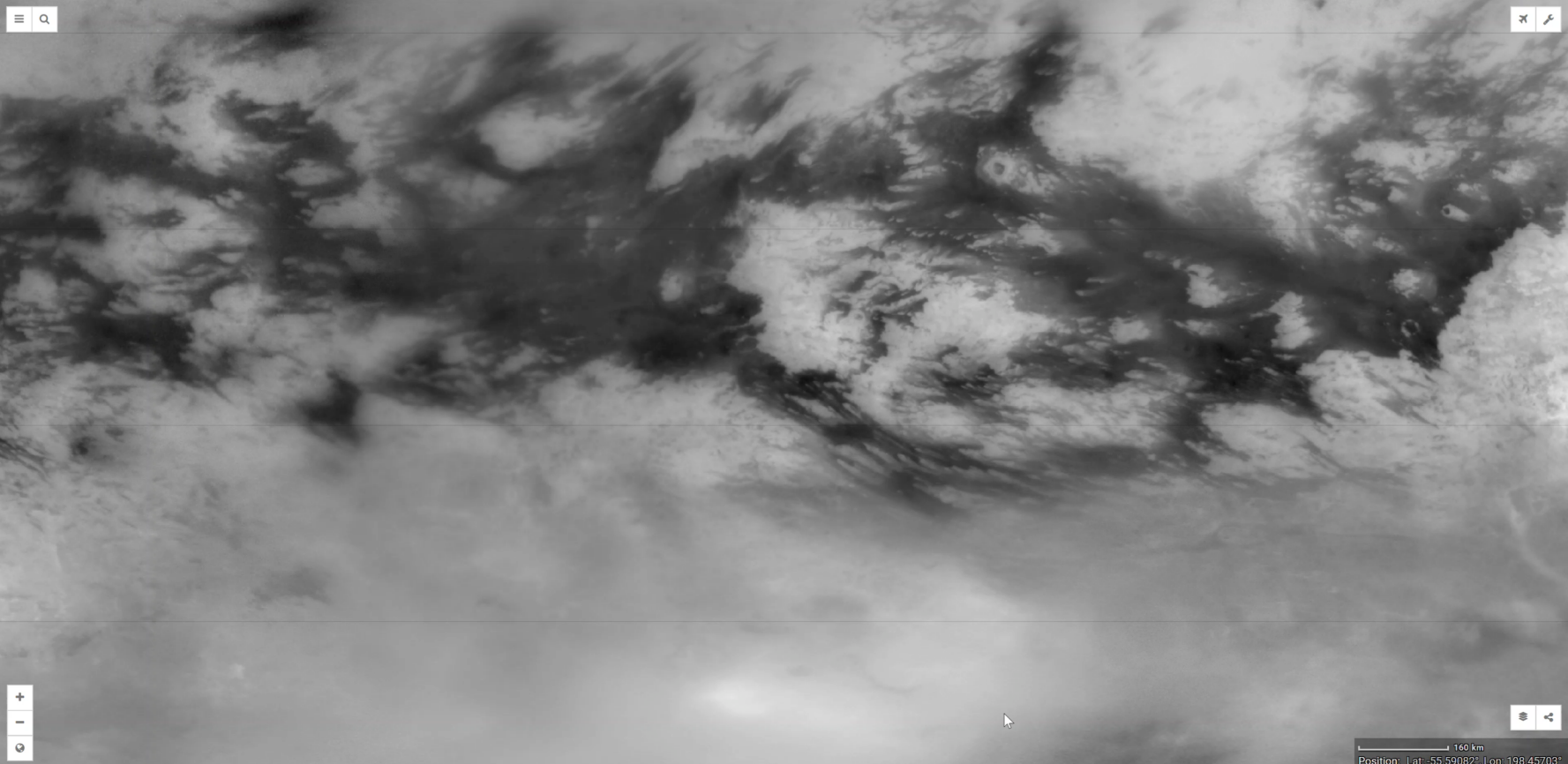
Trek to PDS



Issue

Trek x +

trek.nasa.gov/titan/#v=0.1&x=-70.62011587018293&y=-17.75390591882633&z=3&p=urn%3Aogc%3Adef%3Acrs%3AIAU2000%3A%3A60600&d=



160 km
Position: Lat: 55.59082°, Lon: 198.45703°

Type here to search

4:19 PM
10/24/2019

How can PDS help?

- High performance web service data service APIs
 - Based on specified geospatial location, time and various facets
 - E.g., a polygon, radius given a center point, incident angle
 - Enhanced information model/metadata
 - Transformation to and support of GIS ready format
 - Prevent broken linkage and duplication
- Data lineage
 - As required metadata
 - Promote reusability and reproducibility
- Archive Treks data in PDS?

What can Trek offer?

An example of PSDI (Planetary Spatial Data Infrastructure)

- Discovery & Distribution
- Use
 - Interactive visualization
 - Interactive analytics
 - Data processing platform on the cloud
 - User defined functions
- Expertise & Tools

Questions?

Trek Metadata

Center Emission Angle	33.337565960158
Center Incidence Angle	23.754286456831
Center Lat	4.8288297079471
Center Lon	242.8718275491
Center Phase Angle	35.598167707521
Command Sequence Number	9423
EDR Label Source	Follow the link
Exposure Duration	32000.000000
External Source URI	Follow the link
Flyby	T10
instrument	ISS
instrument Mode	ISSNA
Lines	512
North Azimuth	324.20948980375
Off Nadir Angle	0.40783808110027
Parallax X	0.092563964708615
Parallax Y	-0.65127109634324
Pixel Mean	1332.3126602173
Pixel Resolution	2356.4687582961 meters/pixel
Pixel Std Dev	113.37214226341