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Sequoia Laser In-situ Scattering and Transmissometry (LISST) Data

The Sequoia LISST records transmission, pressure, temperature along with light intensity parameters that can be used to compute % optical transmission. LISST is a burst-type instrument, normally collecting data from 40 elements every 600 seconds. The data from the 40 elements is reported sequentially in a short burst. Data can be downloaded as comma separated text files or MATLAB .mat files. For more information, see the manufacturer's website: http://www.sequoiasci.com/product/lisst-100x/. This site also has the user manual, specifications, and processing application notes, including processing code examples and more.

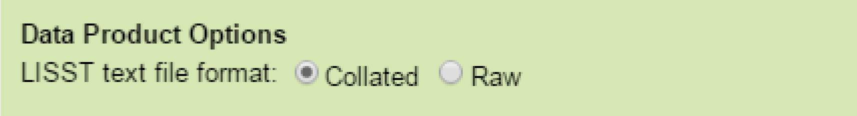
Oceans 3.0 API filter: `dataProductCode=SLISSTD`

Revision History:

- 20150630: Data product migrated from VENUS data download

Data Product Options

Collated or Raw Burst Format for Sequoia LISST Text Files



Data Product Options

LISST text file format: ● Collated ○ Raw

For Sequoia LISST Particle Analyzers, this options controls the format of the LISST text file data product. With the default *Collated* option, the data from the 40 elements is separated in to 40 columns (like a CSV file with 40 sensors). With the alternate option, *Raw*, the data is as reported by the device: sequentially through the 40 elements.

- Collated
  Oceans 3.0 API filter: `dpo_LISSTtextfileformat=1`
- Raw
  Oceans 3.0 API filter: `dpo_LISSTtextfileformat=0`

Formats

LISST data is available in text (**TXT**) files or in **MAT** file formats. Background and factory scatter .txt files will also be provided with the data products, when available.

TXT

Like the standard CSV file for time series scalar data, the LISST text file has a header with basic meta data, followed by the data body delimited by commas. Here is an example for the *Collated* option:

```
%
Time Zone: UTC
Observatory Name: VENUS
Location: Delta Node (SoG)
Site/Station: Lower Slope_Bottom Boundary Layer; Deployment Dates: 2014-03-08 20:24:00 to: 2015-03-29 17:30:00;
Latitude(decdeg): 49.0805 Longitude(decdeg): -123.3395 Depth(m): 142
Device Name: Sequoia LISST-100x 1339; Device ID: 23165
Time Format: yyyymmddTHHMMSS.FFFZ
Data Gaps are represented by NaN's (Not a Number)
Sample Period: 600s from: 2014-03-08 20:24:00 to: 2015-03-29 17:30:00
All detectors measure light intensity.
%
TimeStamp (UTC) , Detector 1 , Detector 2 , Detector 3 , Detector 4 , Detector 5 , Detector 6 , Detector 7 ,
Detector 8 , Detector 9 , Detector 10 , Detector 11 , Detector 12 , Detector 13 , Detector 14 , Detector 15 ,
Detector 16 , Detector 17 , Detector 18 , Detector 19 , Detector 20 , Detector 21 , Detector 22 , Detector 23 ,
Detector 24 , Detector 25 , Detector 26 , Detector 27 , Detector 28 , Detector 29 , Detector 30 , Detector 31 ,
Detector 32 , Laser Transimission Sensor , Battery Voltage (raw counts) , External Aux Input , Laser Reference
sensor , Pressure (raw counts) , Temperature (degree C x 100) , (Day*100+Hour) at which data taken from
instument clock , (Minutes*100+Seconds) at which data taken from instrument clock
20140409T213033.523Z , 2530 , 3370 , 4210 , 5480 , 5070 , 4710 , 5900 , 7040 , 6990 , 8490 , 7500 , 8730 , 8900
, 8740 , 8990 , 9610 , 8640 , 9030 , 8150 , 8920 , 8440 , 9350 , 10920 , 6890 , 8400 , 5170 , 5330 , 3810 ,
3580 , 2870 , 2560 , 1520 , 909 , 2370 , 11 , 1671 , 30614 , 818 , 17710 , 5226
20140409T214017.579Z , 2530 , 3370 , 4210 , 5480 , 5070 , 4710 , 5900 , 7040 , 6990 , 8490 , 7500 , 8730 , 8900
, 8740 , 8990 , 9610 , 8640 , 9030 , 8150 , 8920 , 8440 , 9350 , 10920 , 6890 , 8400 , 5170 , 5330 , 3810 ,
3580 , 2870 , 2560 , 1520 , 909 , 2370 , 11 , 1671 , 30614 , 818 , 17710 , 5226
```

Here is another example, with the *Raw* option:

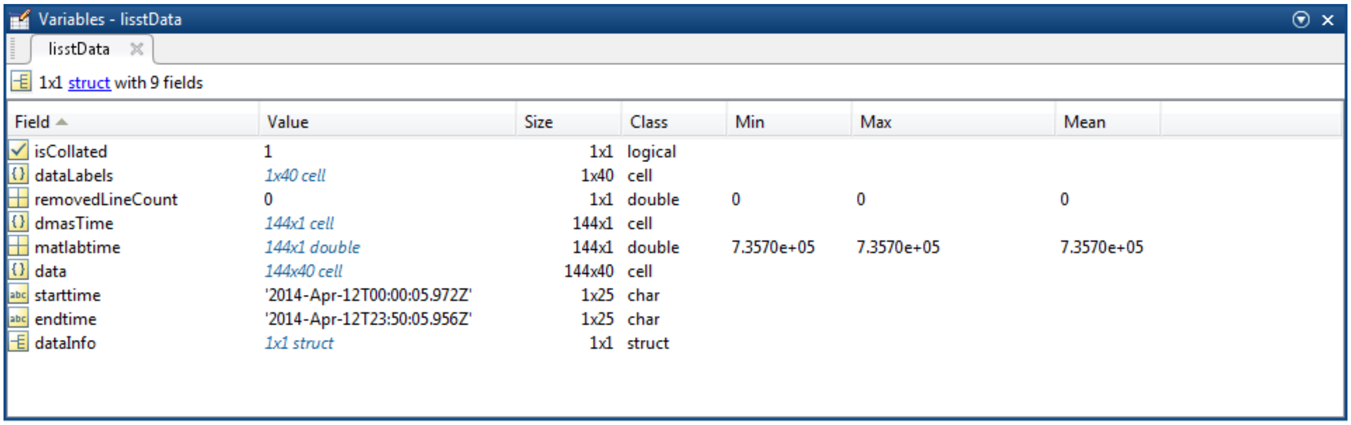
```
%
Time Zone: UTC
Observatory Name: VENUS
Location: Delta Node (SoG)
Site/Station: Lower Slope_Bottom Boundary Layer; Deployment Dates: 2014-03-08 20:24:00 to: 2015-03-29 17:30:00;
Latitude(decdeg): 49.0805 Longitude(decdeg): -123.3395 Depth(m): 142
Device Name: Sequoia LISST-100x 1339; Device ID: 23165
Time Format: yyyymmddTHHMMSS.FFFZ
Data Gaps are represented by NaN's (Not a Number)
Sample Period: 600s from: 2014-03-08 20:24:00 to: 2015-03-29 17:30:00
Elements 1:32 - Light Intensity on Detectors 1 through 32
Element 33 - Laser Transmission Sensor
Element 34 - Battery Voltage in Raw Counts
Element 35 - External Aux Input 1
Element 36 - Laser Reference Sensor
Element 37 - Pressure in raw counts
Element 38 - Temperature in 100ths of degrees C
Element 39 - (Day*100+Hour) from instrument clock
Element 40 - (Minutes*100+Seconds) from instrument clock
%
Time , Raw Data
20140409T213033.587Z , 2530
20140409T213033.651Z , 3370
20140409T213033.715Z , 4210
20140409T213033.779Z , 5480
20140409T213033.844Z , 5070
20140409T213033.907Z , 4710
20140409T213033.971Z , 5900
20140409T213034.035Z , 7040
20140409T213034.099Z , 6990
20140409T213034.163Z , 8490
20140409T213034.227Z , 7500
(file continues...)
```

Oceans 3.0 API filter: `extension=txt`

MAT

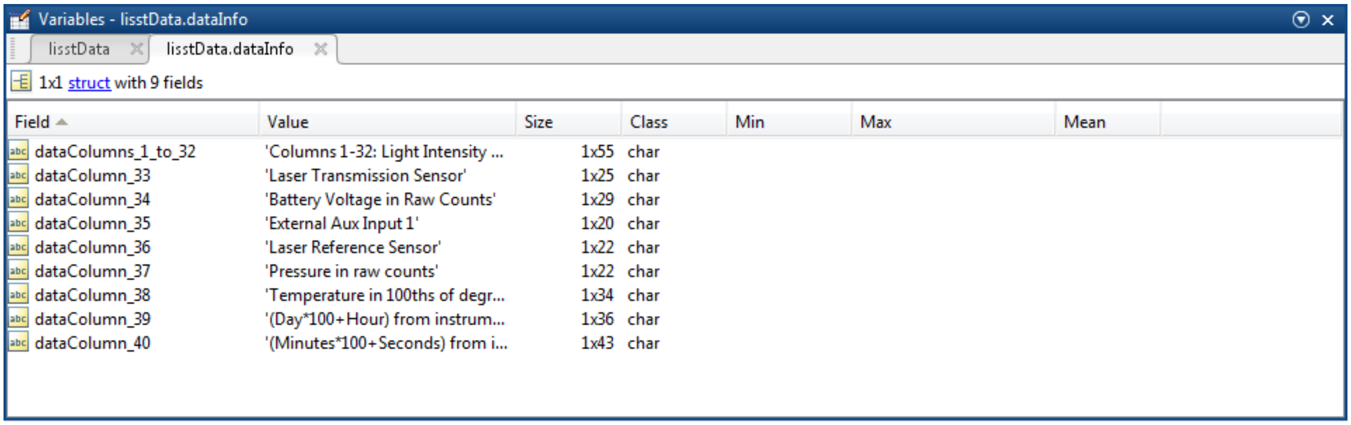
There is no *Raw* option for the **MAT** file format; the data is always *Collated*, or parsed into the 40 sensor elements. The file contains two main structures, the standard *Meta* structure and the *lisstData* structure as described below.

lisstData: here is what the *lisstData* structure looks like in MATLAB:



1x1 struct with 9 fields

Field	Value	Size	Class	Min	Max	Mean
isCollated	1	1x1	logical			
dataLabels	*1x40 cell*	1x40	cell			
removedLineCount	0	1x1	double	0	0	0
dmasTime	*144x1 cell*	144x1	cell			
matlabtime	*144x1 double*	144x1	double	7.3570e+05	7.3570e+05	7.3570e+05
data	*144x40 cell*	144x40	cell			
starttime	'2014-Apr-12T00:00:05.972Z'	1x25	char			
endtime	'2014-Apr-12T23:50:05.956Z'	1x25	char			
dataInfo	*1x1 struct*	1x1	struct			

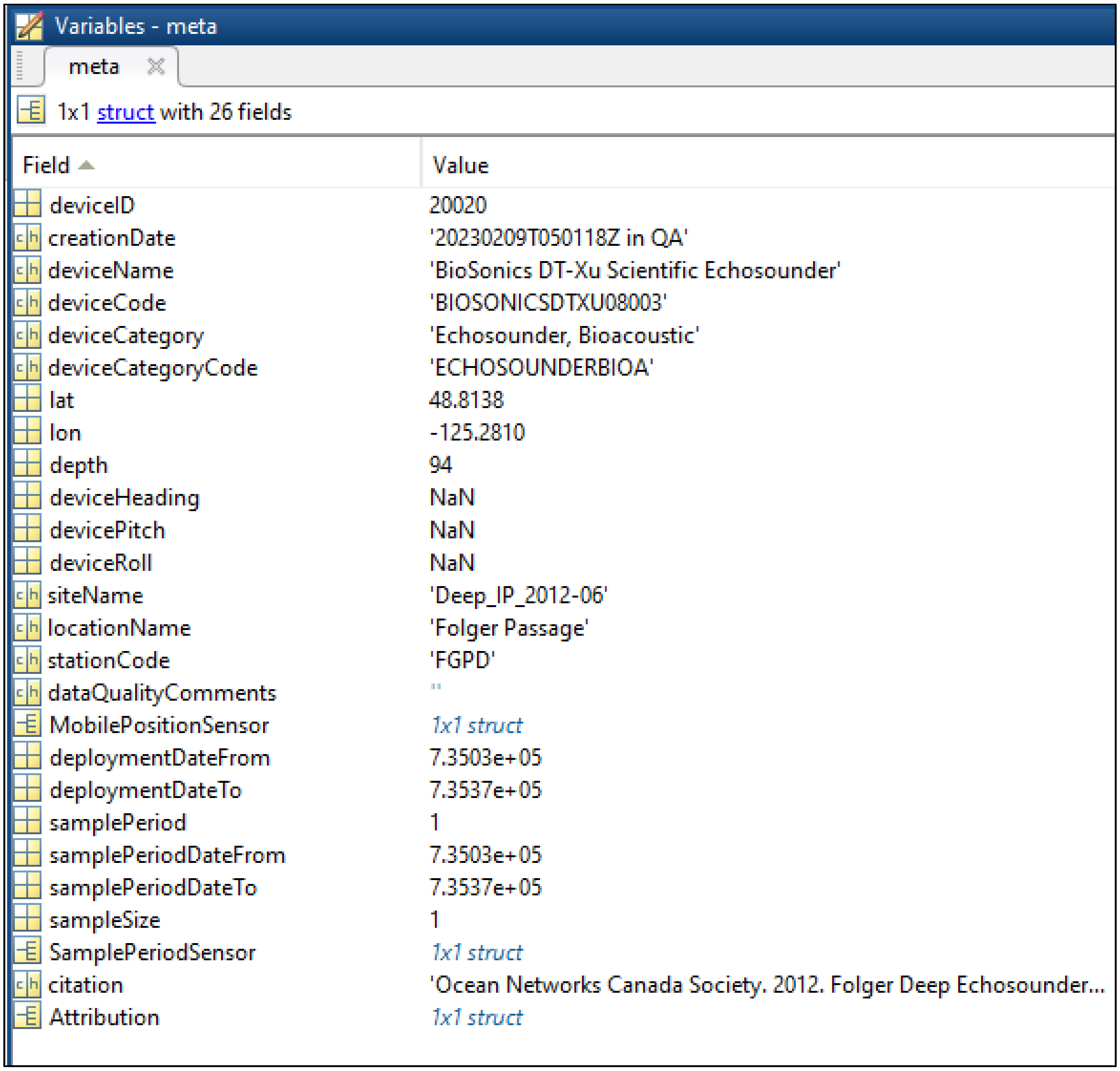


1x1 struct with 9 fields

Field	Value	Size	Class	Min	Max	Mean
dataColumns_1_to_32	'Columns 1-32: Light Intensity ...	1x55	char			
dataColumn_33	'Laser Transmission Sensor'	1x25	char			
dataColumn_34	'Battery Voltage in Raw Counts'	1x29	char			
dataColumn_35	'External Aux Input 1'	1x20	char			
dataColumn_36	'Laser Reference Sensor'	1x22	char			
dataColumn_37	'Pressure in raw counts'	1x22	char			
dataColumn_38	'Temperature in 100ths of degr...	1x34	char			
dataColumn_39	'(Day*100+Hour) from instrum...	1x36	char			
dataColumn_40	'(Minutes*100+Seconds) from i...	1x43	char			

The body of the data is stored in the cell array *lisstData.data,* which will have a size of number of times by 40, with each containing the numeric for a particular element for a particular reading. Time stamps are stored in *lisstData.matlabtime* (datenum format), which is converted from *lisstData.dmasTime* (time in ISO-8601 format in a cell array of strings). *dataLabels* and *dataInfo* describe the 40 elements, *removedLineCount* is the number of raw data lines in the source log file that were ignored (usually device driver commands), *starttime*/*endtime* are the time extents of the data.

Meta: a structure array containing the following metadata fields:

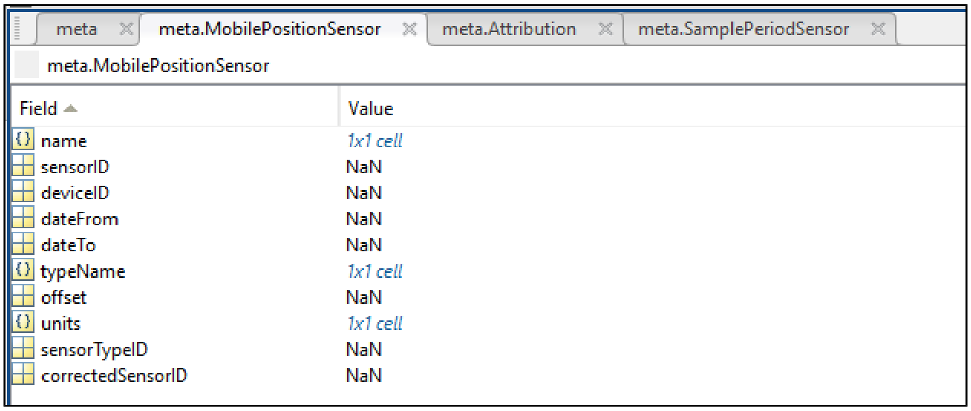


1x1 struct with 26 fields

Field	Value
deviceID	20020
creationDate	'20230209T050118Z in QA'
deviceName	'BioSonics DT-Xu Scientific Echosounder'
deviceCode	'BIOSONICSDTXU08003'
deviceCategory	'Echosounder, Bioacoustic'
deviceCategoryCode	'ECHOSOUNDERBIOA'
lat	48.8138
lon	-125.2810
depth	94
deviceHeading	NaN
devicePitch	NaN
deviceRoll	NaN
siteName	'Deep_IP_2012-06'
locationName	'Folger Passage'
stationCode	'FGPD'
dataQualityComments	''
MobilePositionSensor	*1x1 struct*
deploymentDateFrom	7.3503e+05
deploymentDateTo	7.3537e+05
samplePeriod	1
samplePeriodDateFrom	7.3503e+05
samplePeriodDateTo	7.3537e+05
sampleSize	1
SamplePeriodSensor	*1x1 struct*
citation	'Ocean Networks Canada Society. 2012. Folger Deep Echosounder...
Attribution	*1x1 struct*

- deviceID: A unique identifier to represent the instrument within the Ocean Networks Canada data management and archiving system.
- creationDate:Date and time (using ISO8601 format) that the data product was produced. This is a valuable indicator for comparing to other revisions of the same data product.
- deviceName: A name given to the instrument.
- deviceCode: A unique string for the instrument which is used to generate data product filenames.
- deviceCategory: Device category to list under data search ('Echosounder').
- deviceCategoryCode: Code representing the device category. Used for accessing webservices, as described here: API / webservice documentation (log in to see this link).
- lat: Fixed value obtained at time of deployment. Will be NaN if mobile or if both site latitude and device offset are null. If mobile, sensor information will be available in mobilePositionSensor structure..
- lon: Fixed value obtained at time of deployment. Will be NaN if mobile or if both site longitude and device offset are null. If mobile, sensor information will be available in mobilePositionSensor structure.
- depth: Fixed value obtained at time of deployment. Will be NaN if mobile or if both site depth and device offset are null. If mobile, sensor information will be available in mobilePositionSensor structure.
- deviceHeading: Fixed value obtained at time of deployment. Will be NaN if mobile or if both site heading and device offset are null. If mobile, sensor information will be available in mobilePositionSensor structure.
- devicePitch: Fixed value obtained at time of deployment. Will be NaN if mobile or if both site pitch and device offset are null. If mobile, sensor information will be available in mobilePositionSensor structure.
- deviceRoll: Fixed value obtained at time of deployment. Will be NaN if mobile or if both site roll and device offset are null. If mobile, sensor information will be available in mobilePositionSensor structure.
- siteName: Name corresponding to its latitude, longitude, depth position.
- locationName: The node of the Ocean Networks Canada observatory. Each location contains many sites.
- stationCode: Code representing the station or site. Used for accessing webservices, as described here: API / webservice documentation (log in to see this link).
- dataQualityComments: In some cases, there are particular quality-related issues that are mentioned here.

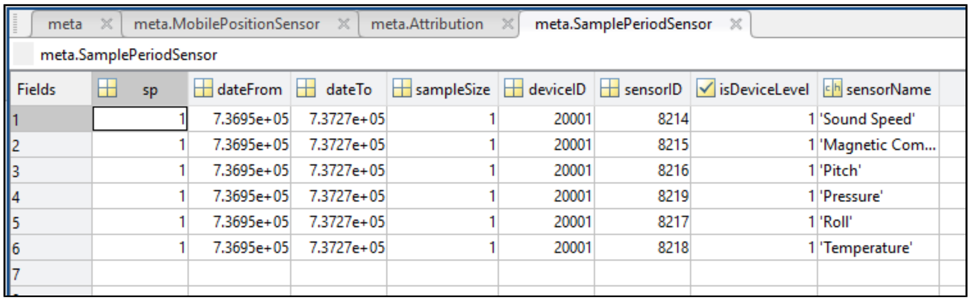
- MobilePositionSensor: A structure with information about sensors that provide additional scalar data on positioning and attitude (latitude, longitidue, depth below sea surface, heading, pitch, yaw, etc).



meta.MobilePositionSensor

Field	Value
name	*1x1 cell*
sensorID	NaN
deviceID	NaN
dateFrom	NaN
dateTo	NaN
typeName	*1x1 cell*
offset	NaN
units	*1x1 cell*
sensorTypeID	NaN
correctedSensorID	NaN

  - name: A cell array of sensor names for mobile position sensors. If not a mobile device, this will be an empty cell string.
  - sensorID: An array of unique identifiers of sensors that provide position data for mobile devices - this data may be used in this data product.
  - deviceID: An array of unique identifiers of devices that provide position data for mobile devices - this data may be used in this data product.
  - dateFrom: An array of datenums denoting the range of applicability of each mobile position sensor - this data may be used in this data product.
  - dateTo: An array of datenums denoting the range of applicability of each mobile position sensor - this data may be used in this data product.
  - typeName: A cell array of sensor names for mobile position sensors. If not a mobile device, this will be an empty cell string. One of: Latitude, Longitude, Depth, COMPASS_SENSOR, Pitch, Roll.
  - offset: An array of offsets between the mobile position sensors' values and the position of the device (for instance, if cabled profiler has a depth sensor that is 1.2 m above the device, the offset will be -1.2m).
  - sensorTypeID: An array of unique identifiers for the sensor type.
  - correctedSensorID: An array of unique identifiers of sensors that provide corrected mobile positioning data. This is generally used for profiling deployments where the latency is corrected for: CTD casts primarily.
- deploymentDateFrom: The date of the deployment on which the data was acquired.
- deploymentDateTo: The date of the end of the deployment on which the data was acquired (will be NaN if still deployed).
- samplingPeriod: Sample period / data rating of the device in seconds, this is the sample period that controls the polling or reporting rate of the device (some parsed scalar sensors may report faster, some devices report in bursts) (may be omitted for some data products).
- samplingPeriodDateFrom: matlab datenum of the start of the corresponding sample period (may be omitted for some data products).
- samplingPeriodDateTo: matlab datenum of the end of the corresponding sample period (may be omitted for some data products).
- sampleSize: the number of readings per sample period, normally 1, except for instruments that report in bursts. Will be zero for intermittent devices (may be omitted for some data products).
- SamplePeriodSensor: A structure array with an entry for each scalar sensor on the device (even though this metadata is for complex data products that don't use scalar sensors).



meta.SamplePeriodSensor

Fields	sp	dateFrom	dateTo	sampleSize	deviceID	sensorID	isDeviceLevel	sensorName
1	1	7.3695e+05	7.3727e+05	1	20001	8214	1	'Sound Speed'
2	1	7.3695e+05	7.3727e+05	1	20001	8215	1	'Magnetic Com...
3	1	7.3695e+05	7.3727e+05	1	20001	8216	1	'Pitch'
4	1	7.3695e+05	7.3727e+05	1	20001	8219	1	'Pressure'
5	1	7.3695e+05	7.3727e+05	1	20001	8217	1	'Roll'
6	1	7.3695e+05	7.3727e+05	1	20001	8218	1	'Temperature'
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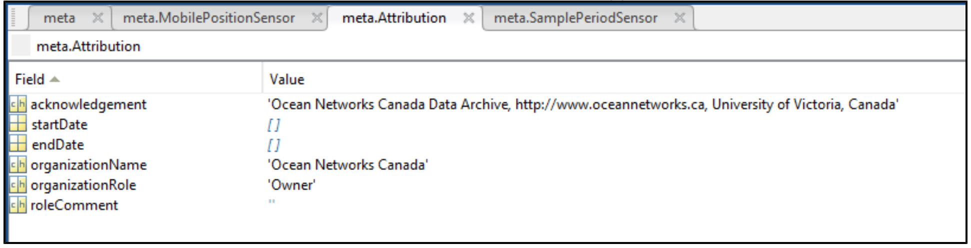
  - sp: sample period in seconds (array), unless sensorid is NaN then this is the device sample period
  - dateFrom: array of date from / start date (inclusive) for each sample period in MATLAB datenum format.
  - dateTo: array of date to / end date (exclusive) for each sample period in MATLAB datenum format.
  - sampleSize: the number of readings per sample period (array). Normally 1, except for instruments that report in bursts. Will be zero for intermittent devices.
  - deviceID: array of unique identifiers of devices (should all be the same).
  - sensorID: array of unique identifiers of sensors on this device.
  - isDeviceLevel: flag (logical) that indicates, when true or 1, if the corresponding sample period/size is from the device-level information (i.e. applies to all sensors and the device driver's poll rate).
  - sensorName: the name of the sensor for which the sample period/size applies (much more user friendly than a sensorID).
- citation: a char array containing the DOI citation text as it appears on the Dataset Landing Page. The citation text is formatted as follows: <Author(s) in alphabetical order>. <Publication Year>. <Title, consisting of Location Name (from searchTreeNodeName or siteName in ONC database) Deployed <Deployment Date (sitedevicedatefrom in ONC database)>. <Repository>. <Persistent Identifier, which is either a DOI URL or the queryPID (search_dtlid in ONC database)>. Accessed Date <query creation date (search.datecreated in ONC database)>

- Attribution: A structure array with information on any contributors, ordered by importance and date. If an organization has more than one role it will be collated. If there are gaps in the date ranges, they are filled in with the default Ocean Networks Canada citation. If the "Attribution Required?" field is set to "No" on the Network Console then the citation will not appear. Here are the fields:

  meta.Attribution

Field	Value
acknowledgement	'Ocean Networks Canada Data Archive, http://www.oceannetworks.ca, University of Victoria, Canada'
startDate	[ ]
endDate	[ ]
organizationName	'Ocean Networks Canada'
organizationRole	'Owner'
roleComment	''

  - acknowledgement: the acknowledgement text, usually formatted as "<organizationName> (<organizationRole>)", except for when there are no attributions and the default is used (as shown above).
  - startDate: datenum format
  - endDate: datenum format
  - organizationName
  - organizationRole: comma separated list of roles
  - roleComment: primarily for internal use, usually used to reference relevant parts of the data agreement (may not appear)

Oceans 3.0 API filter: `extension=mat`

Discussion

To comment on this product, click *Write a comment...* below.