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COVIS Plume Doppler Data

This is a description of the COVIS processed Plume Doppler mode data. Documentation for the raw data is also available.

This data product is extremely data intensive. The raw files, produced every three hours, contain up to 11 GB of data when uncompressed. Processing this data takes time. Data products are pre-processed for quick retrieval. However, the pre-processing may not be up to date, in that case, data products will be generated on-the-fly, which can take 10-40 minutes per 3 hour file.

Oceans 3.0 API filter: `dataProductCode=CPDD`

Revision History

- 20131114: Initial product released

Formats

MAT, **PNG** and **PDF** data products are generated for the Plume DOPPLER mode. Content descriptions and example MAT and PNG files are provided below. Detailed information and further concern please refer to Principle Investigator's Website

MAT

MAT file contains two structures: Meta and covis.

Meta: a structure array containing the following metadata fields:

Variables - meta	
meta ✕	
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).

  - 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).

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:

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)

The **covis** structure contains all the parameter information and the gridded data. Structure covis contains the following structures: type, comments, user, sonar, processing, grid, sweep, ping and burst.

type: type of mode (i.e., doppler for Doppler mode)
comments: information from the COVIS team used to give some description for the experiment.

user: structure containing input parameters for MATLAB code to generate MAT and PNG files from raw tar file.

- verbose: tells whether information on the processing progress is written to the screen or not. Default value is 1 for both imaging and diffuse modes.
- debug: controls whether individual pings are plotted or not. Default value is 0 for both imaging and diffuse modes.
- view: sets the direction from which the data will be viewed in the usual MATLAB orientation units.
  - azimuth: azimuth of the Matlab 3D view. Default value is 37.5
  - elevation: elevation of the Matlab 3D view. Default value is 30
- output: path of output files. Default value is ''.

sonar: structure containing information about sonar itself.

- position: structure containing the sonar position
  - easting: default value is 492669.
  - northing: default value is 5310678.
  - depth: default value is -2205.0.
  - altitude: default value is 4.2000.
  - declination: default value is 18.
  - heading: default value is 230.4. This parameter does not exist for diffuse mode file.

processing: structure containing parameters controlling the processing

- beamformer: type of beamforming.
  - type: default value is "fast".
  - fc: default value is 396000. This parameter does not exist for diffuse mode file.
  - c: default value is 1495. This parameter does not exist for diffuse mode file.
  - fs: default value is 8620.7. This parameter does not exist for diffuse mode file.
  - first_samp: default value is 1. This parameter does not exist for diffuse mode file.
  - last_samp: default value is 3459. This parameter does not exist for diffuse mode file.
  - array_length: default value is 0.4080. This parameter does not exist for diffuse mode file.
  - start_angle: default value is -64. This parameter does not exist for diffuse mode file.
  - end_angle: default value is 64. This parameter does not exist for diffuse mode file.
  - num_beams: default value is 256. This parameter does not exist for diffuse mode file.
  - angle: an array contains 256 float numbers from -1.1170 to 1.1170. This parameter does not exist for diffuse mode file.
  - range: an array contains 865 float numbers from 0.0867 to 75.0042. This parameter does not exist for diffuse mode file.
- calibrate: type of calibration mode.
  - mode: "VSS" for imaging mode file and "TS" for diffuse mode file.
- filter: controls the filtering part of the processing.
  - status: default value is "on".
  - type: default value is "buttorworth".
  - bw: default value is 2, which means the bandwidth in Hz will be 2/pulse length.
  - order: filter order. Default value is 4.
  - decimation: default value is 4. The time series will be decimated by this factor in order to speed up processing. This parameter does not exist for diffuse mode file.
- ping_combination: explains how pings are combined: average or difference.
  - mode: default value is "diff", which means a difference of successive pings is used in order to reduce unwanted ground return.
- bounds: explains value range for processing (Note that it does not affect data collection). This structure does not exist for diffuse mode file.
  - pitch: range of rotator elevations (degrees) over which data is processed.
    - start: default value is 10.
    - stop: default value is 62.
  - heading: heading of the sonar (degrees). There is a physical possibility that this could actually vary during data collection.
    - start: default value is 235.
    - stop: default value is 235.
  - range: distance (meters) out a ping over which to process
    - start: default value is 5.
    - stop: default value is 75.
- correlation: These parameters are used in the cross-correlation of two complex series
  - window_size
  - window_overlap
  - windthresh
  - nlag

grid: structure contains what kind and size of grid used in the final stage of processing.

- type: what the values in the grid mean. Default value is "back-scatter cross section" for imaging mode file, and is "decorrelation intensity" for diffuse mode file.
- shape: shape of the grid. Default value is "rectangular".
- units: units for the output grids
  - spatial: default value is "meters".
  - Value: default value is "1/meters".
- dimensions: number of dimensions in the grid. Default value is 3 for imaging mode, and is 2 for diffuse mode.
- bounds: bounds of the grid.
  - xmin: default value is -35.
  - xmax: default value is 5.
  - ymin: default value is -25.
  - ymax: default value is 5.
  - zmin: default value is 5. This parameter does not exist if grid.dimentions is 2.
  - zmax: default value is 50. This parameter does not exist if grid.dimentions is 2.
- spacing: size of the grid elements.
  - dx: default value is 0.25 for imaging mode file, and is 0.5 for diffuse mode file.
  - dy: default value is 0.25 for imaging mode file, and is 0.5 for diffuse mode file.
  - dz: default value is 0.25. This parameter does not exist if grid.dimentions is 2.
- x: matrix
- y: matrix
- z: matrix This parameter does not exist if grid.dimentions is 2.
- v: matrix
- v_filt: matrix
- w: matrix
- std: matrix
- vr; matrix
- covar: matrix
- size: default value is 121, 161, 181 for imaging mode file, and is 61, 81 for diffuse mode file.
- axis: default value is -35,5,-25,5,5,50 for imaging mode file, and is -35, 5, -25, 6, 0,0 for diffuse mode file.
- name: filename for MAT and PNG files.
- offset_covar

sweep:

- sequence_id
- alpha_id
- mode: diffuse
- timestamp

- alpha_rev
- endtime
- annotation
- schema
- path: location for processed raw tar file
- name: processed raw tar filename

ping: structure array contains covis ping meta. A structure is created when the parameters change. One structure contains the following parameters:

- num
- sec
- rot:
    - pitch
    - roll
    - yaw
- tcm:
    - kPAngle
    - kRAngle
    - kHeading
- hdr: usually empty, may contain the following:
    - control:
        - auto_range_method
        - bd_range
        - auto_bd_filter_method
        - bd_depth
        - auto_gain_method
    - power_sel
    - ping_num
    - prj:
        - horiz_width
        - window_type
        - horiz_angle
        - vert_width
        - window_param
        - focal_point
        - id
        - vert_angle
    - max_ping_rate
    - envelope_type
    - multi_ping
    - xmlt_freq
    - sound_speed
    - absorption
    - range_sel
    - pulse_type
    - hydrophone_id
    - transmit:
        - yaw_stablization
        - pitch_stablization
    - bd:
        - max_range
        - min_range
        - min_depth
        - max_depth
    - pulse_extra
    - ping_period
    - rcvr_bandwidth
    - recv:
        - window_type
        - flags
        - window_param
        - beam_width
    - sonar_id
    - gain_sel
    - sample_rate
    - spreading_loss
    - pulse_width
    - envelope_param

calibrate: a structure with location information pertinent to the data in the file

burst: a structure for each scan. Generally the sonar changes elevation, acquires data and repeats.elev

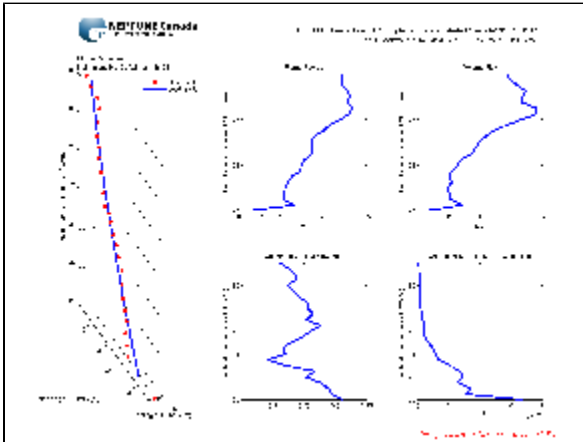- elev: scan elevation in degrees above horizontal
- npings
- start_ping

Oceans 3.0 API filter: `extension=mat`

The plot for the Plume Doppler mode shows five plots summarizing the data, tracking the plume's size, position, relative density and flow rates. All distances are in meters relative to the sonar position.

Oceans 3.0 API filter: `extension=png`

Example:

PDF

The PDF plot shown is the same as the PNG, however, PDF files can contain multiple plots in a vectorized form, which is better for high resolution printing or zooming.

Oceans 3.0 API filter: `extension=pdf`

Discussion

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