RCRV Program: CORIOLIX Integrations

2020 RVTEC Meeting
Wednesday October 28th, 2020

THE UNIVERSITY OF RHODE ISLAND GRADUATE SCHOOL OF OCEANOGRAPHY

Oregon State University College of Earth, Ocean, and Atmospheric Sciences

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

RCRV – Datapresence & Engineering Support Center Staff

Katie Watkins-Brandt
Sensor Systems Engineer

Joined the project: 2011
Developed the underway sensor suite design, specification & procurement
Excels at instrument configuration, installation, maintenance, & procedures

Jasmine Nahorniak
Assistant Datapresence Systems Engineer

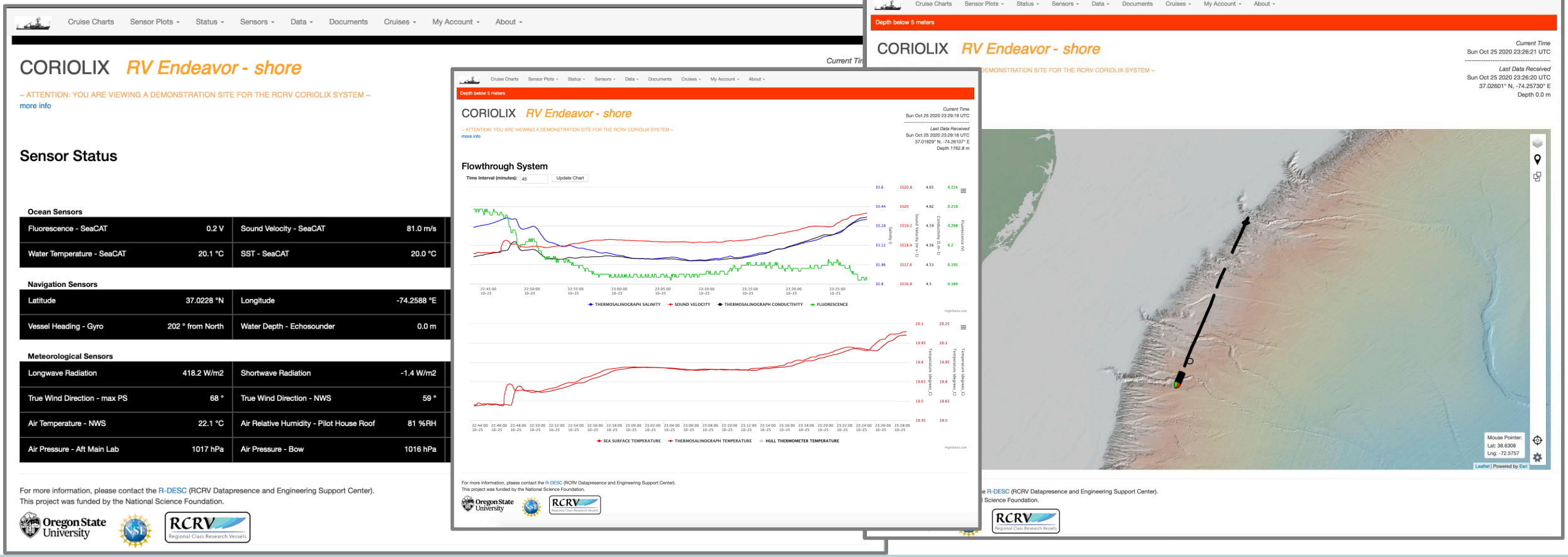
Joined the project: 2015
Lead CORIOLIX developer
Wide ranging skill set - from data management to UI design

Chris Romsos
Datapresence Systems Engineer

Joined the project: 2015
Lead for Datapresence and RCRV Cyberinfrastructure
Background – marine geology, fisheries, geographic info systems

Introduction

Cruise Observations Real-time Interface & Open Live Information eXchange



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Introduction

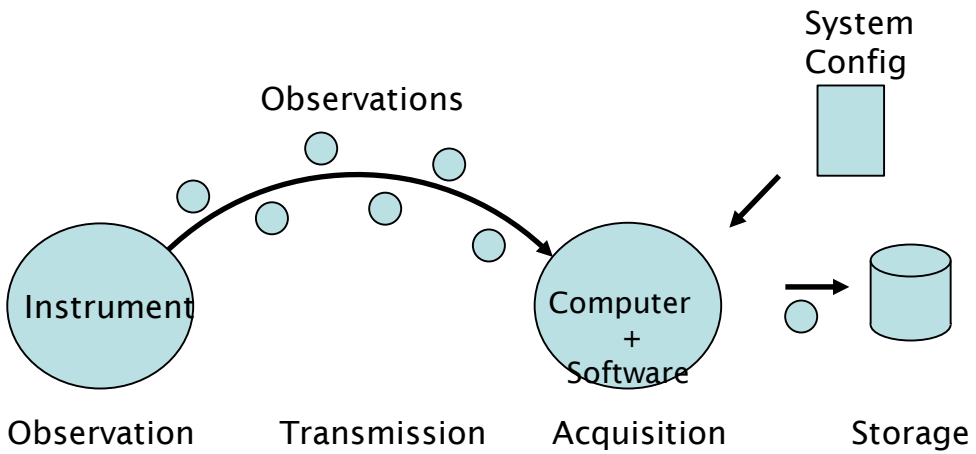
Cruise **O**bservations **R**eal-time **I**nterface & Open **L**ive **I**nformation e**X**change

RVTEC 2019: Live CORIOLIX demo session(s) with Oceanus in transit from Hawaii

RVTEC 2020: Technical Topic, CORIOLIX Integrations

- ***Data Acquisition System Integration - OpenRVDAS***
- ***Data Service Integration – ERDDAP***

DAS Integration: OpenRVDAS <-> CORIOLIX

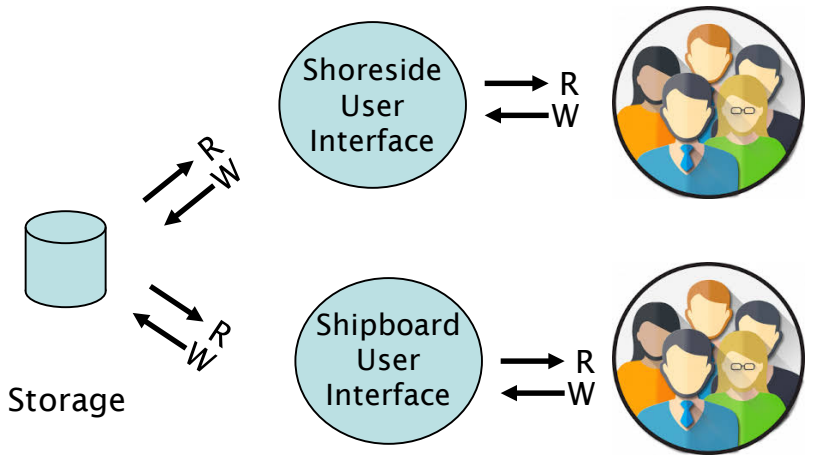


Data Acquisition

Provides Tools For:
- Reading live data
- Parse/modify
- Writing to file/database

Reads from:
- Config Metadata
- Live data

Writes to:
- Timeseries data



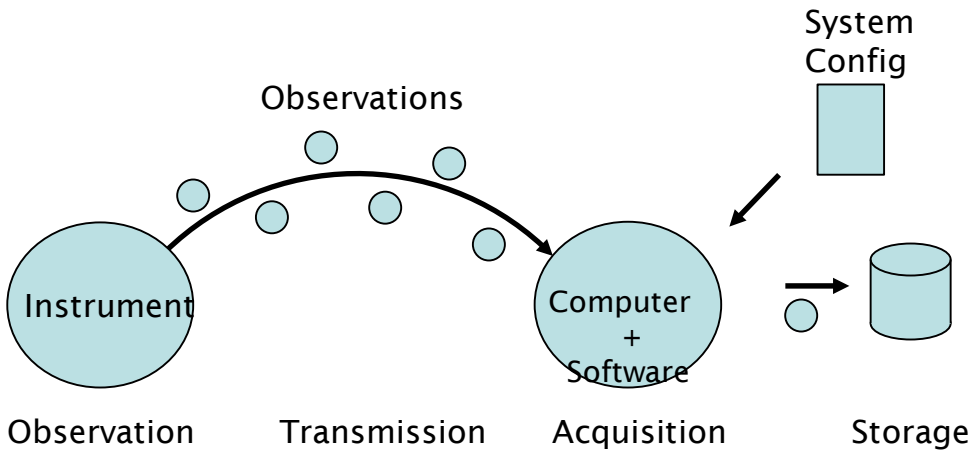
Datapresence

Provides Tools For:
- Availability (ship/shore)
- Access (user groups)
- Monitoring system state
- Synchronizing metadata

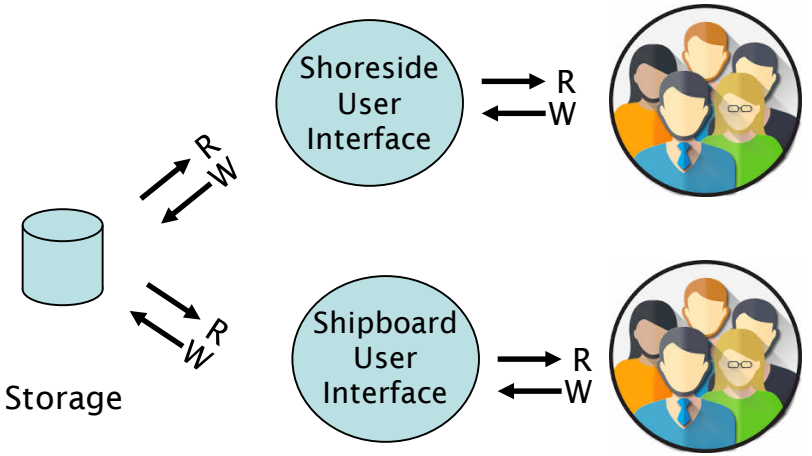
Reads from:
- Metadata
- Instrument datastore

Writes to:
- Metadata
- Clients

DAS Integration: OpenRVDAS <-> CORIOLIX



OpenRVDAS



CORIOLIX

Primary Objective:

- Extend OpenRVDAS to write to CORIOLIX datastore

Secondary Objectives:

- Extend OpenRVDAS to derive system configuration from CORIOLIX metadata

DAS Integration: OpenRVDAS <-> CORIOLIX

RFP Fall 2019: RCRV Selected the team of Cohn and Pinner to complete the work.

David Pablo Cohn
OpenRVDAS Project Lead Developer and Project Owner

J. Webb Pinner
Owner & Principal at Capable Solutions

DAS Integration: Outcomes

Primary Outcome – **CORIOLIXWriter**

- OpenRVDAS writer plugin for writing incoming data streams to the appropriate CORIOLIX database table.
    - Extended OpenRVDAS to support logging to a **PostgreSQL** database
    - Extended OpenRVDAS to support parsing a data string and writing parts of the parsed data record to **multiple endpoints** (database tables)

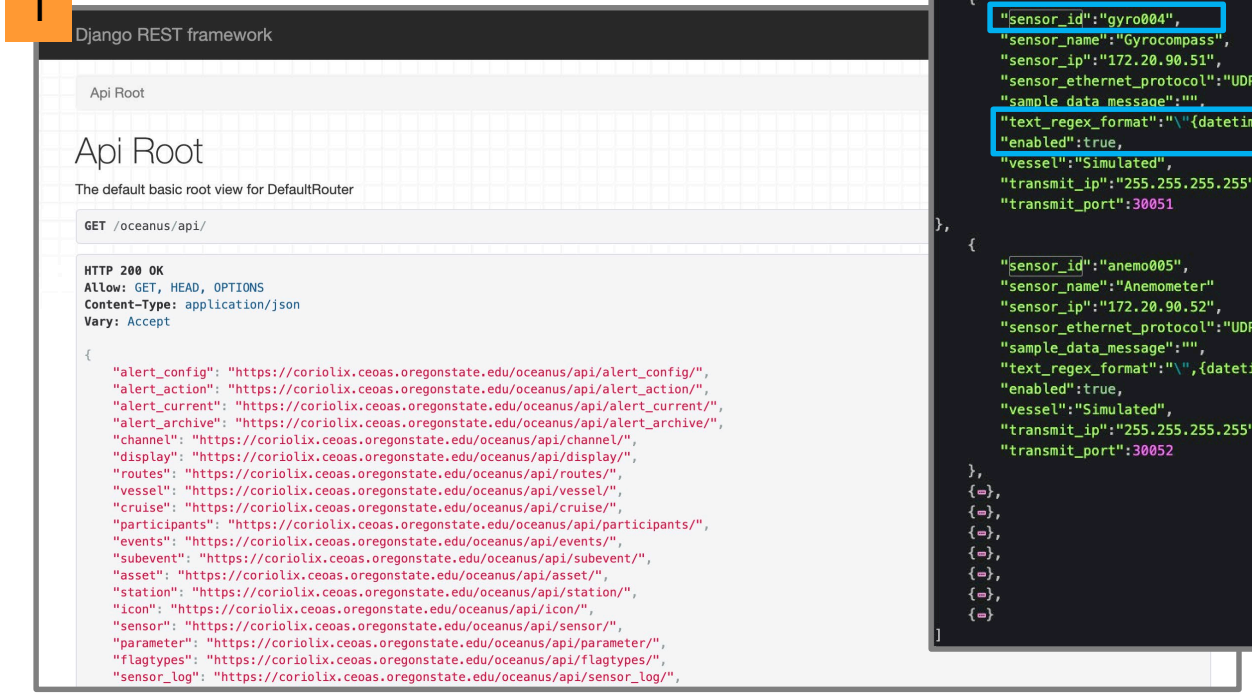
Secondary Outcome – **Configure OpenRVDAS** by querying the CORIOLIX API for configuration metadata

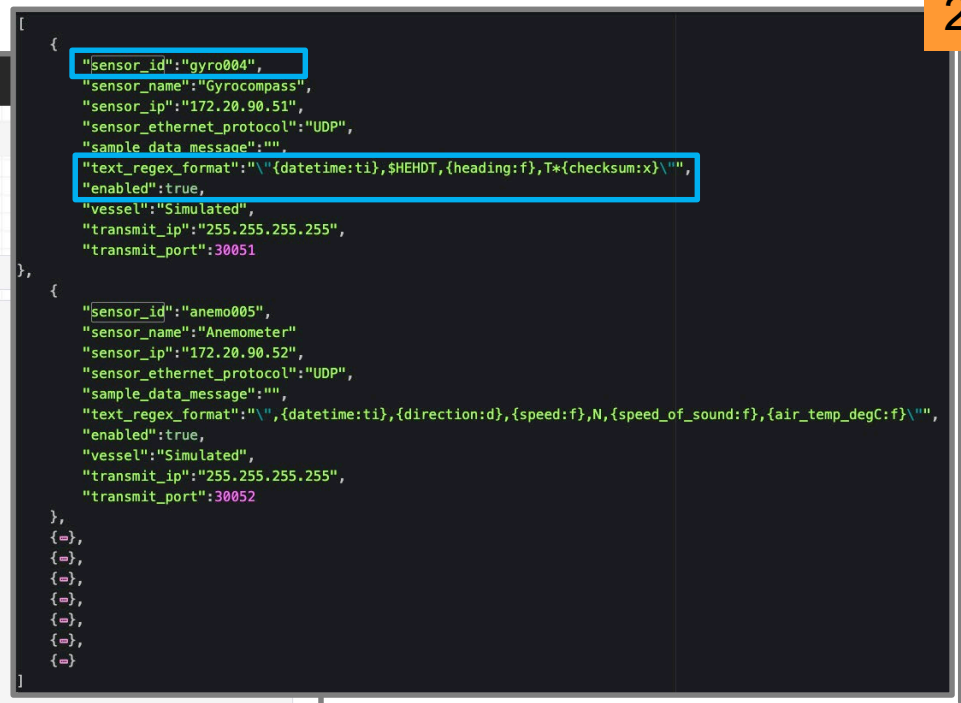
- Developed a scripted workflow to construct an OpenRVDAS cruise configuration based on information extracted from the CORIOLIX API and information stored in a configuration template.

DAS Integration: Workflow

1. Configure OpenRVDAS script queries the CORIOLIX Sensor & Parameter tables for enabled sensors, connection, & parsing info:
   https://coriolix.ceoas.oregonstate.edu/oceanus/api/sensor/?enabled=true
   https://coriolix.ceoas.oregonstate.edu/oceanus/api/parameter/
2. API responds with a filtered list of enabled sensors and Parameter info as JSON

1





2

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DAS Integration: Workflow

3. Configure OpenRVDAS script reads the config_template.yaml (defines operational and logging modes)
4. Creates new cruise.yaml file by iterating over sensors list and using template to format the output file.

3

```yaml
##################
# Cruise boilerplate
cruise:
  id: RCRV-Sample
  start: '2020-01-01'
  end: '2020-12-31'

##################
# Logger definitions
loggers:
  default:  # Default set of configurations for a sensor
    configs:
    - 'off'        # 'off' is a yaml keyword, so needs to be quoted
    - stderr       # echo raw input to stderr
    - udp          # parse and rebroadcast to UDP
    - file/udp     # store raw to logfile, parse and rebroadcast to UDP
    - file/udp/db  # store raw to logfile, parse and store to db

  #gyro004:  # example of a non-default set of configs for a sensor
  #  configs:
  #  - 'off'
  #  - udp
  #  - file/udp/db

##################
# Unique collections of logger configurations comprise Modes
modes:
  'off':
    default: 'off'

  monitor:
    default: udp
    #gyro004: 'off'  # example of non-default config for mode

  underway:
    default: file/udp/db

##################
default_mode: 'off'

##################
config_globals:
  _UDP_WRITE_PORT_: 6221
  _FILE_BASE_: /var/tmp/log/openrvdas

##################
```

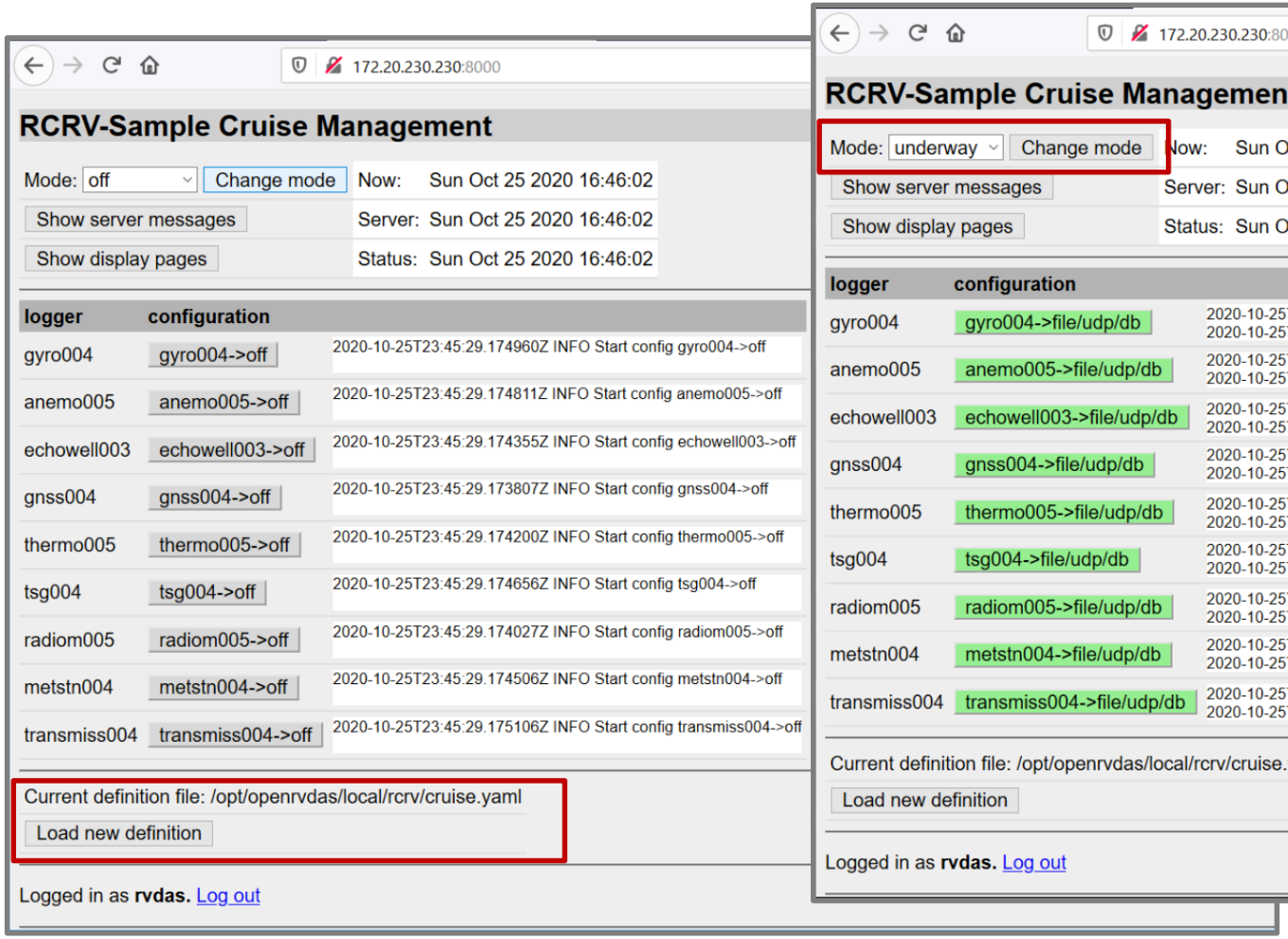
```yaml
  - class: ComposedWriter
    kwargs:
      transforms:
      - class: PrefixTransform
        kwargs:
          prefix: _SENSOR_ID_
      - class: ParseTransform
        kwargs:
          record_format: '{data_id:w} {timestamp:ti},{field_string:os}'
          field_patterns: _FIELD_PATTERNS_
      writers:
      - class: UDPWriter
        kwargs:
          port: _UDP_WRITE_PORT_

# Template to store raw to logfile, parse and rebroadcast to UDP
# and store to CORIOLIX database
file/udp/db:
  name: _SENSOR_ID_->file/udp/db
  readers:
  - class: UDPReader
    kwargs:
      port: _UDP_PORT_
  writers:
  - class: LogfileWriter
    kwargs:
      filebase: _FILE_BASE_/_SENSOR_ID_/raw/_SENSOR_ID_
      split_char: ','
  - class: ComposedWriter
    kwargs:
      transforms:
      - class: PrefixTransform
        kwargs:
          prefix: _SENSOR_ID_
      - class: ParseTransform
        kwargs:
          record_format: '{data_id:w} {timestamp:ti},{field_string:os}'
          field_patterns: _FIELD_PATTERNS_
      writers:
      - class: UDPWriter
        kwargs:
          port: _UDP_WRITE_PORT_
      - class: CORIOLIXWriter
        module: local.rcrv.modules.coriolix_writer
        kwargs:
          data_table: _DATA_TABLE_
```

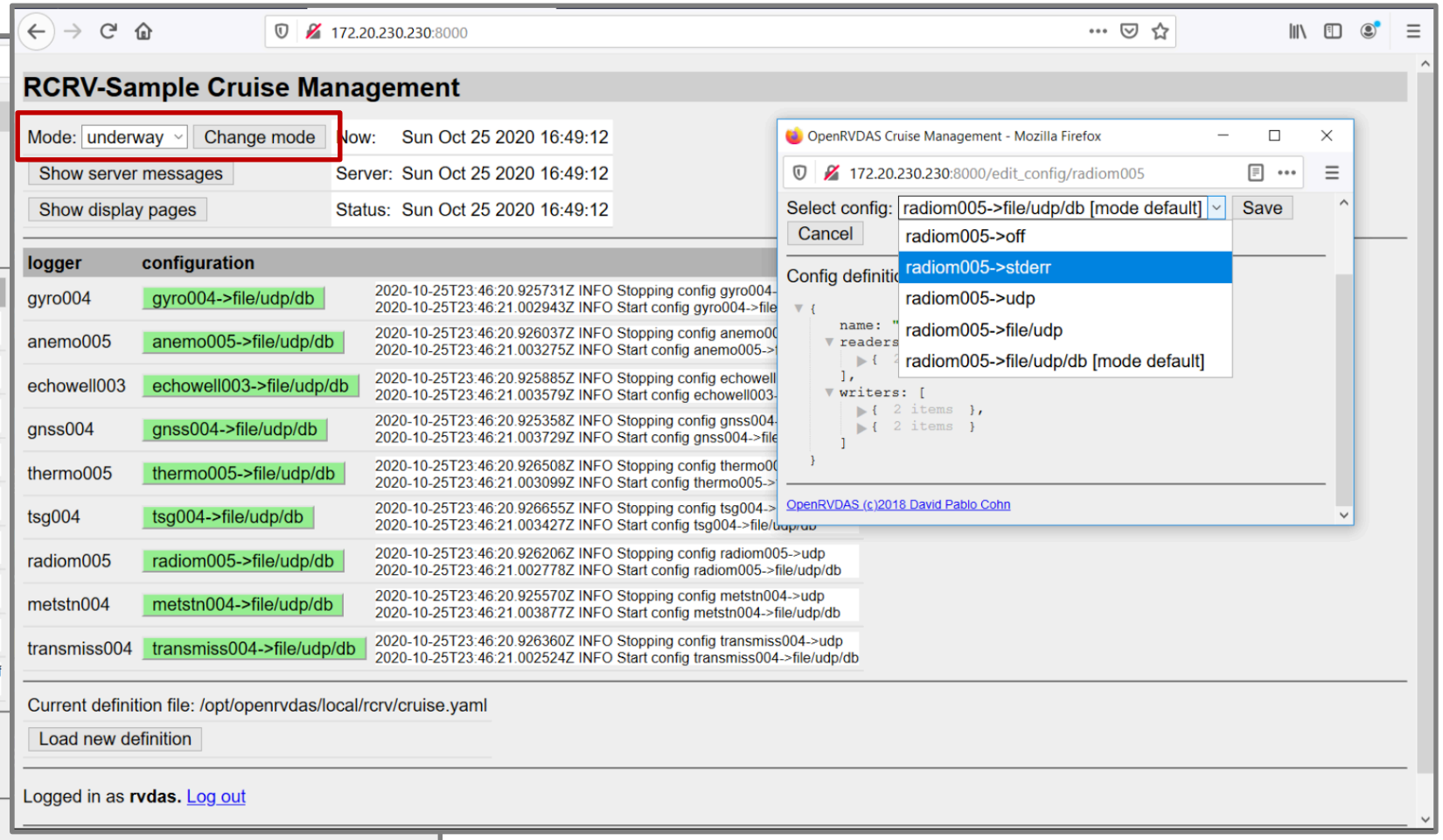
4

```yaml
loggers:
  gyro004:
    configs:
    - gyro004->off
    - gyro004->stderr
    - gyro004->udp
    - gyro004->file/udp
    - gyro004->file/udp/db
  anemo005:=
  echowell003:=
  gnss004:=
  thermo005:=
  tsg004:=
  radiom005:=
  metstn004:=
  transmiss004:
    configs:
    - transmiss004->off
    - transmiss004->stderr
    - transmiss004->udp
    - transmiss004->file/udp
    - transmiss004->file/udp/db
modes:
  'off':
    gyro004: gyro004->off
    anemo005: anemo005->off
    echowell003: echowell003->off
    gnss004: gnss004->off
    thermo005: thermo005->off
    tsg004: tsg004->off
    radiom005: radiom005->off
    metstn004: metstn004->off
    transmiss004: transmiss004->off
  monitor:=
  underway:
    gyro004: gyro004->file/udp/db
    anemo005: anemo005->file/udp/db
    echowell003: echowell003->file/udp/db
    gnss004: gnss004->file/udp/db
    thermo005: thermo005->file/udp/db
    tsg004: tsg004->file/udp/db
    radiom005: radiom005->file/udp/db
    metstn004: metstn004->file/udp/db
    transmiss004: transmiss004->file/udp/db
default_mode: 'off'
configs:
  gyro004->off:
```

```yaml
    gnss004: gnss004->file/udp/db
    thermo005: thermo005->file/udp/db
    tsg004: tsg004->file/udp/db
    radiom005: radiom005->file/udp/db
    metstn004: metstn004->file/udp/db
    transmiss004: transmiss004->file/udp/db
default_mode: 'off'
configs:
  gyro004->off:=
  gyro004->stderr:=
  gyro004->udp:=
  gyro004->file/udp:=
  gyro004->file/udp/db:
    name: gyro004->file/udp/db
    readers:
    - class: UDPReader
      kwargs:
        port: 30357
    writers:
    - class: LogfileWriter
      kwargs:
        filebase: /var/tmp/log/openrvdas/gyro004/raw/gyro004
        split_char: ','
    - class: ComposedWriter
      kwargs:
        transforms:
        - class: PrefixTransform
          kwargs:
            prefix: gyro004
        - class: ParseTransform
          kwargs:
            record_format: '{data_id:w} {timestamp:ti},{field_string:os}'
            field_patterns:
            - $HEHDT,{heading:f},T*{checksum:x}
        writers:
        - class: UDPWriter
          kwargs:
            port: 6221
        - class: CORIOLIXWriter
          module: local.rcrv.modules.coriolix_writer
          kwargs:
            data_table:
              gyro_brdg_archive:
              - heading
  anemo005->off:
    name: anemo005->off
  anemo005->stderr:
```

DAS Integration: OpenRVDAS <-> CORIOLIX





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Data Service Integration: CORIOLIX <-> ERDDAP

ERDDAP
Easier access to scientific data

log in
Brought to you by NOAA NMFS SWFSC ERD

Previous integration example – **Data Acquisition** and managing **Data Acquisition** configuration
This example – **Data Services**, specifically **Scientific Data Services**

Data Services – software to make data more accessible and useable
Scientific Data Services – software to makes data more accessible and usable to scientific clients

What can you do with a data server like ERDDAP?

- Provide **Query & Subset** functionality on top of read access
- Support a range of scientific output **format translations** (.asc, .csv, OPeNDAP, geoJSON, .mat, .nc, .kml, etc)
- Publish and **Subscrib**e options (subscribe to remote sensing data and server locally)

Data Service Integration: CORIOLIX <-> ERDDAP

ERDDAP
Easier access to scientific data

Brought to you by NOAA NMFS SWFSC ERD

ERDDAP > tabledap > Data Access Form

Dataset Title: **RV Oceanus : ANEMO_MMAST_ARCHIVE**
Institution: Oregon State University (Dataset ID: anemo_mmast_archive)
Information: Summary | License | Metadata | Background | Make a graph

Variable	Check All / Uncheck All	Optional Constraint #1	Optional Constraint #2	Minimum	Maximum
datetime (UTC)		>= 2020-10-01T12:00:00	<= 2020-10-25T12:00:00		
datetime_corrected (UTC)		>=	<=		
direction (wind_to_direction, degrees)		>=	<=		
direction_flags (none)		>=	<=		
speed (nautical miles per hour)		>=	<=		
speed_flags (wind_speed_status_flag, none)		>=	<=		

Server-side Functions
distinct()
orderByMax ("speed")

File type: (more info)
.nc - Download a flat, table-like, NetCDF-3 binary file with COARDS/CF/ACDD metadata.
Just generate the URL: https://coriolix.ceoas.oregonstate.edu/oceanus_erddap//erddap/t
(Documentation / Bypass this form)

Submit (Please be patient. It may take a while to get the data.)

The control on the right manages the layers.
You can select different values for the data variable's dimension(s):
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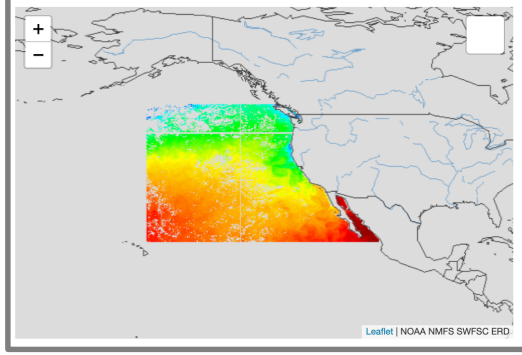
elevation: 0.0



ERDDAP
Easier access to scientific data

Brought to you by NOAA NMFS SWFSC ERD

ERDDAP > List of All Datasets

30 matching datasets, listed in alphabetical order.

Grid DAP Data	Sub-set	Table DAP Data	Make A Graph	WMS	Source Data Files	Title	Sum-mary	FGDC, ISO, Metadata	Back-ground Info	RSS	E mail	Institution	Dataset ID
	set	data	graph			* The List of All Active Datasets in this ERDDAP *		M	background			Oregon State Univ...	allDatasets
data			graph	M		Chlorophyll-a, Aqua MODIS, NPP, 0.0125°, West US, EXPERIMENTAL, 2002-present (8 Day Composite), Lon+/-180		F I M	background	RSS		NOAA NMFS SWFSC ERD	MODIS_Chl_8day
data			graph	M		Fluorescence, Aqua MODIS, NPP, 0.0125°, West US, 2002-present (8 Day Composite), Lon+/-180		F I M	background	RSS		NOAA NMFS SWFSC ERD	MODIS_Chl_Fluorescense_8day
		data	graph			RV Oceanus : ANEMO_MMAST_ARCHIVE		M	background	RSS		Oregon State Univ...	anemo_mmast_archive
		data	graph			RV Oceanus : BINNED_CUSTOM_FLOW_ROLLING		F I M	background	RSS		Oregon State Univ...	binned_custom_flow_rolling
		data	graph			RV Oceanus : BINNED_CUSTOM_MET_ROLLING		F I M	background	RSS		Oregon State Univ...	binned_custom_met_rolling
		data	graph			RV Oceanus : BINNED_CUSTOM_NAV_ROLLING		F I M	background	RSS		Oregon State Univ...	binned_custom_nav_rolling
		data	graph			RV Oceanus : BINNED_DEFAULT_FLOW_ROLLING		F I M	background	RSS		Oregon State Univ...	binned_default_flow_rolling
		data	graph			RV Oceanus : BINNED_DEFAULT_MET_ROLLING		F I M	background	RSS		Oregon State Univ...	binned_default_met_rolling
		data	graph			RV Oceanus : BINNED_DEFAULT_NAV_ROLLING		F I M	background	RSS		Oregon State Univ...	binned_default_nav_rolling
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		data	graph			RV Oceanus : ECHO_WELL_ARCHIVE		M	background	RSS		Oregon State Univ...	echo_well_archive
		data	graph			RV Oceanus : FLUOR_FLTH_ARCHIVE		M	background	RSS		Oregon State Univ...	fluor_flth_archive
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		data	graph			RV Oceanus : GNSS_VTG_BOW_ARCHIVE		M	background	RSS		Oregon State Univ...	gnss_vtg_bow_archive
		data	graph			RV Oceanus : GYRO_BRDG_ARCHIVE		M	background	RSS		Oregon State Univ...	gyro_brdg_archive
		data	graph			RV Oceanus : METSTN_BOW_ARCHIVE		M	background	RSS		Oregon State Univ...	metstn_bow_archive
		data	graph			RV Oceanus : METSTN_STBD_ARCHIVE		M	background	RSS		Oregon State Univ...	metstn_stbd_archive
		data	graph			RV Oceanus : PAR_MMAST_ARCHIVE		M	background	RSS		Oregon State Univ...	par_mmast_archive
		data	graph			RV Oceanus : RAD_MMAST_ARCHIVE		M	background	RSS		Oregon State Univ...	rad_mmast_archive
		data	graph			RV Oceanus : RAIN_MMAST_ARCHIVE		M	background	RSS		Oregon State Univ...	rain_mmast_archive
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		data	graph			RV Oceanus : THERM_FWD_ARCHIVE		M	background	RSS		Oregon State Univ...	therm_fwd_archive
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		data	graph			RV Oceanus : TRANSMISS_FLTH_ARCHIVE		M	background	RSS		Oregon State Univ...	transmiss_flth_archive
		data	graph			RV Oceanus : TRUE_WINDS_ARCHIVE		M	background	RSS		Oregon State Univ...	true_winds_archive
		data	graph			RV Oceanus : TSG_FLTH_ARCHIVE		M	background	RSS		Oregon State Univ...	tsg_flth_archive
data			graph	M		SST, Aqua MODIS, NPP, 0.0125°, West US, Day time (11 microns), 2002-present (8 Day Composite), Lon+/-180		F I M	background	RSS		NOAA NMFS SWFSC ERD	MODIS_SST_Daytime_8day

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ERDDAP
Easier access to scientific data
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ERDDAP > wms > MODIS_SST_Daytime_8day

Dataset Title: SST, Aqua MODIS, NPP, 0.0125°, West US, Day time (11 microns), 2002-present (8 Day Composite), Lon+/-180
Institution: NOAA NMFS SWFSC ERD (Dataset ID: MODIS_SST_Daytime_8day)
Information: Summary | License | FGDC | ISO 19115 | Metadata | Background | Data Access Form | Make a graph

This web page is using Leaflet to display maps which are created on-the-fly by ERDDAP's Web Map Server (WMS) version 1.3.0.
The control on the left of the map lets you zoom in (+) or out (-).
The control on the right manages the layers.
You can select different values for the data variable's dimension(s):
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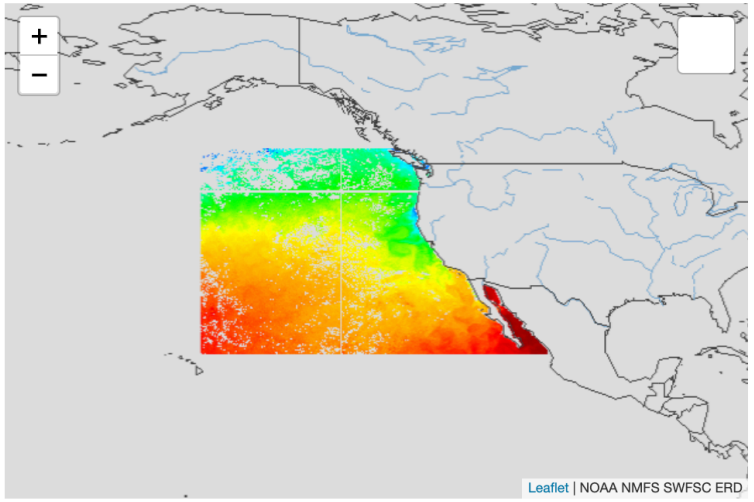
elevation: 0.0

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2104  </dataset>
2105  <!-- PACIFIC MODIS -->
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2112    </dataset>
2113  </dataset>
2114  <dataset type="EDDGridCopy" datasetID="MODIS_SST_Daytime_8day_Pacific" active="true" >
2115    <accessibleViaWMS>true</accessibleViaWMS>
2116    <reloadEveryNMinutes>1440</reloadEveryNMinutes>
2117    <onlySince>now-1month</onlySince>
2118    <dataset  type="EDDGridFromErddap" datasetID="erdMBsstd8day_LonPM180" active="true">
2119      <sourceUrl>https://coastwatch.pfeg.noaa.gov/erddap/griddap/erdMBsstd8day_LonPM180</sourceUrl>
2120    </dataset>
2121  </dataset>
2122  <dataset type="EDDTableFromDatabase" datasetID="ooi_ctdbpn106" active="true">
2205 </erddapDatasets>
```

Very simple to add
Reload: 1/day
Keep: 1 month
Link: to remote data

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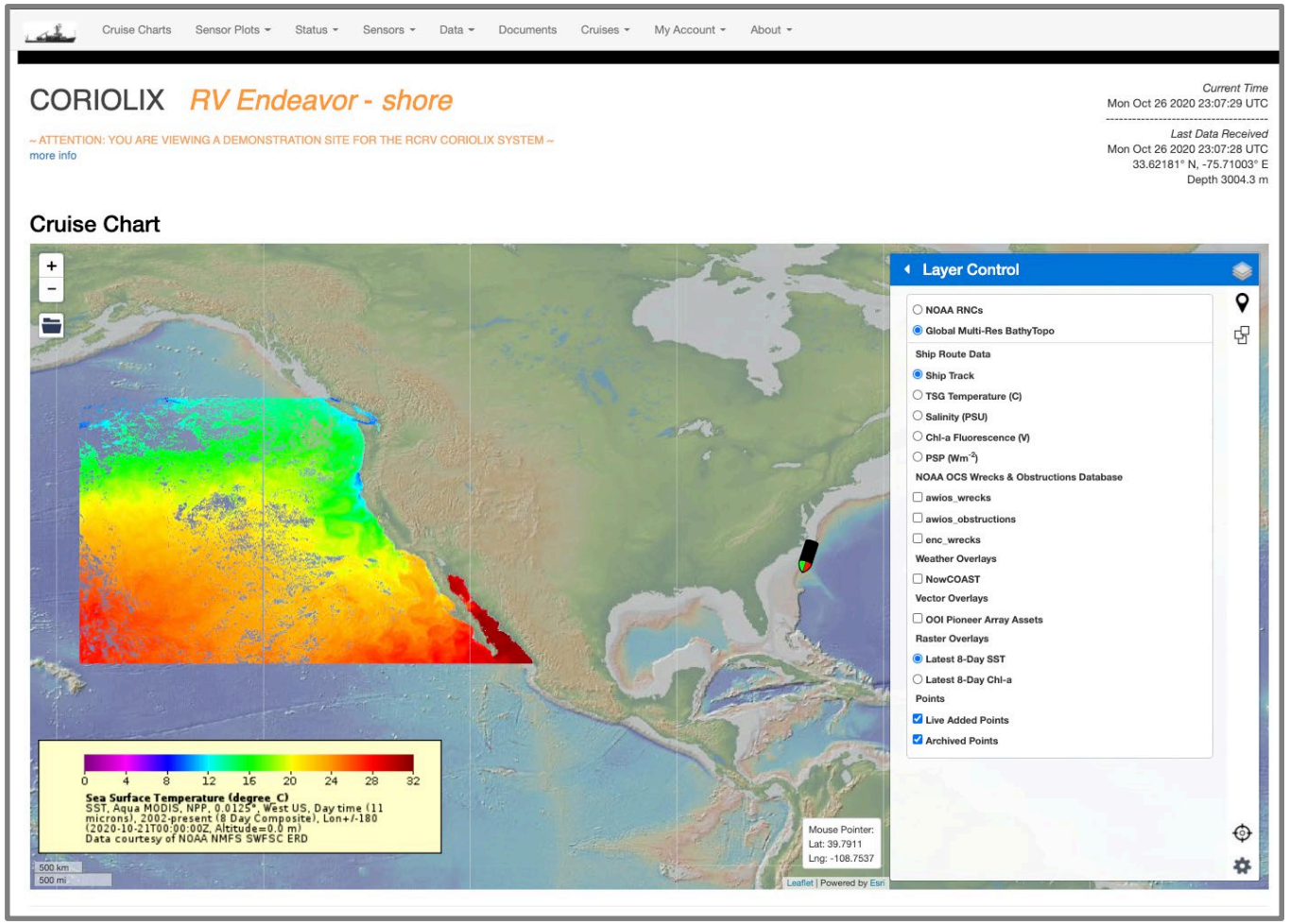
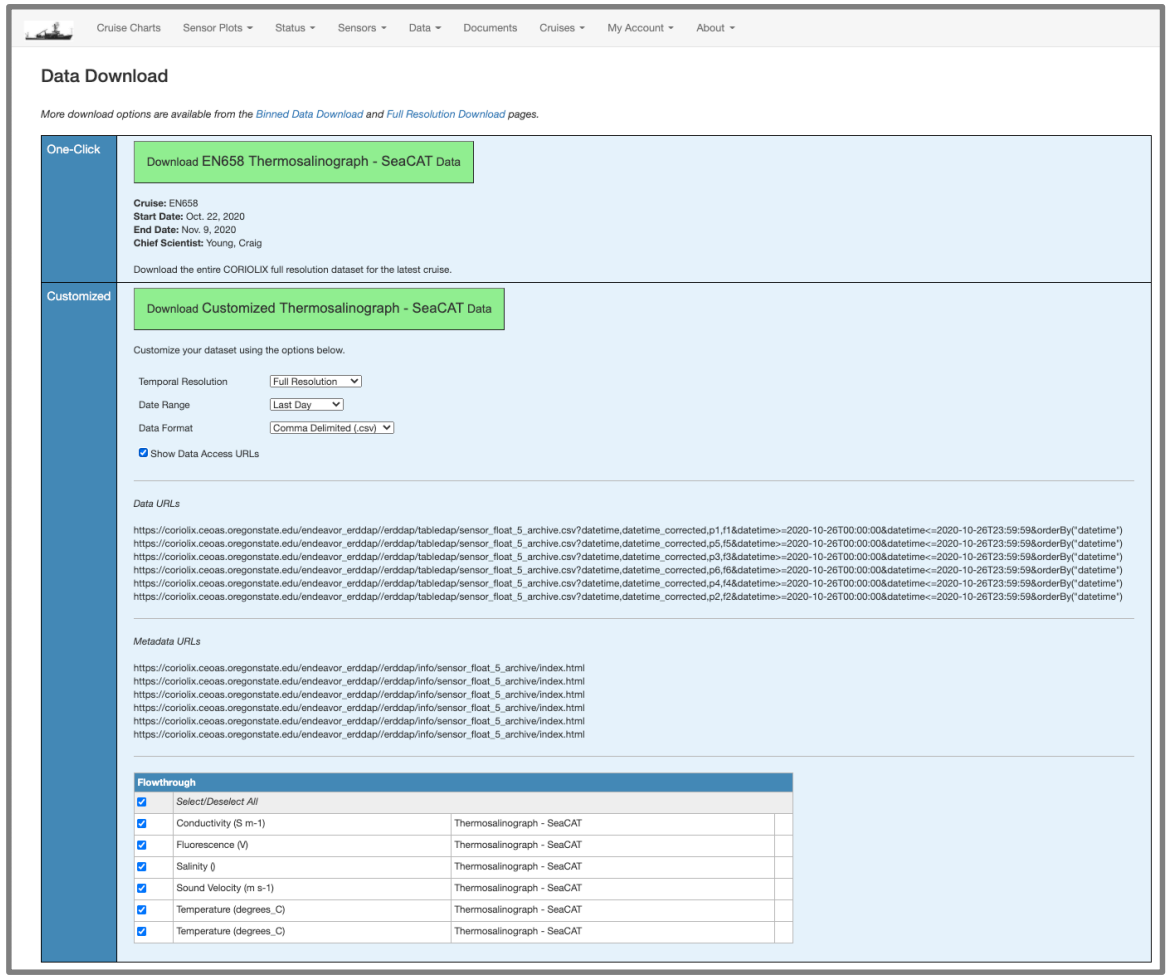
Data Service Integration: CORIOLIX <-> ERDDAP





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