OWSLib Documentation

Release 0.32.0

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CHAPTER

ONE

INTRODUCTION

OWSLib is a Python package for client programming with Open Geospatial Consortium (OGC) web service (hence OWS) interface standards, and their related content models.

OWSLib was buried down inside PCL (Python Cartography Library), but has been brought out as a separate project.

CHAPTER

TWO

FEATURES

2.1 Standards Support

Standard	Version(s)
OGC WMS	1.1.1, 1.3.0
OGC WFS	1.0.0, 1.1.0, 2.0.0, 3.0
OGC WCS	1.0.0, 1.1.0, 2.0, 2.0.1
OGC WMC	1.1.0
OGC SOS	1.0.0, 2.0.0
OGC SensorML	1.0.1
OGC CSW	2.0.2
OGC WPS	1.0.0
OGC Filter	1.1.0
OGC OWS Common	1.0.0, 1.1.0, 2.0
OGC OWS Context	1.0.0 (alpha/under-review)
NASA DIF	9.7
FGDC CSDGM	1998
ISO 19139	2007
ISO 19139-2	2012
Dublin Core	1.1
Swiss GM03	2.3
OGC WMTS	1.0.0
WaterML	1.0, 1.1, 2.0
OpenSearch	1.1

2.2 OGC API Support

Standard	Version(s)
OGC API - Features - Part 1: Core	1.0
OGC API - Coverages - Part 1: Core	draft
OGC API - Records - Part 1: Core	draft
OGC API - Features - Part 3: Filtering and the Common Query Language (CQL)	draft
OGC API - Features - Part 4: Create, Replace, Update and Delete	draft
OGC API - Processes - Part 1: Core	1.0
OGC API - Connected Systems - Part 1: Feature Resources	draft
OGC API - Connected Systems - Part 2: Dynamic Data	draft

CHAPTER

THREE

INSTALLATION

3.1 Requirements

OWSLib requires a Python interpreter, as well as lxml for XML parsing.

3.2 Install

PyPI:

```
pip3 install OWSLib
```

Git:

```
git clone https://github.com/geopython/OWSLib.git
```

UbuntuGIS (stable, unstable):

```
apt-get install python3-owslib
```

Anaconda:

Note: The OWSLib conda packages are provided by the community, not OSGeo, and therefore there may be multiple packages available. To search all conda channels: http://anaconda.org/search?q=type%3Aconda+owslib However usually conda-forge will be the most up-to-date.

```
git conda install -c conda-forge owslib
```

openSUSE:

```
zypper ar http://download.opensuse.org/repositories/Application:/Geo/openSUSE_12.1/ GEO
zypper refresh
zypper install owslib
```

CentOS:

```
wget -O /etc/yum.repos.d/CentOS-CBS.repo http://download.opensuse.org/repositories/
↪Application:/Geo/CentOS_6/Application:Geo.repo
yum install owslib
```

RedHat Enterprise Linux

```
wget -O /etc/yum.repos.d/RHEL-CBS.repo http://download.opensuse.org/repositories/
↪Application:/Geo/RHEL_6/Application:Geo.repo
yum install owslib
```

Fedora:

Note: As of Fedora 20, OWSLib is part of the Fedora core package collection

```
yum install OWSLib
```

CHAPTER

FOUR

USAGE

4.1 WMS

Find out what a WMS has to offer. Service metadata:

```
>>> from owslib.wms import WebMapService
>>> wms = WebMapService('http://wms.jpl.nasa.gov/wms.cgi', version='1.1.1')
>>> wms.identification.type
'OGC:WMS'
>>> wms.identification.version
'1.1.1'
>>> wms.identification.title
'JPL Global Imagery Service'
>>> wms.identification.abstract
'WMS Server maintained by JPL, worldwide satellite imagery.'
```

Available layers:

```
>>> list(wms.contents)
['global_mosaic', 'global_mosaic_base', 'us_landsat_wgs84', 'srtm_mag', 'daily_terra_721
↪', 'daily_aqua_721', 'daily_terra_ndvi', 'daily_aqua_ndvi', 'daily_terra', 'daily_aqua
↪', 'BMNG', 'modis', 'huemapped_srtm', 'srtmplus', 'worldwind_dem', 'us_ned', 'us_
↪elevation', 'us_colordem']
```

Details of a layer:

```
>>> wms['global_mosaic'].title
'WMS Global Mosaic, pan sharpened'
>>> wms['global_mosaic'].queryable
0
>>> wms['global_mosaic'].opaque
0
>>> wms['global_mosaic'].boundingBox
>>> wms['global_mosaic'].boundingBoxWGS84
(-180.0, -60.0, 180.0, 84.0)
>>> wms['global_mosaic'].crsOptions
['EPSG:4326', 'AUTO:42003']
>>> wms['global_mosaic'].styles
{'pseudo_bright': {'title': 'Pseudo-color image (Uses IR and Visual bands, 542 mapping),␣
↪gamma 1.5'}, 'pseudo': {'title': '(default) Pseudo-color image, pan sharpened (Uses IR␣
↪and Visual bands, 542 mapping), gamma 1.5'}, 'visual': {'title': 'Real-color image,␣
```

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```
↪pan sharpened (Uses the visual bands, 321 mapping), gamma 1.5'}, 'pseudo_low': {'title
↪': 'Pseudo-color image, pan sharpened (Uses IR and Visual bands, 542 mapping)'},
↪'visual_low': {'title': 'Real-color image, pan sharpened (Uses the visual bands, 321␣
↪mapping)'}, 'visual_bright': {'title': 'Real-color image (Uses the visual bands, 321␣
↪mapping), gamma 1.5'}}
```

Available methods, their URLs, and available formats:

```
>>> [op.name for op in wms.operations]
['GetCapabilities', 'GetMap']
>>> wms.getOperationByName('GetMap').methods
{'Get': {'url': 'http://wms.jpl.nasa.gov/wms.cgi?'}}
>>> wms.getOperationByName('GetMap').formatOptions
['image/jpeg', 'image/png', 'image/geotiff', 'image/tiff']
```

That's everything needed to make a request for imagery:

```
>>> img = wms.getmap(   layers=['global_mosaic'],
...                     styles=['visual_bright'],
...                     srs='EPSG:4326',
...                     bbox=(-112, 36, -106, 41),
...                     size=(300, 250),
...                     format='image/jpeg',
...                     transparent=True
...                     )
>>> out = open('jpl_mosaic_visb.jpg', 'wb')
>>> out.write(img.read())
>>> out.close()
```

Result:

4.2 WFS

Connect to a WFS and inspect its capabilities.

```
>>> from owslib.wfs import WebFeatureService
>>> wfs11 = WebFeatureService(url='http://geoserv.weichand.de:8080/geoserver/wfs',␣
↪version='1.1.0')
>>> wfs11.identification.title
'INSPIRE WFS 2.0 DemoServer Verwaltungsgrenzen Bayern

>>> [operation.name for operation in wfs11.operations]
['GetCapabilities', 'DescribeFeatureType', 'GetFeature', 'GetGmlObject']
```

List FeatureTypes

```
>>> list(wfs11.contents)
['bvv:vg_ex', 'bvv:bayern_ex', 'bvv:lkr_ex', 'bvv:regbez_ex', 'bvv:gmd_ex']
```

Download GML using `typename`, `bbox` and `srsname`.

```
>>> # OWSLib will switch the axis order from EN to NE automatically if designated by␣
↪EPSG-Registry
>>> response = wfs11.getfeature(typename='bvv:gmd_ex', bbox=(4500000,5500000,4500500,
↪5500500), srsname='urn:x-ogc:def:crs:EPSG:31468')
```

Return a FeatureType's schema via `DescribeFeatureType`. The dictionary returned is compatible with a Fiona schema object.

```
>>> wfs11.get_schema('bvv:vg_ex')
>>> {'properties': {'land': 'string', 'modellart': 'string', 'objart': 'string', 'objart_
↪txt': 'string', 'objid': 'string', 'hdu_x': 'short', 'beginn': 'string', 'ende':
↪'string', 'adm': 'string', 'avg': 'string', 'bez_gem': 'string', 'bez_krs': 'string',
↪'bez_lan': 'string', 'bez_rbz': 'string', 'sch': 'string'}, 'geometry': '3D␣
↪MultiPolygon', 'geometry_column': 'geom'}
```

Download GML using `typename` and `filter`. OWSLib currently only support filter building for WFS 1.1 (FE.1.1).

```
>>> from owslib.fes import *
>>> from owslib.etree import etree
>>> from owslib.wfs import WebFeatureService
>>> wfs11 = WebFeatureService(url='http://geoserv.weichand.de:8080/geoserver/wfs',␣
↪version='1.1.0')

>>> filter = PropertyIsLike(propertyname='bez_gem', literal='Ingolstadt', wildCard='*')
>>> filterxml = etree.tostring(filter.toXML()).decode("utf-8")
>>> response = wfs11.getfeature(typename='bvv:gmd_ex', filter=filterxml)
```

Save response to a file.

```
>>> out = open('/tmp/data.gml', 'wb')
>>> out.write(bytes(response.read(), 'UTF-8'))
>>> out.close()
```

Download GML using `StoredQueries`(only available for WFS 2.0 services)

```
>>> from owslib.wfs import WebFeatureService
>>> wfs20 = WebFeatureService(url='http://geoserv.weichand.de:8080/geoserver/wfs',␣
↪version='2.0.0')

>>> # List StoredQueries
>>> [storedquery.id for storedquery in wfs20.storedqueries]
['bboxQuery', 'urn:ogc:def:query:OGC-WFS::GetFeatureById',
↪'GemeindeByGemeindeschluesselEpsg31468', 'DWithinQuery']

>>> # List Parameters for StoredQuery[1]
>>> parameter.name for parameter in wfs20.storedqueries[1].parameters]
['ID']


>>> response = wfs20.getfeature(storedQueryID='urn:ogc:def:query:OGC-WFS::GetFeatureById
↪', storedQueryParams={'ID':'gmd_ex.1'})
```

4.3 OGC API

The *OGC API* standards are a clean break from the traditional OGC service architecture using current design patterns (RESTful, JSON, OpenAPI). As such, OWSLib the code follows the same pattern.

4.3.1 OGC API - Features - Part 1: Core 1.0

```
>>> from owslib.ogcapi.features import Features
>>> w = Features('https://demo.pygeoapi.io/master')
>>> w.url
'https://demo.pygeoapi.io/master'
>>> conformance = w.conformance()
{u'conformsTo': [u'http://www.opengis.net/spec/ogcapi-features-1/1.0/conf/core', u'http:/
↪/www.opengis.net/spec/ogcapi-features-1/1.0/conf/oas30', u'http://www.opengis.net/spec/
↪ogcapi-features-1/1.0/conf/html', u'http://www.opengis.net/spec/ogcapi-features-1/1.0/
↪conf/geojson']}
>>> api = w.api()  # OpenAPI document/
>>> collections = w.collections()
>>> len(collections['collections'])
13
>>> feature_collections = w.feature_collections()
>>> len(feature_collections)
13
>>> lakes = w.collection('lakes')
>>> lakes['id']
'lakes'
>>> lakes['title']
'Large Lakes'
>>> lakes['description']
'lakes of the world, public domain'
>>> lakes_queryables = w.collection_queryables('lakes')
>>> len(lakes_queryables['queryables'])
```

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```
6
>>> lakes_query = w.collection_items('lakes')
>>> lakes_query['features'][0]['properties']
{u'scalerank': 0, u'name_alt': None, u'admin': None, u'featureclass': u'Lake', u'id': 0,␣
↪u'name': u'Lake Baikal'}
```

4.3.2 OGC API - Coverages - Part 1: Core 1.0

```
>>> from owslib.ogcapi.coverages import Coverages
>>> w = Coverages('https://dev.api.weather.gc.ca/coverages-demo')
>>> w.url
'https://dev.api.weather.gc.ca/coverages-demo/')
>>> api = w.api()  # OpenAPI document
>>> collections = w.collections()
>>> len(collections['collections'])
3
>>> coverages = w.coverages()
>>> len(coverages)
1
>>> gdps = w.collection('gdps-temperature')
>>> gdps['id']
'gdps-temperature'
>>> gdps['title']
Global Deterministic Prediction System sample'
>>> gdps['description']
'Global Deterministic Prediction System sample'
>>> gdps['extent']['spatial']['grid'][0]
>>> {"cellsCount": 2400, "resolution": 0.15000000000000002 }
>>> gdps['extent']['spatial']['grid'][1]
>>> {"cellsCount": 1201, "resolution": 0.15}
>>> schema = w.collection_schema('gdps-temperature')
>>> len(schema['properties'])
1
>>> schema['properties']['1']['type']
'number'
>> gdps_coverage_data = w.coverage('gdps-temperature', range_subset=[1])
```

4.3.3 OGC API - Records - Part 1: Core 1.0

```
>>> from owslib.ogcapi.records import Records
>>> w = Records('https://example.org/records-api')
>>> w.url
'https://example.org/records-api'
>>> conformance = w.conformance()
{'conformsTo': [u'http://www.opengis.net/spec/ogcapi-features-1/1.0/conf/core', u'http://
↪www.opengis.net/spec/ogcapi-features-1/1.0/conf/oas30', u'http://www.opengis.net/spec/
↪ogcapi-features-1/1.0/conf/html', u'http://www.opengis.net/spec/ogcapi-features-1/1.0/
↪conf/geojson', u'http://www.opengis.net/spec/ogcapi-records-1/1.0/req/core', u'http://
↪www.opengis.net/spec/ogcapi-records/1.0/req/oas30', u'http://www.opengis.net/spec/
```

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```
↪ogcapi-records-1/1.0/req/json', u'http://www.opengis.net/spec/ogcapi-records-1/1.0/req/
↪html']}
>>> api = w.api()  # OpenAPI document
>>> collections = w.collections()
>>> len(collections)
1
>>> records = w.records()
>>> len(records)
1
>>> my_catalogue = w.collection('my-catalogue')
>>> my_catalogue['id']
'my-catalogue'
>>> my_catalogue['title']
'My catalogue'
>>> my_catalogue['description']
'My catalogue'
>>> my_catalogue_queryables = w.collection_queryables('my-catalogue')
>>> len(my_catalogue_queryables)
8
>>> my_catalogue_query = w.collection_items('my-catalogue')
>>> my_catalogue_query['features'][0]['properties'].keys()
[u'title', u'abstract', u'keywords']
>>> my_catalogue_query['features'][0]['properties']['title']
u'Roadrunner ambush locations'
>>> my_catalogue_query2 = w.collection_items('my-catalogue', q='birds')
>>> msc_wis_dcpc_query2['numberMatched']
2
>>> msc_wis_dcpc_query2['numberReturned']
2
>>> my_catalogue_cql_text_query = w.collection_items('my-catalogue', filter="title LIKE
↪'Roadrunner%'")
>>> my_catalogue_cql_text_query['features'][0]['properties']['title']
u'Roadrunner ambush locations'
>>> my_catalogue_cql_json_query = w.collection_items('my-catalogue', limit=1, cql={'eq':␣
↪[{ 'property': 'title' }, 'Roadrunner ambush locations']})
>>> my_catalogue_cql_json_query['features'][0]['properties']['title']
u'Roadrunner ambush locations'
```

```
>>> import json
```

```
>>> record_data = 'sample-geojson-record.json'
```

```
>>> with open(record_data) as fh:
..  data = json.load(fh)
```

```
>>> identifier = data['id']
```

```
>>> w.collection_item_create('my-catalogue', data)
```

```
>>> w.collection_item_update('my-catalogue', identifier, data)
```

```
>>> w.collection_item_delete('my-catalogue', identifier)
```

4.3.4 OGC API - Features - Part 4: Create, Replace, Update and Delete

Note: This specification applies to both OGC API - Features and OGC API - Records

```
>>> import json
>>> from owslib.ogcapi.records import Records

>>> record_data = '/path/to/record.json'

>>> url = 'http://localhost:8000'
>>> collection_id = 'metadata:main'

>>> r = Records(url)

>>> cat = r.collection(collection_id)

>>> with open(record_data) as fh:
...     data = json.load(fh)

>>> identifier = data['id']

>>> r.collection_item_delete(collection_id, identifier)

# insert metadata
>>> r.collection_item_create(collection_id, data)

# update metadata
>>> r.collection_item_update(collection_id, identifier, data)

# delete metadata
>>> r.collection_item_delete(collection_id, identifier)
```

4.3.5 OGC API - Processes - Part 1: Core 1.0

```
>>> from owslib.ogcapi.processes import Processes
>>> p = Processes(SERVICE_URL)

>>> processes = p.processes()
>>>  hello_world = p.process('hello-world')

>>> hello_world['id']
'hello-world'
>>> hello_world['title']
'Hello World'

>>> result = p.execute('hello-world', inputs={'name': 'World', 'message': 'Testing from␣
```

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```
↪OWSLib'})
>>> result
{'outputs': [{'id': 'echo', 'value': 'Hello World! Testing from OWSLib'}]}
```

4.3.6 OGC API - Maps - Part 1: Core 1.0

```
>>> from owslib.ogcapi.maps import Maps
>>> m = Maps('http://localhost:5000')
>>> lakes = m.collection('lakes')
>>> data = m.map('lakes', width=1200, height=800, transparent=False)
>>> with open("output.png", "wb") as fh:
...     fh.write(data.getbuffer())
```

4.3.7 OGC API - Environmental Data Retrieval - Part 1: Core 1.0

```
>>> from owslib.ogcapi.edr import EnvironmentalDataRetrieval
>>> e = EnvironmentalDataRetrieval('http://localhost:5000')
>>> icoads_sst = m.collection('icoads-sst')
>>> data = e.query_data('icoads_sst', 'position', coords='POINT(-75 45)', parameter_
↪names=['SST', 'AIRT'])
```

4.3.8 OGC API - Connected Systems - Part 1: Feature Resources & Part 2: Dynamic Data

Note: The library covers all of parts 1 and 2, the example below is a short overview of the functionality. All CRUD operations are performed in a very similar manner. Please see the Connected Systems API docs for the full lists of properties, encoding requirements and expected responses.

```
>>> from owslib.ogcapi.connectedsystems import Systems, Datastreams, Observations
>>> s = Systems('http://localhost:5000', auth=('user', 'password'), headers={'Content-
↪Type': 'application/sml+json'})
>>> ds = Datastreams('http://localhost:5000', auth=('user', 'password'), headers={
↪'Content-Type': 'application/json'})
>>> obs = Observations('http://localhost:5000', auth=('user', 'password'), headers={
↪'Content-Type': 'application/json'})
# insert a new system, datastream and observation
>>> system_info =  {
>>>     "type": "SimpleProcess",
>>>     "uniqueId": "urn:osh:sensor:testsmlsensor:001",
>>>     "label": "Test SML Sensor",
>>>     "description": "A Sensor created from an SML document",
>>>     "definition": "http://www.w3.org/ns/ssn/Sensor"
>>> }
>>> ds_definition = {
>>>         "name": "Test Datastream",
```

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```
>>>         "outputName": "Test Output #1",
>>>         "schema": {
>>>             "obsFormat": "application/swe+json",
>>>             "encoding": {
>>>                 "type": "JSONEncoding",
>>>                 "vectorAsArrays": False
>>>             },
>>>             "recordSchema": {
>>>                 "type": "DataRecord",
>>>                 "label": "Test Datastream Record",
>>>                 "updatable": False,
>>>                 "optional": False,
>>>                 "definition": "http://test.com/Record",
>>>                 "fields": [
>>>                     {
>>>                         "type": "Time",
>>>                         "label": "Test Datastream Time",
>>>                         "updatable": False,
>>>                         "optional": False,
>>>                         "definition": "http://test.com/Time",
>>>                         "name": "timestamp",
>>>                         "uom": {
>>>                             "href": "http://test.com/TimeUOM"
>>>                         }
>>>                     },
>>>                     {
>>>                         "type": "Boolean",
>>>                         "label": "Test Datastream Boolean",
>>>                         "updatable": False,
>>>                         "optional": False,
>>>                         "definition": "http://test.com/Boolean",
>>>                         "name": "testboolean"
>>>                     }
>>>                 ]
>>>             }
>>>         }
>>>     }
>>> observation = {
>>>             "phenomenonTime": the_time,
>>>             "resultTime": the_time,
>>>             "result": {
>>>                 "timestamp": datetime.now().timestamp() * 1000,
>>>                 "testboolean": True
>>>             }
>>>         }
>>> s.create_system(system_info)
>>> system_id = s.resource_headers['Location'][0].split('/')[-1]
>>> ds.create_datastream(system_id, ds_definition)
>>> ds_id = ds.resource_headers['Location'][0].split('/')[-1]
>>> obs.create_observation(ds_id, observation)
>>> obs_id = obs.resource_headers['Location'][0].split('/')[-1]
>>> # retrieve the observations of our datastream
```

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```
>>> observations = obs.get_observations(ds_id)['items']
>>>
```

4.4 WCS

```
>>> # Import OWSLib in Python once installed
... from owslib.wcs import WebCoverageService

>>> # Create coverage object
... my_wcs = WebCoverageService('http://ows.rasdaman.org/rasdaman/ows',
...                             version='2.0.1')

>>> # Get list of coverages
... print my_wcs.contents.keys()
['RadianceColor', 'test_irr_cube_2', 'test_mean_summer_airtemp', 'test_double_1d',
↪'INSPIRE_EL', 'AverageChlorophyllScaled', 'INSPIRE_OI_RGB', 'Temperature4D', 'INSPIRE_
↪OI_IR', 'visible_human', 'INSPIRE_WS_LC', 'meris_lai', 'climate_earth', 'mean_summer_
↪airtemp', 'multiband', 'ls8_coastal_aerosol', 'NN3_3', 'NN3_2', 'NN3_1', 'NN3_4',
↪'AvgTemperatureColorScaled', 'AverageChloroColorScaled', 'lena', 'Germany_DTM',
↪'climate_cloud', 'FiLCCoverageBit', 'AverageChloroColor', 'LandsatMultiBand',
↪'RadianceColorScaled', 'AvgLandTemp', 'NIR', 'BlueMarbleCov']

>>> # Get geo-bounding boxes and native CRS
... my_wcs.contents['AverageChlorophyllScaled'].boundingboxes
[{'nativeSrs': 'http://ows.rasdaman.org/def/crs-compound?1=http://ows.rasdaman.org/def/
↪crs/EPSG/0/4326&2=http://ows.rasdaman.org/def/crs/OGC/0/UnixTime', 'bbox': (-90.0, -
↪180.0, 90.0, 180.0)}]

>>> # Get axis labels
... my_wcs.contents['AverageChlorophyllScaled'].grid.axislabels
['Lat', 'Long', 'unix']

>>> # Get dimension
... my_wcs.contents['AverageChlorophyllScaled'].grid.dimension
3

>>> # Get grid lower and upper bounds
... my_wcs.contents['AverageChlorophyllScaled'].grid.lowlimits
['0', '0', '0']

>>> my_wcs.contents['AverageChlorophyllScaled'].grid.highlimits
['119', '239', '5']

>>> # Get offset vectors for geo axes
... my_wcs.contents['AverageChlorophyllScaled'].grid.offsetvectors
[['-1.5', '0', '0'], ['0', '1.5', '0'], ['0', '0', '1']]

>>> # For coverage with time axis get the date time values
... my_wcs.contents['AverageChlorophyllScaled'].timepositions
[datetime.datetime(2015, 1, 1, 0, 0), datetime.datetime(2015, 2, 1, 0, 0), datetime.
```

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```
↪datetime(2015, 3, 1, 0, 0), datetime.datetime(2015, 4, 1, 0, 0), datetime.
↪datetime(2015, 5, 1, 0, 0), datetime.datetime(2015, 7, 1, 0, 0)]
```

4.5 CSW

Connect to a CSW, and inspect its properties:

```
>>> from owslib.csw import CatalogueServiceWeb
>>> csw = CatalogueServiceWeb('http://geodiscover.cgdi.ca/wes/serviceManagerCSW/csw')
>>> csw.identification.type
'CSW'
>>> [op.name for op in csw.operations]
['GetCapabilities', 'GetRecords', 'GetRecordById', 'DescribeRecord', 'GetDomain']
```

Get supported resultType's:

```
>>> csw.getdomain('GetRecords.resultType')
>>> csw.results
{'values': ['results', 'validate', 'hits'], 'parameter': 'GetRecords.resultType', 'type':
↪ 'csw:DomainValuesType'}
>>>
```

Search for bird data:

```
>>> from owslib.fes import PropertyIsEqualTo, PropertyIsLike, BBox
>>> birds_query = PropertyIsEqualTo('csw:AnyText', 'birds')
>>> csw.getrecords2(constraints=[birds_query], maxrecords=20)
>>> csw.results
{'matches': 101, 'nextrecord': 21, 'returned': 20}
>>> for rec in csw.records:
...     print(csw.records[rec].title)
...
ALLSPECIES
NatureServe Canada References
Bird Studies Canada - BirdMap WMS
Parks Canada Geomatics Metadata Repository
Bird Studies Canada - BirdMap WFS
eBird Canada - Survey Locations
WHC CitizenScience WMS
Project FeederWatch - Survey Locations
North American Bird Banding and Encounter Database
Wildlife Habitat Canada CitizenScience WFS
Parks Canada Geomatics Metadata Repository
Parks Canada Geomatics Metadata Repository
Wildlife Habitat Canada CitizenScience WMS
Canadian IBA Polygon layer
Land
Wildlife Habitat Canada CitizenScience WMS
WATER
Parks Canada Geomatics Metadata Repository
```

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```
Breeding Bird Survey
SCALE
>>>
```

Search for bird data in Canada:

```
>>> bbox_query = BBox([-141,42,-52,84])
>>> csw.getrecords2(constraints=[birds_query, bbox_query])
>>> csw.results
{'matches': 3, 'nextrecord': 0, 'returned': 3}
>>>
```

Search for keywords like 'birds' or 'fowl'

```
>>> birds_query_like = PropertyIsLike('dc:subject', '%birds%')
>>> fowl_query_like = PropertyIsLike('dc:subject', '%fowl%')
>>> csw.getrecords2(constraints=[birds_query_like, fowl_query_like])
>>> csw.results
{'matches': 107, 'nextrecord': 11, 'returned': 10}
>>>
```

Search for a specific record:

```
>>> csw.getrecordbyid(id=['9250AA67-F3AC-6C12-0CB9-0662231AA181'])
>>> c.records['9250AA67-F3AC-6C12-0CB9-0662231AA181'].title
'ALLSPECIES'
```

Search with a CQL query

```
>>> csw.getrecords(cql='csw:AnyText like "%birds%"')
```

Transaction: insert

```
>>> csw.transaction(ttype='insert', typename='gmd:MD_Metadata', record=open("file.xml").
↪read())
```

Transaction: update

```
>>> # update ALL records
>>> csw.transaction(ttype='update', typename='csw:Record', propertyname='dc:title',␣
↪propertyvalue='New Title')
>>> # update records satisfying keywords filter
>>> csw.transaction(ttype='update', typename='csw:Record', propertyname='dc:title',␣
↪propertyvalue='New Title', keywords=['birds','fowl'])
>>> # update records satisfying BBOX filter
>>> csw.transaction(ttype='update', typename='csw:Record', propertyname='dc:title',␣
↪propertyvalue='New Title', bbox=[-141,42,-52,84])
```

Transaction: delete

```
>>> # delete ALL records
>>> csw.transaction(ttype='delete', typename='gmd:MD_Metadata')
>>> # delete records satisfying keywords filter
```

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```
>>> csw.transaction(ttype='delete', typename='gmd:MD_Metadata', keywords=['birds','fowl
↪'])
>>> # delete records satisfying BBOX filter
>>> csw.transaction(ttype='delete', typename='gmd:MD_Metadata', bbox=[-141,42,-52,84])
```

Harvest a resource

```
>>> csw.harvest('http://host/url.xml', 'http://www.isotc211.org/2005/gmd')
```

4.6 WMC

4.7 WPS

Inspect a remote WPS and retrieve the supported processes:

```
>>> from owslib.wps import WebProcessingService
>>> wps = WebProcessingService('http://cida.usgs.gov/climate/gdp/process/
↪WebProcessingService', skip_caps=True)
>>> wps.getcapabilities()
>>> wps.identification.type
'WPS'
>>> wps.identification.title
'Geo Data Portal WPS Processing'
>>> wps.identification.abstract
'Geo Data Portal WPS Processing'
>>> for operation in wps.operations:
...     operation.name
...
'GetCapabilities'
'DescribeProcess'
'Execute'
>>> for process in wps.processes:
...     process.identifier, process.title
...
('gov.usgs.cida.gdp.wps.algorithm.FeatureCoverageIntersectionAlgorithm', 'Feature␣
↪Coverage WCS Intersection')
('gov.usgs.cida.gdp.wps.algorithm.FeatureCoverageOPeNDAPIntersectionAlgorithm', 'Feature␣
↪Coverage OPeNDAP Intersection')
('gov.usgs.cida.gdp.wps.algorithm.FeatureCategoricalGridCoverageAlgorithm', 'Feature␣
↪Categorical Grid Coverage')
('gov.usgs.cida.gdp.wps.algorithm.FeatureWeightedGridStatisticsAlgorithm', 'Feature␣
↪Weighted Grid Statistics')
('gov.usgs.cida.gdp.wps.algorithm.FeatureGridStatisticsAlgorithm', 'Feature Grid␣
↪Statistics')
('gov.usgs.cida.gdp.wps.algorithm.PRMSParameterGeneratorAlgorithm', 'PRMS Parameter␣
↪Generator')
>>>
```

Determine how a specific process needs to be invoked - i.e. what are its input parameters, and output result:

```
>>> from owslib.wps import printInputOutput
>>> process = wps.describeprocess('gov.usgs.cida.gdp.wps.algorithm.
↪FeatureWeightedGridStatisticsAlgorithm')
>>> process.identifier
'gov.usgs.cida.gdp.wps.algorithm.FeatureWeightedGridStatisticsAlgorithm'
>>> process.title
'Feature Weighted Grid Statistics'
>>> process.abstract
'This algorithm generates area weighted statistics of a gridded dataset for a set of␣
↪vector polygon features. Using the bounding-box that encloses ...
>>> for input in process.dataInputs:
...     printInputOutput(input)
...
 identifier=FEATURE_COLLECTION, title=Feature Collection, abstract=A feature collection␣
↪encoded as a WFS request or one of the supported GML profiles.,...
 Supported Value: mimeType=text/xml, encoding=UTF-8, schema=http://schemas.opengis.net/
↪gml/2.0.0/feature.xsd
 Supported Value: mimeType=text/xml, encoding=UTF-8, schema=http://schemas.opengis.net/
↪gml/2.1.1/feature.xsd
 Supported Value: mimeType=text/xml, encoding=UTF-8, schema=http://schemas.opengis.net/
↪gml/2.1.2/feature.xsd
 Supported Value: mimeType=text/xml, encoding=UTF-8, schema=http://schemas.opengis.net/
↪gml/2.1.2.1/feature.xsd
 Supported Value: mimeType=text/xml, encoding=UTF-8, schema=http://schemas.opengis.net/
↪gml/3.0.0/base/feature.xsd
 Supported Value: mimeType=text/xml, encoding=UTF-8, schema=http://schemas.opengis.net/
↪gml/3.0.1/base/feature.xsd
 Supported Value: mimeType=text/xml, encoding=UTF-8, schema=http://schemas.opengis.net/
↪gml/3.1.0/base/feature.xsd
 Supported Value: mimeType=text/xml, encoding=UTF-8, schema=http://schemas.opengis.net/
↪gml/3.1.1/base/feature.xsd
 Supported Value: mimeType=text/xml, encoding=UTF-8, schema=http://schemas.opengis.net/
↪gml/3.2.1/base/feature.xsd
 Default Value: mimeType=text/xml, encoding=UTF-8, schema=http://schemas.opengis.net/gml/
↪2.0.0/feature.xsd
 minOccurs=1, maxOccurs=1
 identifier=DATASET_URI, title=Dataset URI, abstract=The base data web service URI for␣
↪the dataset of interest., data type=anyURI
 Allowed Value: AnyValue
 Default Value: None
 minOccurs=1, maxOccurs=1
 identifier=DATASET_ID, title=Dataset Identifier, abstract=The unique identifier for the␣
↪data type or variable of interest., data type=string
 Allowed Value: AnyValue
 Default Value: None
 minOccurs=1, maxOccurs=2147483647
 identifier=REQUIRE_FULL_COVERAGE, title=Require Full Coverage, abstract=If turned on,␣
↪the service will require that the dataset of interest ....
 Allowed Value: True
 Default Value: True
 minOccurs=1, maxOccurs=1
 identifier=TIME_START, title=Time Start, abstract=The date to begin analysis., data␣
↪type=dateTime
```

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```
 Allowed Value: AnyValue
 Default Value: None
 minOccurs=0, maxOccurs=1
 identifier=TIME_END, title=Time End, abstract=The date to end analysis., data␣
↪type=dateTime
 Allowed Value: AnyValue
 Default Value: None
 minOccurs=0, maxOccurs=1
 identifier=FEATURE_ATTRIBUTE_NAME, title=Feature Attribute Name, abstract=The attribute␣
↪that will be used to label column headers in processing output., ...
 Allowed Value: AnyValue
 Default Value: None
 minOccurs=1, maxOccurs=1
 identifier=DELIMITER, title=Delimiter, abstract=The delimiter that will be used to␣
↪separate columns in the processing output., data type=string
 Allowed Value: COMMA
 Allowed Value: TAB
 Allowed Value: SPACE
 Default Value: COMMA
 minOccurs=1, maxOccurs=1
 identifier=STATISTICS, title=Statistics, abstract=Statistics that will be returned for␣
↪each feature in the processing output., data type=string
 Allowed Value: MEAN
 Allowed Value: MINIMUM
 Allowed Value: MAXIMUM
 Allowed Value: VARIANCE
 Allowed Value: STD_DEV
 Allowed Value: SUM
 Allowed Value: COUNT
 Default Value: None
 minOccurs=1, maxOccurs=7
 identifier=GROUP_BY, title=Group By, abstract=If multiple features and statistics are␣
↪selected, this will change whether the processing output ...
 Allowed Value: STATISTIC
 Allowed Value: FEATURE_ATTRIBUTE
 Default Value: None
 minOccurs=1, maxOccurs=1
 identifier=SUMMARIZE_TIMESTEP, title=Summarize Timestep, abstract=If selected,␣
↪processing output will include columns with summarized statistics ...
 Allowed Value: True
 Default Value: True
 minOccurs=0, maxOccurs=1
 identifier=SUMMARIZE_FEATURE_ATTRIBUTE, title=Summarize Feature Attribute, abstract=If␣
↪selected, processing output will include a final row of ...
 Allowed Value: True
 Default Value: True
 minOccurs=0, maxOccurs=1
>>> for output in process.processOutputs:
...     printInputOutput(output)
...
 identifier=OUTPUT, title=Output File, abstract=A delimited text file containing␣
↪requested process output., data type=ComplexData
```

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```
 Supported Value: mimeType=text/csv, encoding=UTF-8, schema=None
 Default Value: mimeType=text/csv, encoding=UTF-8, schema=None
 reference=None, mimeType=None
>>>
```

Submit a processing request (extraction of a climate index variable over a specific GML polygon, for a given period of time), monitor the execution until complete:

```
>>> from owslib.wps import GMLMultiPolygonFeatureCollection
>>> polygon = [(-102.8184, 39.5273), (-102.8184, 37.418), (-101.2363, 37.418), (-101.
↪2363, 39.5273), (-102.8184, 39.5273)]
>>> featureCollection = GMLMultiPolygonFeatureCollection( [polygon] )
>>> processid = 'gov.usgs.cida.gdp.wps.algorithm.FeatureWeightedGridStatisticsAlgorithm'
>>> inputs = [ ("FEATURE_ATTRIBUTE_NAME","the_geom"),
...            ("DATASET_URI", "dods://cida.usgs.gov/qa/thredds/dodsC/derivatives/
↪derivative-days_above_threshold.pr.ncml"),
...            ("DATASET_ID", "ensemble_b1_pr-days_above_threshold"),
...            ("TIME_START","2010-01-01T00:00:00.000Z"),
...            ("TIME_END","2011-01-01T00:00:00.000Z"),
...            ("REQUIRE_FULL_COVERAGE","false"),
...            ("DELIMITER","COMMA"),
...            ("STATISTICS","MEAN"),
...            ("GROUP_BY","STATISTIC"),
...            ("SUMMARIZE_TIMESTEP","false"),
...            ("SUMMARIZE_FEATURE_ATTRIBUTE","false"),
...            ("FEATURE_COLLECTION", featureCollection)
...          ]
>>> output = "OUTPUT"
>>> execution = wps.execute(processid, inputs, output = "OUTPUT")
Executing WPS request...
Execution status=ProcessStarted
>>> from owslib.wps import monitorExecution
>>> monitorExecution(execution)
Checking execution status... (location=http://cida.usgs.gov/climate/gdp/process/
↪RetrieveResultServlet?id=6809217153012787208)
Execution status=ProcessSucceeded
Execution status: ProcessSucceeded
Output URL=http://cida.usgs.gov/climate/gdp/process/RetrieveResultServlet?
↪id=6809217153012787208OUTPUT.3cbcd666-a912-456f-84a3-6ede450aca95
```

Alternatively, define the feature through an embedded query to a WFS server:

```
>>> from owslib.wps import WFSQuery, WFSFeatureCollection
>>> wfsUrl = "http://cida.usgs.gov/climate/gdp/proxy/http://igsarm-cida-gdp2.er.usgs.gov:
↪8082/geoserver/wfs"
>>> query = WFSQuery("sample:CONUS_States", propertyNames=['the_geom',"STATE"], filters=[
↪"CONUS_States.508","CONUS_States.469"])
>>> featureCollection = WFSFeatureCollection(wfsUrl, query)
>>> # same process submission as above
...
```

You can also submit a pre-made request encoded as WPS XML:

```
>>> request = open('/Users/cinquini/Documents/workspace-cog/wps/tests/resources/wps_
↪USGSExecuteRequest1.xml','rb').read()
>>> execution = wps.execute(None, [], request=request)
Executing WPS request...
Execution status=ProcessStarted
>>> monitorExecution(execution)
Checking execution status... (location=http://cida.usgs.gov/climate/gdp/process/
↪RetrieveResultServlet?id=5103866488472745994)
Execution status=ProcessSucceeded
Execution status: ProcessSucceeded
Output URL=http://cida.usgs.gov/climate/gdp/process/RetrieveResultServlet?
↪id=5103866488472745994OUTPUT.f80e2a78-96a9-4343-9777-be60fac5b256
```

4.8 SOS 1.0

GetCapabilities

Imports

```
>>> from tests.utils import cast_tuple_int_list, resource_file
>>> from owslib.sos import SensorObservationService
>>> from owslib.fes import FilterCapabilities
>>> from owslib.ows import OperationsMetadata
>>> from owslib.crs import Crs
>>> from datetime import datetime
>>> from operator import itemgetter
```

Initialize ncSOS

```
>>> xml = open(resource_file('sos_ncSOS_getcapabilities.xml'), 'rb').read()
>>> ncsos = SensorObservationService(None, xml=xml)
```

Initialize 52N

```
>>> xml = open(resource_file('sos_52n_getcapabilities.xml'), 'rb').read()
>>> f2n = SensorObservationService(None, xml=xml)
```

Initialize NDBC

```
>>> xml = open(resource_file('sos_ndbc_getcapabilities.xml'), 'rb').read()
>>> ndbc = SensorObservationService(None, xml=xml)
```

ServiceIdentification

```
>>> id = ndbc.identification
```

```
>>> id.service
'OGC:SOS'
```

```
>>> id.version
'1.0.0'
```

```
>>> id.title
'National Data Buoy Center SOS'
```

```
>>> id.abstract
'National Data Buoy Center SOS'
```

```
>>> id.keywords
['Weather', 'Ocean Currents', 'Air Temperature', 'Water Temperature', 'Conductivity',
↪'Salinity', 'Barometric Pressure', 'Water Level', 'Waves', 'Winds', 'NDBC']
```

```
>>> id.fees
'NONE'
```

```
>>> id.accessconstraints
'NONE'
```

ServiceProvider

```
>>> p = ndbc.provider
```

```
>>> p.name
'National Data Buoy Center'
```

```
>>> p.url
'http://sdf.ndbc.noaa.gov/'
```

ServiceContact

```
>>> sc = p.contact
```

Unused fields should return nothing

```
>>> sc.role
>>> sc.position
>>> sc.instructions
>>> sc.organization
>>> sc.fax
>>> sc.hours
```

```
>>> sc.name
'Webmaster'
```

```
>>> sc.phone
'228-688-2805'
```

```
>>> sc.address
'Bldg. 3205'
```

```
>>> sc.city
'Stennis Space Center'
```

```
>>> sc.region
'MS'
```

```
>>> sc.postcode
'39529'
```

```
>>> sc.country
'USA'
```

```
>>> sc.email
'webmaster.ndbc@noaa.gov'
```

OperationsMetadata

```
>>> o = ndbc.operations
>>> len(o)
3
```

Name

```
>>> len(o)
3
```

Get by name

```
>>> getcap = ndbc.get_operation_by_name('GetCapabilities')
>>> isinstance(getcap, OperationsMetadata)
True
```

Get by name (case insensitive)

```
>>> getcap = ndbc.get_operation_by_name('getcapabilities')
>>> isinstance(getcap, OperationsMetadata)
True
```

GetCapabilities

```
>>> getcap.constraints
[]
```

```
>>> x = getcap.parameters
>>> x == {'Sections': {'values': ['ServiceIdentification', 'ServiceProvider',
↪'OperationsMetadata', 'Contents', 'All']}}
True
```

```
>>> x = sorted(getcap.methods, key=itemgetter('type'))
>>> x == [{'type': 'Get', 'url': 'http://sdf.ndbc.noaa.gov/sos/server.php',
↪'constraints': []}, {'type' : 'Post', 'url': 'http://sdf.ndbc.noaa.gov/sos/
↪server.php', 'constraints': []}]
True
```

DescribeSensor

```
>>> descsen = ndbc.get_operation_by_name('describesensor')
```

```
>>> descsen.constraints
[]
```

```
>>> x = descsen.parameters
>>> x == {'outputFormat': {'values': ['text/xml;subtype="sensorML/1.0.1"']}}
True
```

```
>>> x = sorted(descsen.methods, key=itemgetter('type'))
>>> x == [{'type': 'Get', 'url': 'http://sdf.ndbc.noaa.gov/sos/server.php',
↪'constraints': []}, {'type' : 'Post', 'url': 'http://sdf.ndbc.noaa.gov/sos/
↪server.php', 'constraints': []}]
True
```

GetObservation

```
>>> getob = ndbc.get_operation_by_name('getobservation')
```

```
>>> getob.constraints
[]
```

```
>>> x = getob.parameters
>>> x == {'observedProperty': {'values': ['air_temperature', 'air_pressure_at_
↪sea_level', 'sea_water_electrical_conductivity', 'currents', 'sea_water_
↪salinity', 'sea_floor_depth_below_sea_surface', 'sea_water_temperature',
↪'waves', 'winds']}}
True
```

```
>>> x = sorted(getob.methods, key=itemgetter('type'))
>>> x == [{'type' : 'Get', 'url': 'http://sdf.ndbc.noaa.gov/sos/server.php',
↪'constraints': []}, {'type' : 'Post', 'url': 'http://sdf.ndbc.noaa.gov/sos/
↪server.php', 'constraints': []}]
True
```

Filter_Capabilities

```
>>> filter = ndbc.filters
>>> isinstance(filter, FilterCapabilities)
False
```

Contents

```
>>> contents = ndbc.contents
>>> len(contents)
848
```

Dict access __getitem__

```
>>> ndbc['station-46084'].name
'urn:ioos:station:wmo:46084'
```

```
>>> ndbc['rubbishrubbish'].name
Traceback (most recent call last):
  ...
KeyError: 'No Observational Offering with id: rubbishrubbish'
```

Network

```
>>> network = contents['network-all']
>>> network.id
'network-all'
```

```
>>> network.name
'urn:ioos:network:noaa.nws.ndbc:all'
```

```
>>> network.description
'All stations on the NDBC SOS server'
```

```
>>> srs = network.srs
>>> isinstance(srs, Crs)
True
>>> srs.getcodeurn()
'urn:ogc:def:crs:EPSG::4326'
>>> srs.getcode()
'EPSG:4326'
```

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```
>>> cast_tuple_int_list(network.bbox)
[-179, -77, 180, 80]
>>> bbsrs = network.bbox_srs
>>> isinstance(bbsrs, Crs)
True
>>> bbsrs.getcodeurn()
'urn:ogc:def:crs:EPSG::4326'
>>> bbsrs.getcode()
'EPSG:4326'
```

```
>>> bp = network.begin_position
>>> isinstance(bp, datetime)
True
>>> ep = network.end_position
>>> isinstance(ep, datetime)
True
```

```
>>> network.result_model
'om:Observation'
```

```
>>> procs = network.procedures
>>> len(procs)
847
```

```
>>> network.observed_properties
['http://mmisw.org/ont/cf/parameter/air_temperature', 'http://mmisw.org/ont/cf/
↪parameter/air_pressure_at_sea_level', 'http://mmisw.org/ont/cf/parameter/sea_
↪water_electrical_conductivity', 'http://mmisw.org/ont/cf/parameter/currents',
↪'http://mmisw.org/ont/cf/parameter/sea_water_salinity', 'http://mmisw.org/ont/cf/
↪parameter/sea_floor_depth_below_sea_surface', 'http://mmisw.org/ont/cf/parameter/
↪sea_water_temperature', 'http://mmisw.org/ont/cf/parameter/waves', 'http://mmisw.
↪org/ont/cf/parameter/winds']
```

```
>>> foi = network.features_of_interest
>>> len(foi)
1082
```

```
>>> rfs = network.response_formats
>>> len(rfs)
5
>>> rfs[-1]
'application/vnd.google-earth.kml+xml'
```

```
>>> rms = network.response_modes
>>> len(rms)
1
>>> rms[0]
'inline'
```

Station

```
>>> station = contents['station-zbqn7']
>>> station.id
'station-zbqn7'
```

```
>>> station.name
'urn:ioos:station:wmo:zbqn7'
```

```
>>> station.description
"Zeke's Basin, North Carolina"
```

```
>>> srs = station.srs
>>> isinstance(srs, Crs)
True
>>> srs.getcodeurn()
'urn:ogc:def:crs:EPSG::4326'
>>> srs.getcode()
'EPSG:4326'
>>> cast_tuple_int_list(station.bbox)
[-77, 33, -77, 33]
```

```
>>> bbsrs = station.bbox_srs
>>> isinstance(bbsrs, Crs)
True
>>> bbsrs.getcodeurn()
```

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```
'urn:ogc:def:crs:EPSG::4326'
>>> bbsrs.getcode()
'EPSG:4326'
```

```
>>> bp = station.begin_position
>>> isinstance(bp, datetime)
True
>>> ep = station.end_position
>>> isinstance(ep, datetime)
True
```

```
>>> station.result_model
'om:Observation'
```

```
>>> procs = station.procedures
>>> len(procs)
1
>>> procs[0]
'urn:ioos:station:wmo:zbqn7'
```

```
>>> ops = station.observed_properties
>>> len(ops)
3
>>> ops[0]
'http://mmisw.org/ont/cf/parameter/sea_water_electrical_conductivity'
```

```
>>> foi = station.features_of_interest
>>> len(foi)
1
>>> foi[0]
'urn:cgi:Feature:CGI:EarthOcean'
```

```
>>> rfs = station.response_formats
>>> len(rfs)
5
>>> rfs[0]
'text/xml;schema="ioos/0.6.1"'
```

```
>>> rm = station.response_modes
>>> len(rm)
1
>>> rm[0]
'inline'
```

GetObservation

Imports

```
>>> from tests.utils import resource_file
>>> from owslib.sos import SensorObservationService
>>> from owslib.fes2 import FilterCapabilities
```

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```
>>> from owslib.ows import OperationsMetadata
>>> from owslib.crs import Crs
>>> from datetime import datetime
>>> from operator import itemgetter
```

Initialize

```
>>> xml = open(resource_file('sos_ngwd.xml'),'rb').read()
>>> ngwd = SensorObservationService(None, xml=xml, version='2.0.0')
```

ServiceIdentification

```
>>> id = ngwd.identification
```

```
>>> id.service
'OGC:SOS'
```

```
>>> id.version
'2.0.0'
```

```
>>> len(id.profiles)
5
```

```
>>> id.title
'GIN SOS'
```

```
>>> id.abstract
'GIN SOS mediator'
```

```
>>> id.keywords
['water level', 'groundwater level', 'surface water flow']
```

```
>>> id.fees
'NONE'
```

```
>>> id.accessconstraints
'NONE'
```

ServiceProvider

```
>>> p = ngwd.provider
```

```
>>> p.name
'Geological Survey of Canada, Earth Sciences Sector, Natural Resources Canada,␣
↪Government of Canada'
```

```
>>> p.url
'http://gw-info.net'
```

ServiceContact

```
>>> sc = p.contact
```

Unused fields should return nothing >>> sc.role >>> sc.position 'Research Scientist' >>> sc.instructions >>> sc.organization >>> sc.fax '+1-613-995-9273' >>> sc.hours

```
>>> sc.name
'Boyan Brodaric'
```

```
>>> sc.phone
'+1-613-992-3562'
```

```
>>> sc.address
'615 Booth Street'
```

```
>>> sc.city
'Ottawa'
```

```
>>> sc.region
```

```
>>> sc.postcode
'K1A 0E9'
```

```
>>> sc.country
'Canada'
```

```
>>> sc.email
'brodaric at nrcan dot gc dot ca'
```

OperationsMetadata

```
>>> o = ngwd.operations
>>> len(o)
4
```

Get by name >>> getcap = ngwd.get_operation_by_name('GetCapabilities') >>> isinstance(getcap, OperationsMetadata) True

Get by name (case insensitive) >>> getcap = ngwd.get_operation_by_name('getcapabilities') >>> isinstance(getcap, OperationsMetadata) True

GetCapabilities >>> getcap.constraints []

```
>>> x = getcap.parameters
>>> x == {'AcceptVersions': {'values': ['2.0.0']}, 'updateSequence': {'values':
↪ []}, 'Sections': {'values': ['ServiceIdentification', 'ServiceProvider',
↪'OperationsMetadata', 'FilterCapabilities', 'Contents', 'All']},
↪'AcceptFormats': {'values': ['text/xml', 'application/zip']}}
True
```

```
>>> x = sorted(getcap.methods, key=itemgetter('type'))
>>> x == [{'type' : 'Get', 'url': 'http://ngwd-bdnes.cits.nrcan.gc.ca:8080/
↪proxy/GinService/sos/gw?', 'constraints': []}, {'type' : 'Post', 'url':
```

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```
↪'http://ngwd-bdnes.cits.nrcan.gc.ca:8080/proxy/GinService/sos/gw',
↪'constraints': []}]
True
```

DescribeSensor >>> descsen = ngwd.get_operation_by_name('describesensor')

```
>>> descsen.constraints
[]
```

```
>>> x = descsen.parameters
>>> x == {'procedureDescriptionFormat': {'values': ['http://www.opengis.net/
↪sensorML/1.0.1']}, 'procedure': {'values': ['urn:ogc:object:Sensor::GIN_
↪GroundwaterLevelProcess']}}
True
```

```
>>> x = sorted(descsen.methods, key=itemgetter('type'))
>>> x == [{'type': 'Get', 'url': 'http://ngwd-bdnes.cits.nrcan.gc.ca:8080/
↪proxy/GinService/sos/gw?', 'constraints': []}, {'type' : 'Post', 'url':
↪'http://ngwd-bdnes.cits.nrcan.gc.ca:8080/proxy/GinService/sos/gw',
↪'constraints': []}]
True
```

GetObservation >>> getob = ngwd.get_operation_by_name('getobservation')

```
>>> getob.constraints
[]
```

```
>>> x = getob.parameters
>>> x == {'srsName': {'values': []}, 'temporalFilter': {'values': []},
↪'offering': {'values': ['GW_LEVEL']}, 'result': {'values': []},
↪'responseFormat': {'values': ['http://www.opengis.net/waterml/2.0',
↪'application/zip']}, 'observedProperty': {'values': ['urn:ogc:def:phenomenon:
↪OGC:1.0.30:groundwaterlevel']}, 'procedure': {'values': ['urn:ogc:object:
↪Sensor::GIN_GroundwaterLevelProcess']}}
True
```

```
>>> x = getob.methods
>>> x == [{'type' : 'Get', 'url': 'http://ngwd-bdnes.cits.nrcan.gc.ca:8080/
↪proxy/GinService/sos/gw?', 'constraints': []}, {'type': 'Post', 'url': 'http:
↪//ngwd-bdnes.cits.nrcan.gc.ca:8080/proxy/GinService/sos/gw', 'constraints':␣
↪[]}]
True
```

Filter_Capabilities

```
>>> filter = ngwd.filters
>>> isinstance(filter, FilterCapabilities)
False
```

Contents

```
>>> contents = ngwd.contents
>>> len(contents)
1
```

Network >>> network = contents[‘GW_LEVEL’] >>> network.id ‘GW_LEVEL’

```
>>> network.procedures
['urn:ogc:object:Sensor::GIN_GroundwaterLevelProcess']
```

```
>>> srs = network.bbox_srs
>>> isinstance(srs, Crs)
True
>>> srs.id
'http://www.opengis.net/def/crs/EPSG/0/4326'
```

```
>>> srs.getcodeurn()
'urn:ogc:def:crs:EPSG::4326'
```

```
>>> srs.getcode()
'EPSG:4326'
```

(left, bottom, right, top) >>> network.bbox (-120.0, 41.0, -60.0, 60.0)

```
>>> bbsrs = network.bbox_srs
```

```
>>> isinstance(bbsrs, Crs)
True
```

```
>>> bbsrs.getcodeurn()
'urn:ogc:def:crs:EPSG::4326'
```

```
>>> bbsrs.getcode()
'EPSG:4326'
```

```
>>> bp = network.begin_position
>>> isinstance(bp, datetime)
True
>>> ep = network.end_position
>>> isinstance(ep, datetime)
True
```

```
>>> network.observed_properties
['urn:ogc:def:phenomenon:OGC:1.0.30:groundwaterlevel']
```

```
>>> network.response_formats
[]
```

```
>>> network.observation_models
[]
```

4.9 SOS 2.0

4.9.1 Examples of service metadata and GetObservation

Tests using the 52North demo service

```
>>> from owslib.sos import SensorObservationService
>>> service = SensorObservationService('http://sensorweb.demo.52north.org/52n-sos-webapp/
↪sos/kvp',version='2.0.0')
>>> for content in sorted(service.contents):
...  print(content)
...
http://www.52north.org/test/offering/1
http://www.52north.org/test/offering/2
http://www.52north.org/test/offering/3
http://www.52north.org/test/offering/4
http://www.52north.org/test/offering/5
http://www.52north.org/test/offering/6
http://www.52north.org/test/offering/7
http://www.52north.org/test/offering/8
http://www.52north.org/test/offering/developer
```

```
>>> id = service.identification
```

Check basic service metadata >>> id.service 'OGC:SOS'

```
>>> id.title
'52N SOS'
```

```
>>> provider=service.provider
>>> provider.name
'52North'
```

```
>>> len(service.operations)
16
```

Check allowed params for get FOI

```
>>> get_foi=service.get_operation_by_name('GetFeatureOfInterest')
>>> try:
...     x = unicode('test')
...     for x in sorted(get_foi.parameters['featureOfInterest']['values']):
...         print(x.encode('utf8'))
... except:
...     for x in sorted(get_foi.parameters['featureOfInterest']['values']):
...         print(x)
http://www.52north.org/test/featureOfInterest/1
http://www.52north.org/test/featureOfInterest/2
http://www.52north.org/test/featureOfInterest/3
http://www.52north.org/test/featureOfInterest/4
http://www.52north.org/test/featureOfInterest/5
http://www.52north.org/test/featureOfInterest/6
```

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```
http://www.52north.org/test/featureOfInterest/7
http://www.52north.org/test/featureOfInterest/8
http://www.52north.org/test/featureOfInterest/Heiden
http://www.52north.org/test/featureOfInterest/Münster/FE101
http://www.52north.org/test/featureOfInterest/Portland
http://www.52north.org/test/featureOfInterest/TODO
http://www.52north.org/test/featureOfInterest/world
```

Check allowed params for get observation

```
>>> get_obs=service.get_operation_by_name('GetObservation')
get_obs.parameters['responseFormat']['values']
['http://www.opengis.net/om/2.0']
```

Get observation call

Get latest value using O&M reponse format

#'<?xml version="1.0" encoding="UTF-8"?>n<sos:GetObservationResponse xmlns:sos="http://www.opengis.net/sos/2.0" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:om="http://www.opengis.net/om/2.0" xmlns:gml="http://www.opengis.net/gml/3.2" xmlns:xlink="http://www.w3.org/1999/xlink" xsi:schemaLocation="http://www.opengis.net/sos/2.0 http://schemas.opengis.net/sos/2.0/sosGetObservation.xsd http://www.opengis.net/gml/3.2 http://schemas.opengis.net/gml/3.2.1/gml.xsd http://www.opengis.net/om/2.0 http://schemas.opengis.net/om/2.0/observation.xsd">n <sos:observationData>n <om:OM_Observation gml:id="o_729058FD6AAFC4701C83D125175F889F51FD4798">n <om:type xlink:href="http://www.opengis.net/def/observationTyp OM/2.0/OM_Measurement"/>n <om:phenomenonTime>n <gml:TimeInstant gml:id="phenomenonTime_2118549">n <gml:timePosition>2014-07-10T04:31:58.000Z</gml:timePosition>n </gml:TimeInstant>n </om:phenomenonTime>n <om:resultTime xlink:href="#phenomenonTime_2118549"/>n <om:procedure xlink:href="http://geoviqua.dev.52north.org/procedures/WXT520"/>n <om:observedProperty xlink:href="http://geoviqua.dev.52north.org/properties/AirTemperature"/>n <om:featureOfInterest xlink:href="http://geoviqua.dev.52north.org/stations/Vaisala-WXT520" xlink:title="Vaisala_WXT520"/>n <om:result xmlns:ns="http://www.opengis.net/gml/3.2" uom="degC" xsi:type="ns:MeasureType">17.2</om:result>n </om:OM_Observation>n </sos:observationData>n</sos:GetObservationResponse>' >>> latest_response = service.get_observation('http://www.opengis.net/om/2.0', ['http://www.52north.org/test/offering/1'], ['http://www.52north.org/test/observableProperty/1'], eventTime='om:phenomenonTime,latest', timeout=120)

4.9.2 Using the GetObservation response decoder for O&M and WaterML2.0 results

SOS version 2.0 tests using the 52North installation for IOOS: http://ioossos.axiomalaska.com/

Imports

```
>>> from owslib.sos import SensorObservationService
>>> from owslib.swe.observation.sos200 import SOSGetObservationResponse
>>> from owslib.etree import etree
```

Setup

#>>> service = SensorObservationService('http://geoviqua.dev.52north.org/SOS-Q/sos/kvp',version='2.0.0')

```
>>> service = SensorObservationService('http://ioossos.axiomalaska.com/52n-sos-ioos-
↪stable/sos/kvp',version='2.0.0')
```

http://ioossos.axiomalaska.com/52n-sos-ioos-stable/sos/kvp?service=SOS&request=GetObservation&namespaces=xmlns(om%2Chttp%3A%2F%2Fwww.opengis.net%2Fom%2F2.0)&temporalFilter=om%3AphenomenonTime%2Clatest&version=2.0.0

Check allowed params for get observation

```
>>> get_obs=service.get_operation_by_name('GetObservation')
```

```
>>> response = service.get_observation(responseFormat='http://www.opengis.net/om/2.0',␣
↪offerings=['urn:ioos:station:test:8'], observedProperties=['http://mmisw.org/ont/cf/
↪parameter/sea_water_temperature'], timeout=60)
```

```
>>> xml_tree = etree.fromstring(response)
```

```
>>> parsed_response = SOSGetObservationResponse(xml_tree)
```

```
>>> type(parsed_response)
<class 'owslib.swe.observation.sos200.SOSGetObservationResponse'>
```

```
>>> o=parsed_response.observations[0]
```

Value changes each call so can't be tested

>>> o.get_result().value

```
>>> o.get_result().uom
'urn:ogc:def:uom:udunits:2:Cel'
```

This O&M structure of the results splits each point into an O&M object, resulting in 400 results

```
>>> len(parsed_response.observations)
400
>>> type(parsed_response.observations[0])
<class 'owslib.swe.observation.om.MeasurementObservation'>
```

Get observation for a specific offering (in this case corresponds to a station) and observed property (sea water temperature)

```
>>> response = service.get_observation(responseFormat='http://www.opengis.net/waterml/2.0
↪', offerings=['urn:ioos:station:test:8'], observedProperties=['http://mmisw.org/ont/cf/
↪parameter/sea_water_temperature'], timeout=60)
>>> xml_tree = etree.fromstring(response)
>>> parsed_response = SOSGetObservationResponse(xml_tree)
>>> type(parsed_response)
<class 'owslib.swe.observation.sos200.SOSGetObservationResponse'>
```

```
>>> len(parsed_response.observations)
20
>>> type(parsed_response.observations[0])
<class 'owslib.swe.observation.waterml2.MeasurementTimeseriesObservation'>
>>> type(parsed_response.observations[0].get_result())
<class 'owslib.swe.observation.waterml2.MeasurementTimeseries'>
```

```
>>> measurement_timeseries = parsed_response.observations[0].get_result()
>>> len(measurement_timeseries)
20
```

4.10 SensorML

Imports

```
>>> from tests.utils import resource_file
>>> from owslib.swe.sensor.sml import SensorML
>>> from dateutil import parser
    >>> from datetime import timezone
```

Initialize

```
>>> xml = open(resource_file('sml_ndbc_station.xml'), 'rb').read()
>>> root = SensorML(xml)
>>> system = root.members[0]
```

```
>>> system.description
'Station metadata for 41012 - 40NM ENE of St Augustine, FL'
```

Contacts

```
>>> sorted(system.contacts.keys())
['urn:ogc:def:classifiers:OGC:contactType:operator', 'urn:ogc:def:classifiers:OGC:
↪contactType:publisher']
```

```
>>> operators = system.get_contacts_by_role('urn:ogc:def:classifiers:OGC:contactType:
↪operator')
>>> operators[0].role
'urn:ogc:def:classifiers:OGC:contactType:operator'
>>> operators[0].organization
'National Data Buoy Center'
>>> operators[0].country
'US'
```

```
>>> publishers = system.get_contacts_by_role('urn:ogc:def:classifiers:OGC:contactType:
↪publisher')
>>> publishers[0].role
'urn:ogc:def:classifiers:OGC:contactType:publisher'
>>> publishers[0].organization
'National Data Buoy Center'
>>> publishers[0].country
'USA'
>>> publishers[0].phone
'228-688-2805'
>>> publishers[0].address
'Bldg. 3205'
>>> publishers[0].city
```

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```
'Stennis Space Center'
>>> publishers[0].postcode
'39529'
>>> publishers[0].email
'webmaster.ndbc@noaa.gov'
>>> publishers[0].region
'MS'
```

Identification

```
>>> sorted(system.identifiers.keys())
['Long Name', 'Short Name', 'StationId']
```

```
>>> sid = system.get_identifiers_by_name('StationId')
>>> sid[0].name
'StationId'
>>> sid[0].definition
'urn:ioos:def:identifier:NOAA:stationID'
>>> sid[0].codeSpace
'http://sdf.ndbc.noaa.gov'
>>> sid[0].value
'urn:ioos:station:wmo:41012'
```

Classifiers

```
>>> sorted(system.classifiers.keys())
['Platform Type']
>>> classi = system.get_classifiers_by_name('Platform type')
>>> classi[0].name
'Platform Type'
>>> classi[0].definition
'urn:ioos:def:classifier:NOAA:platformType'
>>> classi[0].codeSpace
'http://sdf.ndbc.noaa.gov'
>>> classi[0].value
'MOORED BUOY'
```

Documents

```
>>> system.documentation
[<owslib.swe.sensor.sml.Documentation ...>]
```

```
>>> doc = system.documentation[0].documents[0]
>>> doc.description
'Handbook of Automated Data Quality Control Checks and Procedures, National Data Buoy␣
↪Center, August 2009'
>>> doc.format
'pdf'
>>> doc.url
'http://www.ndbc.noaa.gov/NDBCHandbookofAutomatedDataQualityControl2009.pdf'
```

History

```
>>> sorted(system.history.keys())
['deployment_start', 'deployment_stop']
```

```
>>> his = system.get_history_by_name('deployment_start')
>>> his
[<owslib.swe.sensor.sml.Event ...>]
>>> len(his)
2
```

```
>>> event = his[0]
>>> parser.parse(event.date).replace(tzinfo=timezone.utc).isoformat()
'2010-01-12T00:00:00+00:00'
>>> event.description
'Deployment start event'
>>> event.documentation[0].url
'http://sdftest.ndbc.noaa.gov/sos/server.php?service=SOS&request=DescribeSensor&
↪version=1.0.0&outputformat=text/xml;subtype="sensorML/1.0.1"&procedure=urn:ioos:
↪station:wmo:41012:20100112'
```

4.11 ISO

```
>>> from owslib.iso import *
>>> m=MD_Metadata(etree.parse('tests/resources/9250AA67-F3AC-6C12-0CB9-0662231AA181_iso.
↪xml'))
>>> m.identification.topiccategory
'farming'
>>>
```

ISO Codelists:

Imports

```
>>> from tests.utils import resource_file
>>> from owslib.etree import etree
>>> from owslib.iso import CodelistCatalogue
```

Print testing the code lists

```
>>> e=etree.parse(resource_file('gmxCodelists.xml'))
>>> c=CodelistCatalogue(e)
>>> sorted(c.getcodelistdictionaries())
['CI_DateTypeCode', 'CI_OnLineFunctionCode', 'CI_PresentationFormCode', 'CI_RoleCode',
↪'DQ_EvaluationMethodTypeCode', 'DS_AssociationTypeCode', 'DS_InitiativeTypeCode', 'MD_
↪CellGeometryCode', 'MD_CharacterSetCode', 'MD_ClassificationCode', 'MD_
↪CoverageContentTypeCode', 'MD_DatatypeCode', 'MD_DimensionNameTypeCode', 'MD_
↪GeometricObjectTypeCode', 'MD_ImagingConditionCode', 'MD_KeywordTypeCode', 'MD_
↪MaintenanceFrequencyCode', 'MD_MediumFormatCode', 'MD_MediumNameCode', 'MD_
↪ObligationCode', 'MD_PixelOrientationCode', 'MD_ProgressCode', 'MD_RestrictionCode',
↪'MD_ScopeCode', 'MD_SpatialRepresentationTypeCode', 'MD_TopicCategoryCode', 'MD_
↪TopologyLevelCode', 'MX_ScopeCode']
```

```
>>> sorted(c.getcodedefinitionidentifiers('CI_RoleCode'))
['author', 'custodian', 'distributor', 'originator', 'owner', 'pointOfContact',
↪'principalInvestigator', 'processor', 'publisher', 'resourceProvider', 'user']
```

4.12 CRS Handling

```
>>> from owslib import crs
>>> c=crs.Crs('EPSG:4326')
>>> c.code
4326
>>> c.getcodeurn()
'urn:ogc:def:crs:EPSG::4326'
>>> c.getcodeuri1()
'http://www.opengis.net/def/crs/EPSG/0/4326'
>>> c.getcodeuri2()
'http://www.opengis.net/gml/srs/epsg.xml#4326'
>>> c=crs.Crs('urn:ogc:def:crs:EPSG::4326')
>>> c.authority
'EPSG'
>>> c.axisorder
'yx'
>>> c=crs.Crs('http://www.opengis.net/gml/epsg.xml#4326')
>>> c.code
4326
>>> c.axisorder
'yx'
>>> c=crs.Crs('urn:x-ogc:def:crs:EPSG:6.11:2192')
>>> c.axisorder
'xy'
>>> c.code
2192
>>> c.version
'6.11'
>>> c=crs.Crs('http://www.opengis.net/def/crs/EPSG/0/4326')
>>> c.authority
'EPSG'
>>> c.code
4326
>>> c.axisorder
'yx'
>>> c=crs.Crs('PROJ4:+proj=lcc +lat_1=46.8 +lat_0=46.8 +lon_0=0 +k_0=0.99987742 +x_
↪0=600000 +y_0=2200000')
>>> c.authority
'PROJ4'
>>> c.code
'+proj=lcc +lat_1=46.8 +lat_0=46.8 +lon_0=0 +k_0=0.99987742 +x_0=600000 +y_0=2200000'
>>> c=crs.Crs('http://www.opengis.net/def/crs/OGC/1.3/CRS84')
>>> c.code
'CRS84'
>>> c.version
```

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```
'1.3'
>>> c.getcodeurn()
'urn:ogc:def:crs:OGC:1.3:CRS84'
>>> c.getcodeuri1()
'http://www.opengis.net/def/crs/OGC/1.3/CRS84'
```

4.13 Dublin Core

4.14 NASA DIF

4.15 FGDC

4.16 Swiss GM03

Imports

```
>>> from tests.utils import resource_file
>>> from owslib.etree import etree
>>> from owslib.gm03 import GM03
```

Print testing some metadata elements

```
>>> e = etree.parse(resource_file('gm03_example1.xml'))
>>> gm03 = GM03(e)
>>> gm03.header.version
'2.3'
>>> gm03.header.sender
'geocat.ch'
>>> hasattr(gm03.data, 'core')
False
>>> hasattr(gm03.data, 'comprehensive')
True
>>> len(gm03.data.comprehensive.elements)
13
>>> sorted(list(gm03.data.comprehensive.elements.keys()))
['address', 'citation', 'contact', 'data_identification', 'date', 'extent', 'extent_
↪geographic_element', 'geographic_bounding_box', 'identification_point_of_contact',
↪'keywords', 'metadata', 'metadata_point_of_contact', 'responsible_party']
>>> isinstance(gm03.data.comprehensive.date, list)
True
>>> len(gm03.data.comprehensive.date)
1
>>> gm03.data.comprehensive.metadata.file_identifier
'41ac321f632e55cebf0508a2cea5d9023fd12d9ad46edd679f2c275127c88623fb9c9d29726bef7c'
>>> gm03.data.comprehensive.metadata.date_stamp
'1999-12-31T12:00:00'
>>> gm03.data.comprehensive.metadata.language
'de'
```

Test TID searching

```
>>> gm03.data.comprehensive.metadata.tid
'xN6509077498146737843'
>>> search_tid = gm03.data.comprehensive.metadata.tid
>>> gm03.data.comprehensive.get_element_by_tid('404') is None
True
>>> gm03.data.comprehensive.get_element_by_tid(search_tid) is None
False
>>> search_tid2 = gm03.data.comprehensive.extent.data_identification.ref
>>> search_tid2
'xN8036063300808707346'
>>> gm03.data.comprehensive.get_element_by_tid(search_tid2) is None
False
>>> e = etree.parse(resource_file('gm03_example2.xml'))
>>> gm03 = GM03(e)
>>> gm03.data.comprehensive.geographic_bounding_box.extent_type_code
'false'
>>> gm03.data.comprehensive.geographic_bounding_box.north_bound_latitude
'47.1865387201702'
>>> gm03.data.comprehensive.geographic_bounding_box.south_bound_latitude
'47.1234508676764'
>>> gm03.data.comprehensive.geographic_bounding_box.east_bound_longitude
'9.10597474389878'
>>> gm03.data.comprehensive.geographic_bounding_box.west_bound_longitude
'9.23798212070671'
```

4.17 WMTS

Imports

```
>>> from tests.utils import scratch_file
```

Find out what a WMTS has to offer. Service metadata:

```
>>> from owslib.wmts import WebMapTileService
>>> wmts = WebMapTileService("http://map1c.vis.earthdata.nasa.gov/wmts-geo/wmts.cgi")
>>> wmts.identification.type
'OGC WMTS'
>>> wmts.identification.version
'1.0.0'
>>> wmts.identification.title
'NASA Global Imagery Browse Services for EOSDIS'
>>> bytearray(wmts.identification.abstract, 'utf-8')
bytearray(b'Near real time imagery from multiple NASA instruments')
>>> wmts.identification.keywords
['World', 'Global']
```

Service Provider:

```
>>> wmts.provider.name
'National Aeronautics and Space Administration'
```

```
>>> wmts.provider.url
'https://earthdata.nasa.gov/'
```

Available Layers:

```
>>> len(wmts.contents.keys()) > 0
True
>>> sorted(list(wmts.contents))[0]
'AIRS_CO_Total_Column_Day'
```

Fetch a tile (using some defaults):

```
>>> tile = wmts.gettile(layer='MODIS_Terra_CorrectedReflectance_TrueColor',␣
↪tilematrixset='EPSG4326_250m', tilematrix='0', row=0, column=0, format="image/jpeg")
>>> out = open(scratch_file('nasa_modis_terra_truecolour.jpg'), 'wb')
>>> bytes_written = out.write(tile.read())
>>> out.close()
```

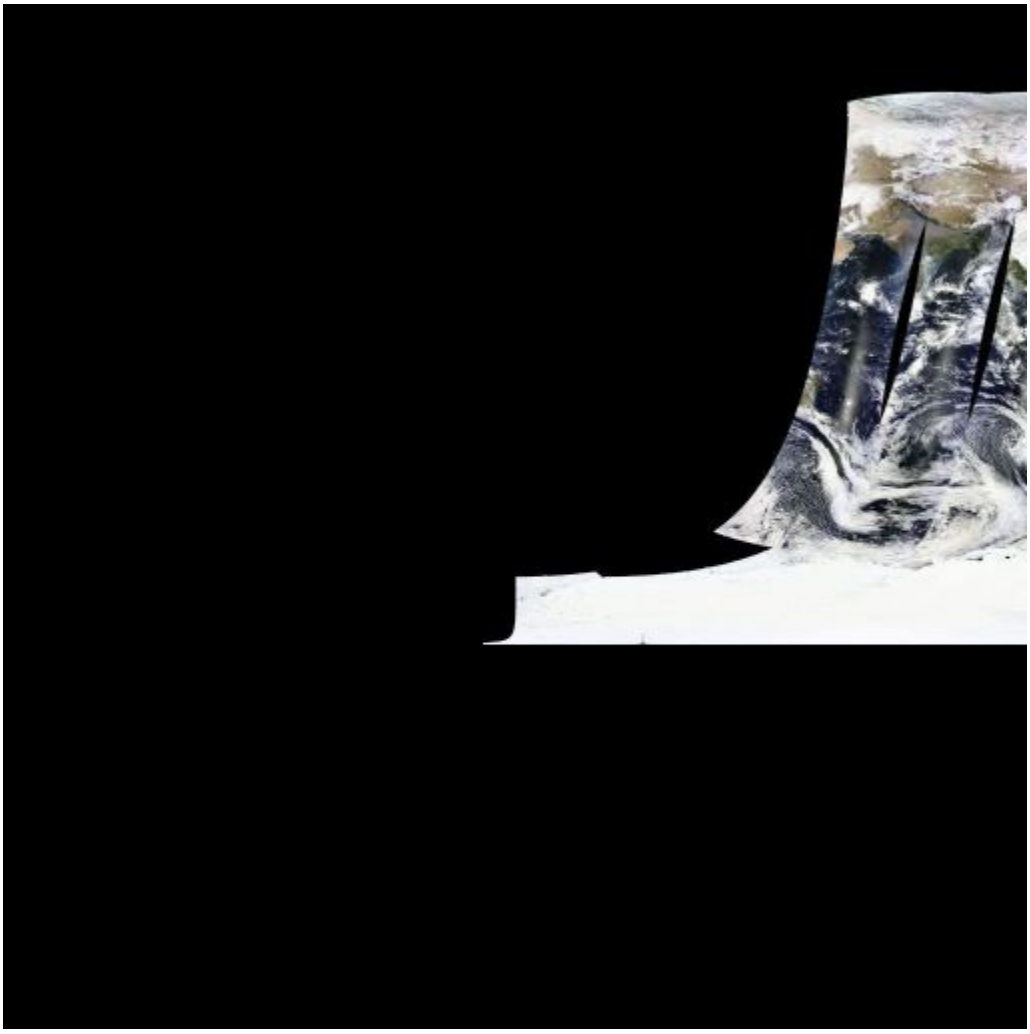
Test styles for several layers

```
>>> wmts.contents['MLS_SO2_147hPa_Night'].styles
{'default': {'isDefault': True, 'title': 'default'}}
>>> wmts.contents['MLS_SO2_147hPa_Night'].styles
{'default': {'isDefault': True, 'title': 'default'}}
```

Test a WMTS without a ServiceProvider tag in Capabilities XML

```
>>> wmts = WebMapTileService('http://data.geus.dk/arcgis/rest/services/
↪OneGeologyGlobal/S071_G2500_OneGeology/MapServer/WMTS/1.0.0/WMTSCapabilities.xml')
```

Result:



4.18 WaterML

Using WaterML 1.1 for examples

Imports

```
>>> from tests.utils import resource_file
>>> from owslib.waterml.wml11 import WaterML_1_1 as wml
```

An example GetSites response (from cuahsi)

```
>>> f = open(resource_file('cuahsi_example_all_sites.xml'), 'rb').read()
>>> sites = wml(f).response
```

Can view the queryInfo structure for information about the query

```
>>> sites.query_info.creation_time
datetime.datetime(2009, 6, 12, 10, 47, 54, 531250, tzinfo=tzoffset(None, -25200))
>>> sites.query_info.notes
```

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```
['ALL Sites(empty request)']
>>> sites.query_info.criteria.method_called
'GetSites'
```

Get a list of codes for the sites returned

```
>>> codes = sites.site_codes
>>> sorted(codes)
[['10105900'], ['USU-LBR-Confluence'], ['USU-LBR-EFLower'], ['USU-LBR-EFRepeater'],␣
↪['USU-LBR-EFWeather'], ['USU-LBR-ExpFarm'], ['USU-LBR-Mendon'], ['USU-LBR-Paradise
↪'], ['USU-LBR-ParadiseRepeater'], ['USU-LBR-SFLower'], ['USU-LBR-SFUpper'], ['USU-
↪LBR-Wellsville']]
```

Get the names ofthe sites

```
>>> sorted(sites.site_names)
['East Fork Little Bear River Radio Repeater near Avon, Utah', 'East Fork Little␣
↪Bear River at Paradise Canal Diversion near Avon, Utah', 'Little Bear River Upper␣
↪Weather Station near Avon, Utah', 'Little Bear River at McMurdy Hollow near␣
↪Paradise, Utah', 'Little Bear River at Mendon Road near Mendon, Utah', 'Little␣
↪Bear River at Paradise, Utah', 'Little Bear River below Confluence of South and␣
↪East Forks near Avon, Utah', 'Little Bear River near Wellsville, Utah', 'Radio␣
↪Repeater near Paradise, Utah', 'South Fork Little Bear River above Davenport␣
↪Creek near Avon, Utah', 'South Fork Little Bear River below Davenport Creek near␣
↪Avon, Utah', 'Utah State University Experimental Farm near Wellsville, Utah']
```

Get a site to view it in more detail

```
>>> site = sites[codes[0][0]]
>>> site.geo_coords
[('-111.946402', '41.718473')]
>>> site.latitudes
['41.718473']
>>> site.longitudes
['-111.946402']
>>> info = site.site_info
>>> info.notes
[]
>>> x = info.site_properties
>>> x == {'County': 'Cache', 'PosAccuracy_m': '1', 'State': 'Utah', 'Site Comments':
↪ 'Located below county road bridge at Mendon Road crossing'}
True
>>> info.altname
>>> info.elevation
'1345'
```

An example GetSiteInfo response

```
>>> f = open(resource_file('cuahsi_example_siteinfo_multiple.xml')).read()
>>> sites = wml(f).response
```

```
>>> sites.query_info.criteria.method_called
'GetSiteInfo'
```

List codes and names of the sites

```
>>> codes = sites.site_codes
>>> sorted(codes)
[['USU-LBR-Mendon'], ['USU-LBR-Wellsville']]
>>> sorted(sites.site_names)
['Little Bear River at Mendon Road near Mendon, Utah', 'Little Bear River near␣
↪Wellsville, Utah']
```

Get a site for a closer look

```
>>> site = sites[codes[1][0]]
>>> site.geo_coords
[('-111.917649', '41.643457')]
```

Get the (first) catalog of series for the site

```
>>> catalog = site[0]
```

Get a series from the catalog for a closer look

```
>>> series = catalog[3]
>>> series.properties
{}
>>> series.begin_date_time
datetime.datetime(2007, 11, 5, 14, 30)
>>> series.end_date_time
datetime.datetime(2008, 4, 5, 20, 30)
>>> series.method_id
'23'
>>> series.source_id
'2'
>>> series.value_count
'7309'
>>> series.value_type
'Field Observation'
>>> series.name
'Turbidity'
>>> series.organization
'Utah State University Utah Water Research Laboratory'
```

List variable names and codes

```
>>> sorted(site.variable_names)
['Battery voltage', 'Gage height', 'Oxygen, dissolved', 'Oxygen, dissolved percent␣
↪of saturation', 'Phosphorus, total as P', 'Phosphorus, total as P, filtered',
↪'Solids, total Suspended', 'Specific conductance, unfiltered', 'Temperature',
↪'Turbidity', 'pH, unfiltered']
>>> sorted(site.variable_codes)
['USU10', 'USU13', 'USU3', 'USU32', 'USU33', 'USU34', 'USU35', 'USU36', 'USU39',
↪'USU4', 'USU40', 'USU41', 'USU5', 'USU6', 'USU7', 'USU8', 'USU9']
```

Get a variable by its code

```
>>> variable = site['USU7']
>>> variable.variable_name
'Turbidity'
>>> variable.properties
{}
>>> variable.speciation
'Not Applicable'
>>> variable.unit.name
'nephelometric turbidity units'
>>> variable.time_scale.unit.name
'second'
```

Example GetValues response

```
>>> f = open(resource_file('cuahsi_example_get_values.xml')).read()
>>> series = wml(f).response
```

```
>>> series.query_info.criteria.method_called
'GetValuesForASite'
```

List the names of the series returned (usually None)

```
>>> series.series_names
[None, None, None, None, None, None, None, None, None, None, None, None]
```

List the variables and their codes

```
>>> sorted(series.variable_names)
['Battery Voltage', 'Battery voltage', 'Gage height', 'Temperature', 'Turbidity']
>>> codes = series.variable_codes
>>> sorted(codes)
['SDSC45', 'USU10', 'USU11', 'USU12', 'USU13', 'USU3', 'USU4', 'USU5', 'USU6', 'USU7
↪', 'USU8', 'USU9']
```

Get variables by code

```
>>> var = series.get_series_by_variable(var_code='USU4')
```

Get the first values set from the first variable retrieved from the code

```
>>> vals = var[0].values[0]
```

List (in tuple) the dates and their corresponding measurements

```
>>> sorted(vals.get_date_values())
[(datetime.datetime(2005, 8, 5, 0, 0), '34.53'), (datetime.datetime(2005, 8, 5, 0,␣
↪30), '37.12'), (datetime.datetime(2005, 8, 5, 1, 0), '35.97'), (datetime.
↪datetime(2005, 8, 5, 1, 30), '35.78'), (datetime.datetime(2005, 8, 5, 2, 0), '35.
↪68'), (datetime.datetime(2005, 8, 5, 2, 30), '36.08'), (datetime.datetime(2005, 8,
↪ 5, 3, 0), '37.8'), (datetime.datetime(2005, 8, 5, 3, 30), '37.93'), (datetime.
↪datetime(2005, 8, 5, 4, 0), '38.88'), (datetime.datetime(2005, 8, 5, 4, 30), '37.
↪34'), (datetime.datetime(2005, 8, 5, 5, 0), '35.15'), (datetime.datetime(2005, 8,␣
↪5, 5, 30), '35.96'), (datetime.datetime(2005, 8, 5, 6, 0), '35.62'), (datetime.
↪datetime(2005, 8, 5, 6, 30), '34.72'), (datetime.datetime(2005, 8, 5, 7, 0), '34.7
```

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```
↪'), (datetime.datetime(2005, 8, 5, 7, 30), '33.54'), (datetime.datetime(2005, 8,␣
↪5, 8, 0), '34.98'), (datetime.datetime(2005, 8, 5, 8, 30), '31.65'), (datetime.
↪datetime(2005, 8, 5, 9, 0), '32.49'), (datetime.datetime(2005, 8, 5, 9, 30), '32.
↪78'), (datetime.datetime(2005, 8, 5, 10, 0), '30.58'), (datetime.datetime(2005, 8,
↪ 5, 10, 30), '32.8'), (datetime.datetime(2005, 8, 5, 11, 0), '31.83'), (datetime.
↪datetime(2005, 8, 5, 11, 30), '30.71'), (datetime.datetime(2005, 8, 5, 12, 0),
↪'30.82'), (datetime.datetime(2005, 8, 5, 12, 30), '29.72'), (datetime.
↪datetime(2005, 8, 5, 13, 0), '27.05'), (datetime.datetime(2005, 8, 5, 13, 30),
↪'25.5'), (datetime.datetime(2005, 8, 5, 14, 0), '24.69'), (datetime.datetime(2005,
↪ 8, 5, 14, 30), '26.03'), (datetime.datetime(2005, 8, 5, 15, 0), '25.55'),␣
↪(datetime.datetime(2005, 8, 5, 15, 30), '25.96'), (datetime.datetime(2005, 8, 5,␣
↪16, 0), '24.72'), (datetime.datetime(2005, 8, 5, 16, 30), '23.36'), (datetime.
↪datetime(2005, 8, 5, 17, 0), '24.21'), (datetime.datetime(2005, 8, 5, 17, 30),
↪'25.61'), (datetime.datetime(2005, 8, 5, 18, 0), '24.73'), (datetime.
↪datetime(2005, 8, 5, 18, 30), '25.73'), (datetime.datetime(2005, 8, 5, 19, 0),
↪'24.76'), (datetime.datetime(2005, 8, 5, 19, 30), '24.96'), (datetime.
↪datetime(2005, 8, 5, 20, 0), '25.69'), (datetime.datetime(2005, 8, 5, 20, 30),
↪'27.34'), (datetime.datetime(2005, 8, 5, 21, 0), '27.14'), (datetime.
↪datetime(2005, 8, 5, 21, 30), '27.7'), (datetime.datetime(2005, 8, 5, 22, 0), '28.
↪88'), (datetime.datetime(2005, 8, 5, 22, 30), '30.44'), (datetime.datetime(2005,␣
↪8, 5, 23, 0), '32.14'), (datetime.datetime(2005, 8, 5, 23, 30), '34.02'),␣
↪(datetime.datetime(2005, 8, 6, 0, 0), '33.61')]
```

Example GetVariables response

```
>>> f = open(resource_file('cuahsi_example_get_variables.xml')).read()
>>> varis = wml(f).response
```

Just a list of variables

```
>>> codes = varis.variable_codes
>>> sorted(codes)
['SDSC45', 'USU10', 'USU11', 'USU12', 'USU13', 'USU14', 'USU15', 'USU16', 'USU17',
↪'USU18', 'USU19', 'USU20', 'USU21', 'USU22', 'USU23', 'USU24', 'USU25', 'USU26',
↪'USU27', 'USU28', 'USU29', 'USU3', 'USU30', 'USU31', 'USU32', 'USU33', 'USU34',
↪'USU35', 'USU36', 'USU37', 'USU38', 'USU39', 'USU4', 'USU40', 'USU41', 'USU42',
↪'USU43', 'USU5', 'USU6', 'USU7', 'USU8', 'USU9']
>>> sorted(varis.variable_names)
['Barometric pressure', 'Battery Voltage', 'Battery voltage', 'Discharge', 'Gage␣
↪height', 'Oxygen, dissolved', 'Oxygen, dissolved percent of saturation',
↪'Phosphorus, total as P', 'Phosphorus, total as P, filtered', 'Precipitation',
↪'Radiation, incoming shortwave', 'Relative humidity', 'Solids, total Suspended',
↪'Specific conductance, unfiltered', 'Temperature', 'Turbidity', 'Wind direction',
↪'Wind speed', 'pH, unfiltered']
>>> var = varis[codes[10]]
>>> var.variable_name
'Gage height'
>>> var.no_data_value
'-9999'
>>> var.properties
{}
>>> var.unit.name
'international foot'
```

4.19 OGC OWS Context 1.0.0 Atom CML and GeoJSON Encoding (alpha/under-review)

The OGC OWS Context implementation in OWSlib is currently in alpha and under review, and will still be improved. Please get in touch if you (want to) use it and provide feedback on how more comfortable it should be (especially handling geometries and dates in different encodings) and if it doesn't treat your "standards-compliant" OWS Context document right. Greatly appreciated :-)

Basic reading/parsing of OGC Web Services Context Documents (OWS Context) in OWC Atom 1.0.0 Encoding and OWC GeoJSON 1.0.0 Encoding Standards:

Imports

```
>>> import os
>>> from owslib.owscontext.core import OwcContext
>>> from tests.utils import resource_file
```

Test OWC Atom XML Read

```
>>> f = open(resource_file(os.path.join('owc_atom_examples', 'wms_meris.xml')), 'rb').
↪read()
>>> owc = OwcContext.from_atomxml(f)
>>> owc.title
'Satellite Image and Countries borders Over France and England'
>>> res = owc.resources[0]
>>> res.id
'http://geoserver.sourceforge.net/html/index.php/'
>>> res.title
'MER_RR__2PRLRA20120406_102429_000026213113_00238_52838_0211.N1.tif'
>>> off = res.offerings[0]
>>> off.offering_code
'http://www.opengis.net/spec/owc-atom/1.0/req/wms'
>>> op = off.operations[0]
>>> op.operations_code
'GetCapabilities'
>>> op.request_url
'http://ows.genesi-dec.eu/geoserver/385d7d71-650a-414b-b8c7-739e2c0b5e76/wms?SERVICE=WMS&
↪VERSION=1.3.0&REQUEST=GetCapabilities'
```

Test OWC GeoJSON Read

```
>>> f = open(resource_file(os.path.join('owc_geojson_examples','owc1.geojson')), 'rb').
↪read().decode('utf-8')
>>> owc = OwcContext.from_json(f)
>>> # bcause json works on pure strings, the doctest unicode results for Python 2.7␣
↪would cause errors, I add print()
>>> print(owc.title)
WPS 52North example
>>> res = owc.resources[0]
>>> print(res.id)
http://geoprocessing.demo.52north.org:8080/wps/WebProcessingService/process1/
>>> print(res.title)
WPS 52 north
>>> off = res.offerings[0]
```

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```
>>> print(off.offering_code)
http://www.opengis.net/spec/owc-geojson/1.0/req/wps
>>> op = off.operations[0]
>>> print(op.operations_code)
GetCapabilities
>>> print(op.request_url)
http://geoprocessing.demo.52north.org:8080/wps/WebProcessingService?SERVICE=WPS&
↪VERSION=1.0.0&REQUEST=GetCapabilities
```

additionally, possibility to construct OWS Context documents from scratch, and then write/serialise into OWC Atom 1.0.0 Encoding or OWC GeoJSON 1.0.0 Encoding Standards:

```
>>> from owslib.owscontext.core import OwcResource, OwcContext
>>> myContext=OwcContext(id='http://my.url.com/context/id/1',
      update_date='2017-11-02T15:24:24.446+12:00',
      title='Awesome new Context doc')
>>> myContext.rights='Creative Commons 4.0 BY'
>>> myEntry=OwcResource(id='http://my.url.com/resource/demo-feature-1',
      update_date='2017-11-02T15:24:24.446+12:00',
      title='This is a feature')
>>> contributor={'name': 'Alex K',
      'email': None,
      'uri': 'https://allixender.blogspot.com'}
>>> myEntry.authors.append(contributor)

>>> # ... here also continue to build your OGC data offerings, e.g. WMS GetMap etc.

>>> myContext.resources.append(myEntry)
>>> myContext.to_json()
>>> myContext.to_atomxml()
```

4.20 OpenSearch

```
>>> from owslib.opensearch import OpenSearch
>>> url = 'https://example.org/opensearch'
>>> o = OpenSearch(url)
>>> results = o.search('application/json', productType='SLC')  # dict of results
```

CHAPTER

FIVE

EXAMPLES

You can try these notebook online using Binder, or view the notebooks on NBViewer.

5.1 Interact with a WMS¶

OGC Web Map Service (WMS) can be used to download map images rendered by the remote server.

Example from the GeoPython Workshop

This is the metadata of the service endpoint:

[1]:
```
from owslib.wms import WebMapService

wms_url = "https://ows.terrestris.de/osm/service"

wms = WebMapService(wms_url, version="1.3.0")

print(f"WMS version: {wms.identification.version}")
print(f"WMS title: {wms.identification.title}")
print(f"WMS abstract: {wms.identification.abstract}")
print(f"Provider name: {wms.provider.name}")
print(f"Provider address: {wms.provider.contact.address}")
```

```
WMS version: 1.3.0
WMS title: OpenStreetMap WMS
WMS abstract: OpenStreetMap WMS, bereitgestellt durch terrestris GmbH und Co. KG.␣
↪Beschleunigt mit MapProxy (http://mapproxy.org/)
Provider name: terrestris GmbH und Co. KG
Provider address: Kölnstr. 99
```

Check the Capabilities response directly from the server

Available WMS layers:

[2]:
```
list(wms.contents)
```

[2]:
```
['OSM-WMS',
 'OSM-WMS-no-labels',
 'OSM-Overlay-WMS',
```

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```
 'TOPO-WMS',
 'TOPO-OSM-WMS',
 'SRTM30-Hillshade',
 'SRTM30-Colored',
 'SRTM30-Colored-Hillshade',
 'SRTM30-Contour',
 'Dark']
```

[3]:
```
wms.contents['SRTM30-Colored'].boundingBox
```

[3]:
```
(-180.0, -56.0, 180.0, 60.0, 'CRS:84')
```

[4]:
```
wms.contents['SRTM30-Colored'].boundingBoxWGS84
```

[4]:
```
(-180.0, -56.0, 180.0, 60.0)
```

[5]:
```
print(wms['SRTM30-Colored'].crsOptions)
```

```
['EPSG:4326', 'EPSG:25832', 'EPSG:900913', 'EPSG:21781', 'EPSG:4258', 'EPSG:2180', 'EPSG:
↪2100', 'EPSG:2056', 'EPSG:29192', 'EPSG:31466', 'EPSG:4839', 'EPSG:3068', 'EPSG:31463',
↪ 'EPSG:31468', 'EPSG:29193', 'EPSG:32648', 'EPSG:3857', 'EPSG:4647', 'EPSG:3034',
↪'EPSG:31467', 'EPSG:3035', 'EPSG:4686', 'EPSG:4674', 'EPSG:25833', 'EPSG:5243']
```

[6]:
```
print(wms['SRTM30-Colored'].styles)
```

```
{'default': {'title': 'default', 'legend': 'https://ows.terrestris.de/osm/service?
↪styles=&layer=SRTM30-Colored&service=WMS&format=image%2Fpng&sld_version=1.1.0&
↪request=GetLegendGraphic&version=1.1.1', 'legend_width': '155', 'legend_height': '241',
↪ 'legend_format': 'image/png'}}
```

Available methods, their URLs, and available formats:

[7]:
```
[op.name for op in wms.operations]
```

[7]:
```
['GetCapabilities', 'GetMap', 'GetFeatureInfo', 'GetLegendGraphic']
```

[8]:
```
wms.getOperationByName('GetMap').methods
```

[8]:
```
[{'type': 'Get', 'url': 'https://ows.terrestris.de/osm/service?'}]
```

[9]:
```
wms.getOperationByName('GetMap').formatOptions
```

[9]:
```
['image/jpeg', 'image/png']
```

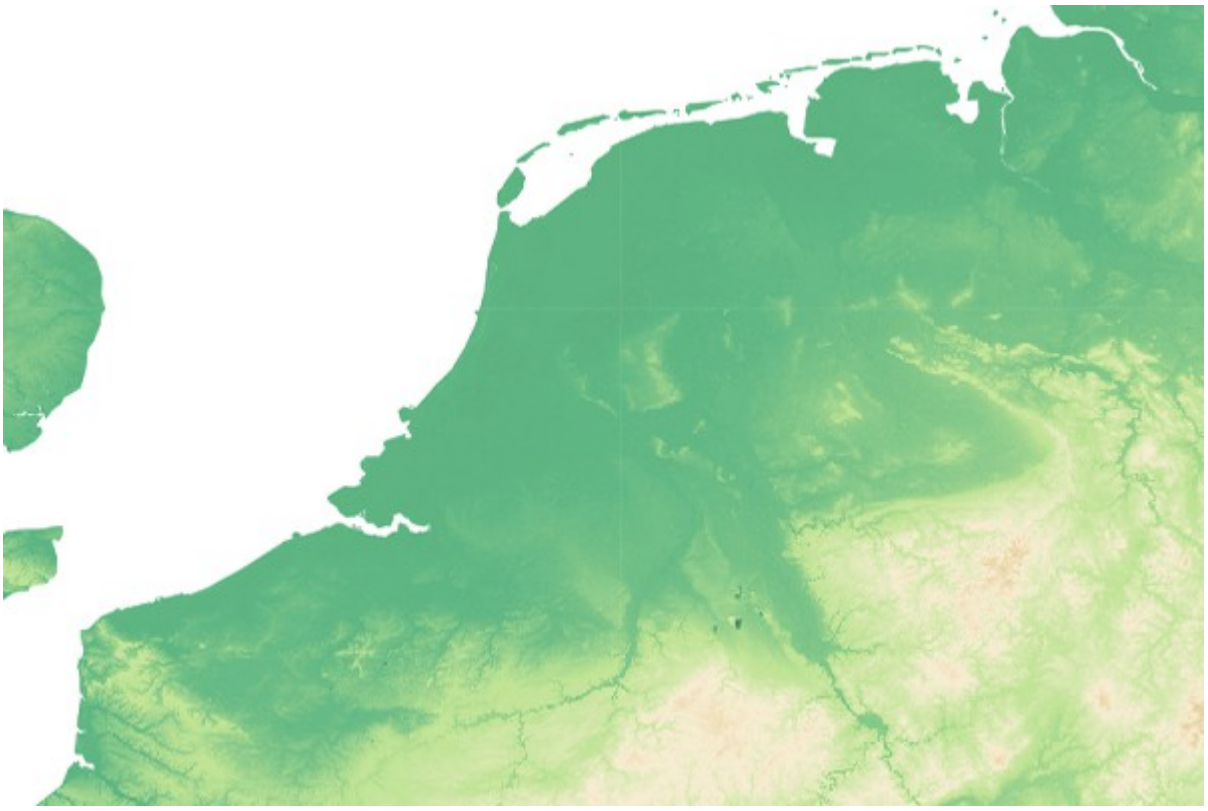
That's everything needed to make a request for imagery:

[10]:
```
img = wms.getmap(
    layers=['SRTM30-Colored'],
    size=[600, 400],
    srs="EPSG:4326",
    bbox=[1.0, 50.0, 10.0, 54.0],
    format="image/jpeg")
```

Result:

[11]:
```
from IPython.display import Image
Image(img.read())
```

[11]:



CHAPTER

SIX

DEVELOPMENT

The OWSLib wiki is located at https://github.com/geopython/OWSLib/wiki

The OWSLib source code is available at https://github.com/geopython/OWSLib

You can find out about software metrics at the OWSLib OpenHub page at https://www.openhub.net/p/OWSLib.

6.1 Testing

```
python3 setup.py test
```

Or . . .

```
# install requirements
pip3 install -r requirements.txt
pip3 install -r requirements-dev.txt # needed for tests only

# run tests
python3 -m pytest

# linting
flake8 owslib/wmts.py
```

CHAPTER

SEVEN

SUPPORT

7.1 Mailing Lists

OWSLib provides users and developers mailing lists. Subscription options and archives are available at https://lists.osgeo.org/mailman/listinfo/owslib-users and https://lists.osgeo.org/mailman/listinfo/owslib-devel.

7.2 Submitting Questions to the Community

To submit questions to a mailing list, first join the list by following the subscription procedure above. Then post questions to the list by sending an email message to either owslib-users@lists.osgeo.org or owslib-devel@lists.osgeo.org.

7.3 Searching the Archives

All Community archives are located in https://lists.osgeo.org/pipermail/owslib-users/ https://lists.osgeo.org/pipermail/owslib-devel/

7.4 Metrics

You can find out about software metrics at the OWSLib OpenHub page.

7.5 Gitter

As well, visit OWSLib on Gitter at `https://app.gitter.im/#/room/#geopython_owslib:gitter.im` for real-time discussion.

CHAPTER

EIGHT

LOGGING

OWSLib logs messages to the 'owslib' named Python logger. You may configure your application to use the log messages as follows:

```
import logging

owslib_logger = logging.getLogger('owslib')

# Add formatting and handlers as needed
owslib_logger.setLevel(logging.DEBUG)
```

CHAPTER

NINE

LICENSE

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CHAPTER

TEN

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