

Connecting Essential Ocean Variables to datasets using the I-ADOPT ontology and smart mappings

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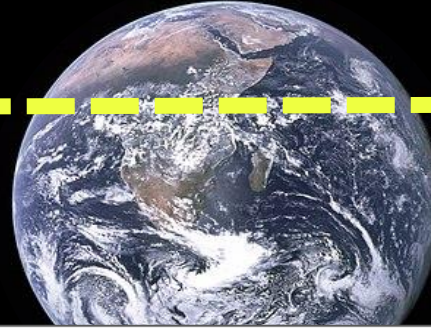
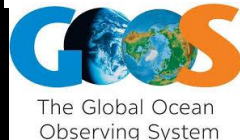
Outline of the presentation

- 1- What are we trying to solve?
- 2- What we already have
- 3- Linked Data Approach
requirements and steps

Fast, reliable, reproducible data flows

GOOS Essential Ocean Variables

Physics	Biochemistry	Biology and Ecosystems
<ul style="list-style-type: none"> Sea state Ocean surface stress Sea ice Sea surface height Sea surface temperature Subsurface temperature Surface currents Subsurface currents Sea surface salinity Subsurface salinity Ocean surface heat flux 	<ul style="list-style-type: none"> Oxygen Nutrients Inorganic carbon Transient tracers Particulate matter Nitrus oxide Stable carbon isotopes Dissolved organic carbon 	<ul style="list-style-type: none"> Phytoplankton biomass and diversity Zooplankton biomass and diversity Fish abundance and distribution Marine turtles, birds, mammals abundance and distribution Hard coral cover and composition Seagrass cover and composition Macroalgal canopy cover and composition Mangrove cover and composition Microbe biomass and diversity (*emerging) Invertebrate abundance and distribution (*emerging)
Cross-disciplinary (including human impact)		
	<ul style="list-style-type: none"> Ocean colour Marine debris (*emerging) 	<ul style="list-style-type: none"> Ocean sound



OBSERVATIONS / MEASUREMENTS
(in situ, remote, modeling)

DATASET
Repositories

Access and
Interoperability

Hindered by
diversity of:

Data servers
Data formats
Vocabularies

Value what we have and build from it

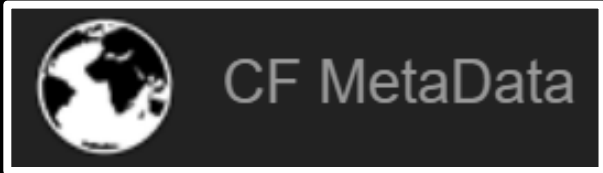
Community agreed standards and best practices

Open source tools

International and cross-discipline collaborations

Atmospheric and Modelling
Community Standards

Oceanographic Community
Standards



CF Standard Names



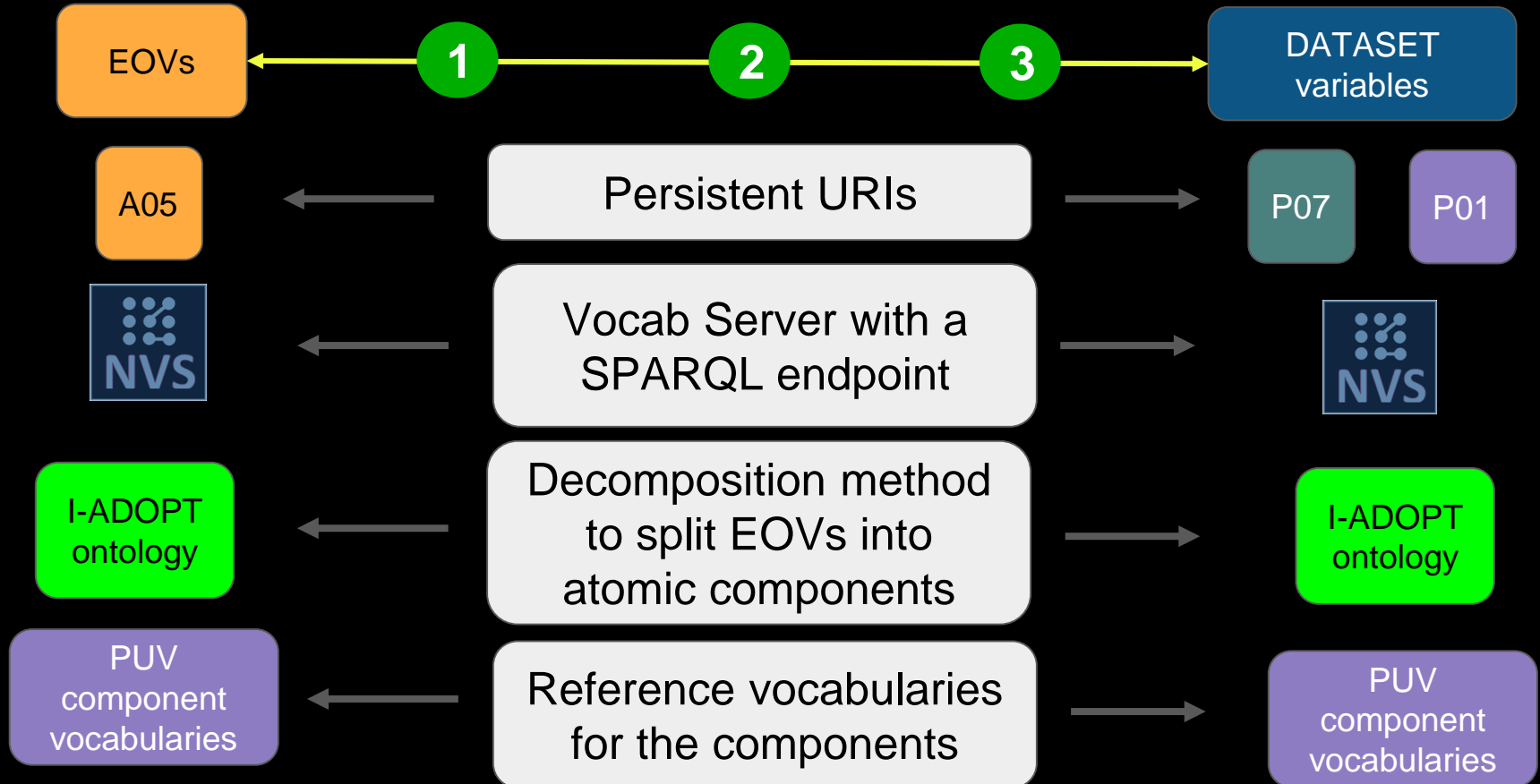
BODC Parameter Usage
Vocabulary (PUV)



The NERC Vocabulary Server (NVS)

Service Status

Linked Data Approach - our requirements



Step 1 - Decompose EOVs



Oxygen	
URI	http://vocabdev.nerc.ac.uk/collection/A05/curr...
Within Vocab	AtlantOS Essential Variables
Alternative Labels	Dissolved O2
Definition	The amount of dissolved oxygen in seawater
Date	2016-06-23T15:58:53
Identifier	SDN:A05::EV_OXY
Note	accepted
Has Current Version	1
version	1
hasConstraint	dissolved plus reactive particulate
hasMatrix	water body
hasObjectOfInterest	oxygen
hasProperty	Concentration

Temperature	
URI	http://vocabdev.nerc.ac.uk/collection/A05/current/EV_SEATEMP/
Within Vocab	AtlantOS Essential Variables
Alternative Labels	Sea temperature
Definition	The temperature of seawater using water column measurements.
Date	2016-06-23T15:58:53
Identifier	SDN:A05::EV_SEATEMP
Note	accepted
Has Current Version	1
version	1
hasObjectOfInterest	water body
hasProperty	Temperature

Nutrients	
URI	http://vocabdev.nerc.ac.uk/collection/A05/current/EV_NUTS/
Within Vocab	AtlantOS Essential Variables
Alternative Labels	Inorganic nutrients
Definition	The amount of dissolved inorganic macro nutrients (NO3, PO4, Si and NO2) in seawater using water column measurements.
Date	2016-06-23T15:58:53
Identifier	SDN:A05::EV_NUTS
Note	accepted
Has Current Version	1
version	1
hasMatrix	water body
hasObjectOfInterest	nitrite nitrate+nitrite silicate phosphate nitrate
hasProperty	Concentration

Step 2 - Do the same with P07 and P01

EOVs

2

DATASET
variables

Concept

moles_of_oxygen_per_unit_mass_in_sea_water

URI	http://vocabdev.nerc.ac.uk/collection/P07/current/CFSN0517/
Within Vocab	Climate and Forecast Standard Names
Alternative Labels	
Definition	moles_of_X_per_unit_mass_inY is also called 'molality' of X in Y, where X is a material const
Date	2006-09-26T18:12:43
Identifier	SDN:P07::CFSN0517
Note	accepted
Has Current Version	1
version	1
inScheme	http://vocabdev.nerc.ac.uk/scheme/NETOC_PARAM/current/ http://vocabdev.nerc.ac.uk/scheme/NETMAR_OCEAN/current/

hasConstraint	dissolved plus reactive particulate
hasMatrix	water body
hasObjectOfInterest	oxygen
hasProperty	Concentration

Concept

Concentration of oxygen {O2 CAS 7782-44-7} per unit mass of the water body [dissolved plus reactive particulate phase]

URI	http://vocabdev.nerc.ac.uk/collection/P01/current/DOXMZZXX/
Within Vocab	BODC Parameter Usage Vocabulary
Alternative Labels	DissO2_Mass, DissO2_Mass
Definition	Concentration of dissolved oxygen per unit mass of the water column. Oxygen may be expressed in terms of mass, volume or quantity of substance.
Date	2015-08-26T15:08:03
Identifier	SDN:P01::DOXMZZXX
Note	accepted
Has Current Version	3
Version	1 2 3
version	3
inScheme	http://vocabdev.nerc.ac.uk/scheme/EMODNET_CHEM/current/ http://vocabdev.nerc.ac.uk/scheme/NETOC_PARAM/current/ http://vocabdev.nerc.ac.uk/scheme/NETMAR_OCEAN/current/

hasMatrix	water body
hasObjectOfInterest	oxygen
hasProperty	Concentration

Step 3 - Build SPARQL query

EOVs

3

DATASET variables

```
11 optional{<http://vocabdev.nerc.ac.uk/collection/A05/current/EV_OXY/> <https://w3id.org/iadopt/ont#hasMatrix>
12 ?mat .
13
14 optional{<http://vocabdev.nerc.ac.uk/collection/A05/current/EV_OXY/> <https://w3id.org/iadopt/ont#hasConstraint> ?
cons .}
15
16 <http://vocabdev.nerc.ac.uk/collection/P07/current/> skos:member ?dt .
17 ?dt owl:deprecated ?depr . FILTER((str(?depr)!="false"))
18 ?dt <https://w3id.org/iadopt/ont#hasObjectOfInterest> ?ooi;
19 <https://w3id.org/iadopt/ont#hasProperty> ?prop.
20 optional{?dt <https://w3id.org/iadopt/ont#hasMatrix>
21 ?mat .}
22
23 optional{?dt <https://w3id.org/iadopt/ont#hasConstraint> ?cons .}
```

dt	prefLabel
<http://vocabdev.nerc.ac.uk/collection/P07/current/CFSN0529/>	"mass_concentration_of_oxygen_in_sea_water"@en
<http://vocabdev.nerc.ac.uk/collection/P07/current/CFSN0517/>	"moles_of_oxygen_per_unit_mass_in_sea_water"@en
<http://vocabdev.nerc.ac.uk/collection/P07/current/CF14N29/>	"mole_concentration_of_dissolved_molecular_oxygen_in_sea_water"@en

Showing 1 to 3 of 3 entries

Used as input to a broker to discover datasets

What is novel about our approach?

Static mappings

- Time-consuming
- High maintenance
- Logic can be opaque

Mappings based on reasoning

- Dynamic
- Logic is explicit
- Consistent

“Smart mappings”

See [Kokkinaki et al poster on the ENVRI-FAIR EOVS Demonstrator](#)

Nutrients

URI	http://vocabdev.nerc.ac.uk/collection/A05/current/EV_NUTS/
Within Vocab	AtlantOS Essential Variables
Alternative Labels	Inorganic nutrients
Definition	The amount of dissolved inorganic macro nutrients (NO ₃ , PO ₄ , Si and NO ₂) in seawater using water column measurements.
Date	2016-06-23T15:58:53
Identifier	SDN:A05::EV_NUTS
Note	accepted
Has Current Version	1
version	1
hasMatrix	water body
hasObjectOfInterest	nitrite nitrate+nitrite silicate phosphate nitrate
hasProperty	Concentration
Narrower	P07:CFSN0516 moles_of_nitrite_per_unit_mass_in_sea_water P07:CFSN0519 moles_of_silicate_per_unit_mass_in_sea_water P07:CFSN0514 moles_of_nitrate_and_nitrite_per_unit_mass_in_sea_water P07:CFSN0518 moles_of_phosphate_per_unit_mass_in_sea_water P07:CFSN0515 moles_of_nitrate_per_unit_mass_in_sea_water P01:NTRIKGD5 Concentration of nitrite (NO ₂ - CAS 14797-65-0) per unit mass of the water body [dissolved plus reactive particulate <0.2um phase] by filtration and colorimetric autoanalysis P01:NTRIKGD1 Concentration of nitrite (NO ₂ - CAS 14797-65-0) per unit mass of the water body [dissolved plus reactive particulate