RESEARCH DATA ALLIANCE
I-ADOPT WG

How to make climate research interoperable with I-ADOPT from field observation to data publication

Knowledge in Climate Research - Ontology Summit 2022

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The RDA I-ADOPT Working Group (2019-2021)

"InteroperAble Descriptions of Observable Property Terminologies"

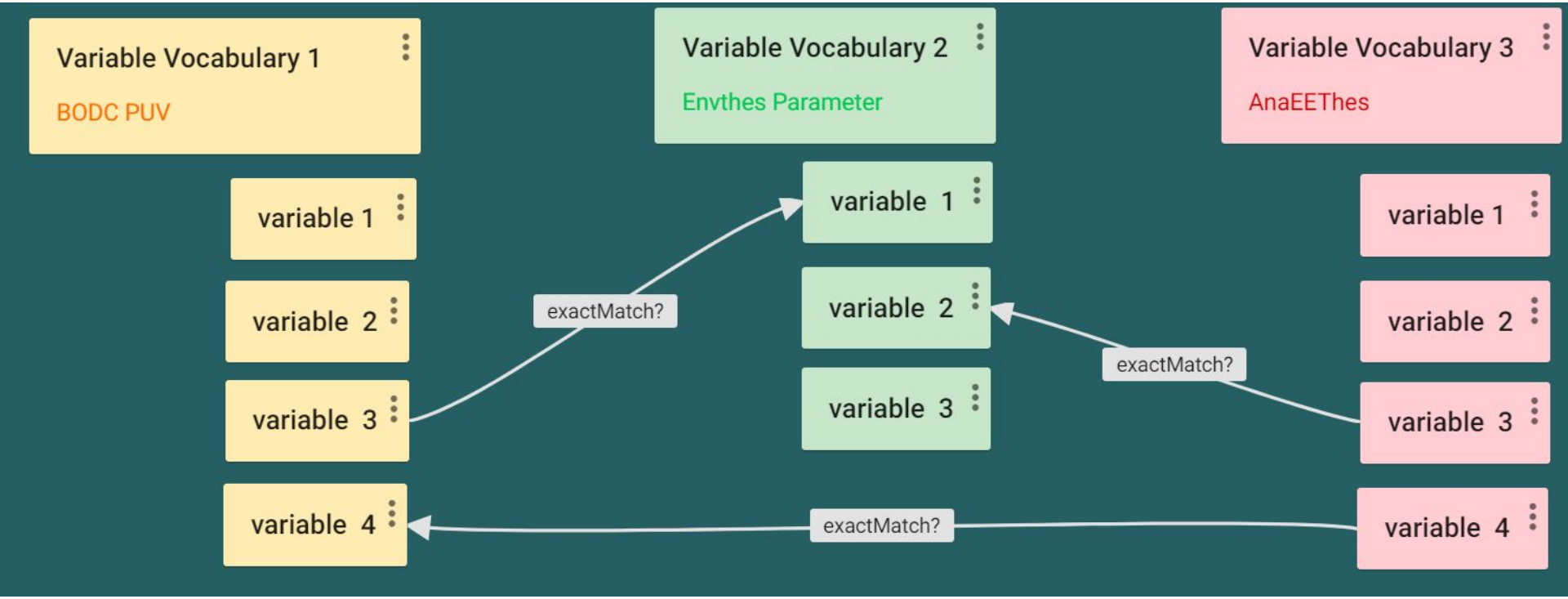
Motivation:

- Addressing the "I" of FAIR
- Enabling interoperability between existing terminologies
- Promoting the use of FAIR terminologies to annotate research data with well identified, unambiguous and machine-readable vocabularies

Led by a core group made of 4 co-chairs (**Barbara Magagna**, **Gwenaëlle Moncoiffé**, **Anusuriya Devaraju** and **Maria Stoica**) plus **Sirko Schindler** and **Alison Pamment,** with regular contributions from many others.

Addressed Challenge:

Proliferation of unmapped variable description terminologies



Examples: wind speed (vs speed of wind), soil colour (vs colour of soils). concentration of atomic nitrogen in earth's atmosphere (vs. nitrogen concentration)

I-ADOPT Framework – Focus and Scope

The ***variable***, aka *observable property, parameter* or *quantity kind*

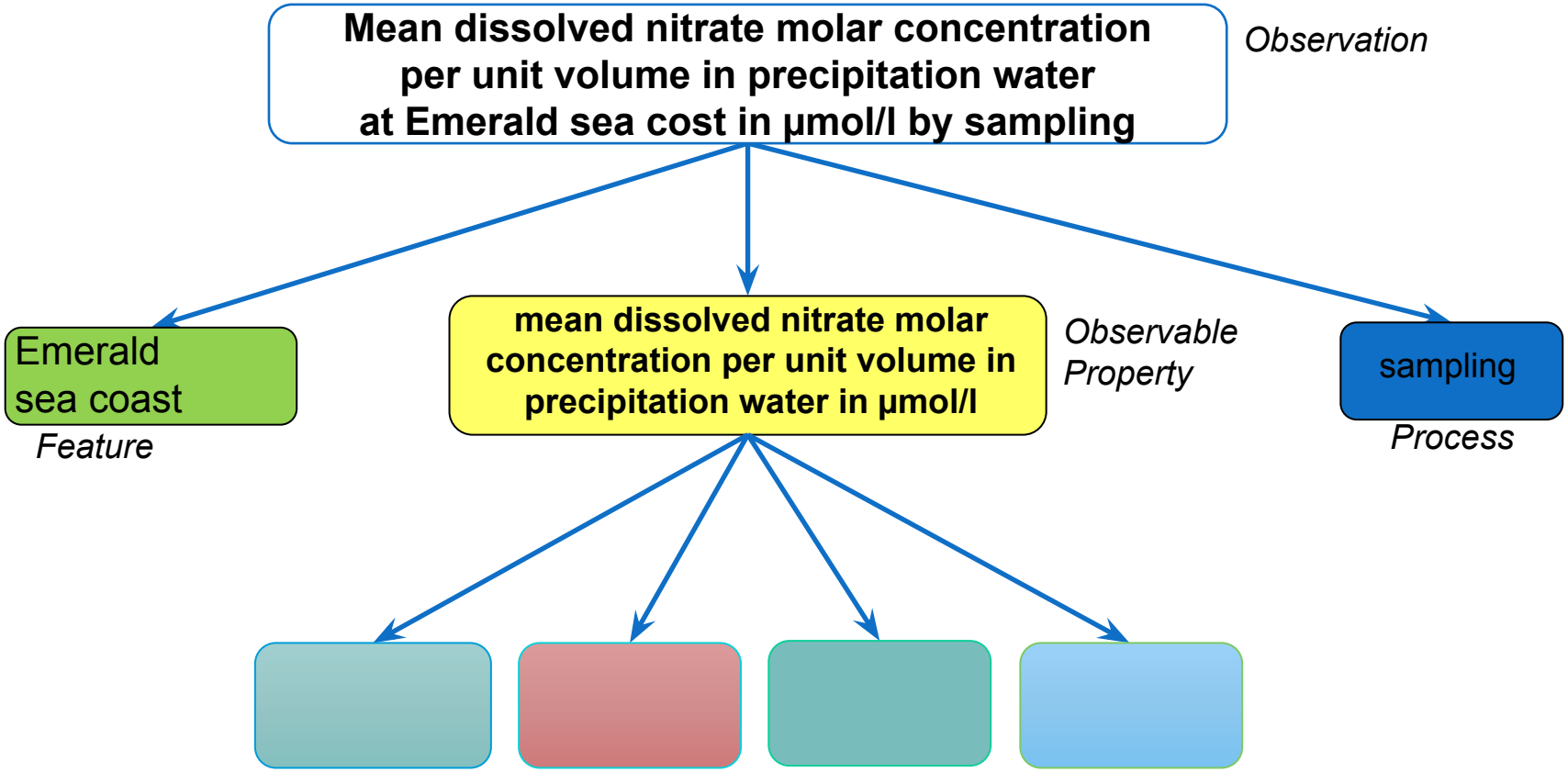
The concept "Variable" in I-ADOPT represents **WHAT** has been observed independently of WHERE, HOW and WHEN the data acquisition took place.

Mainly inspired by:
Complex Property Model – CPM (Leadbetter&Vodden, 2016) and
Scientific Variable Ontology – SVO (Stoica&Peckham, 2019):

A variable can be represented by a combination of descriptive components giving meaning to the value derived from a data acquisition event be it an observation, a measurement, a simulation or a calculation.

I-ADOPT only supports the **classification of variable types**.

Conceptualizations of variable descriptions, inspired from CPM



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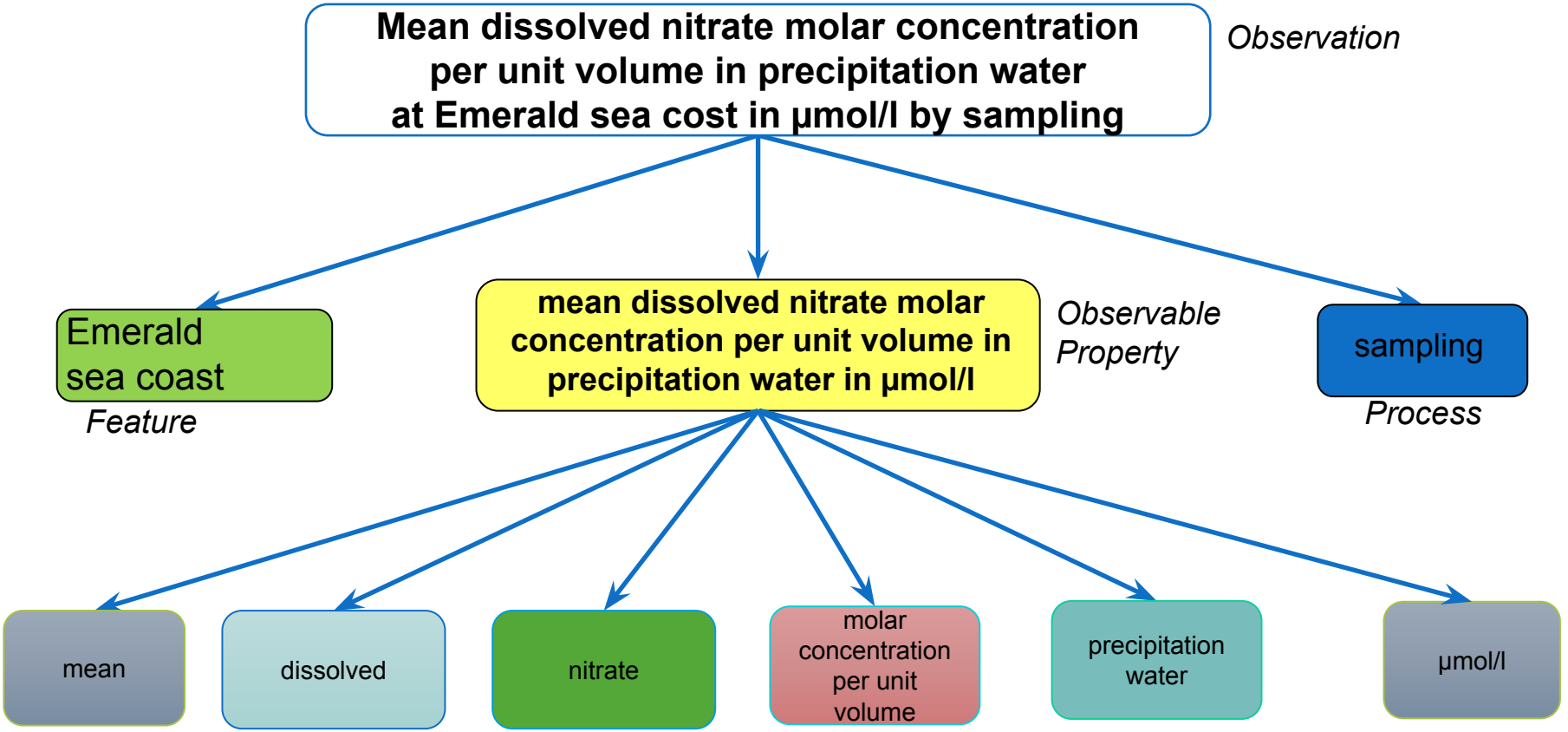

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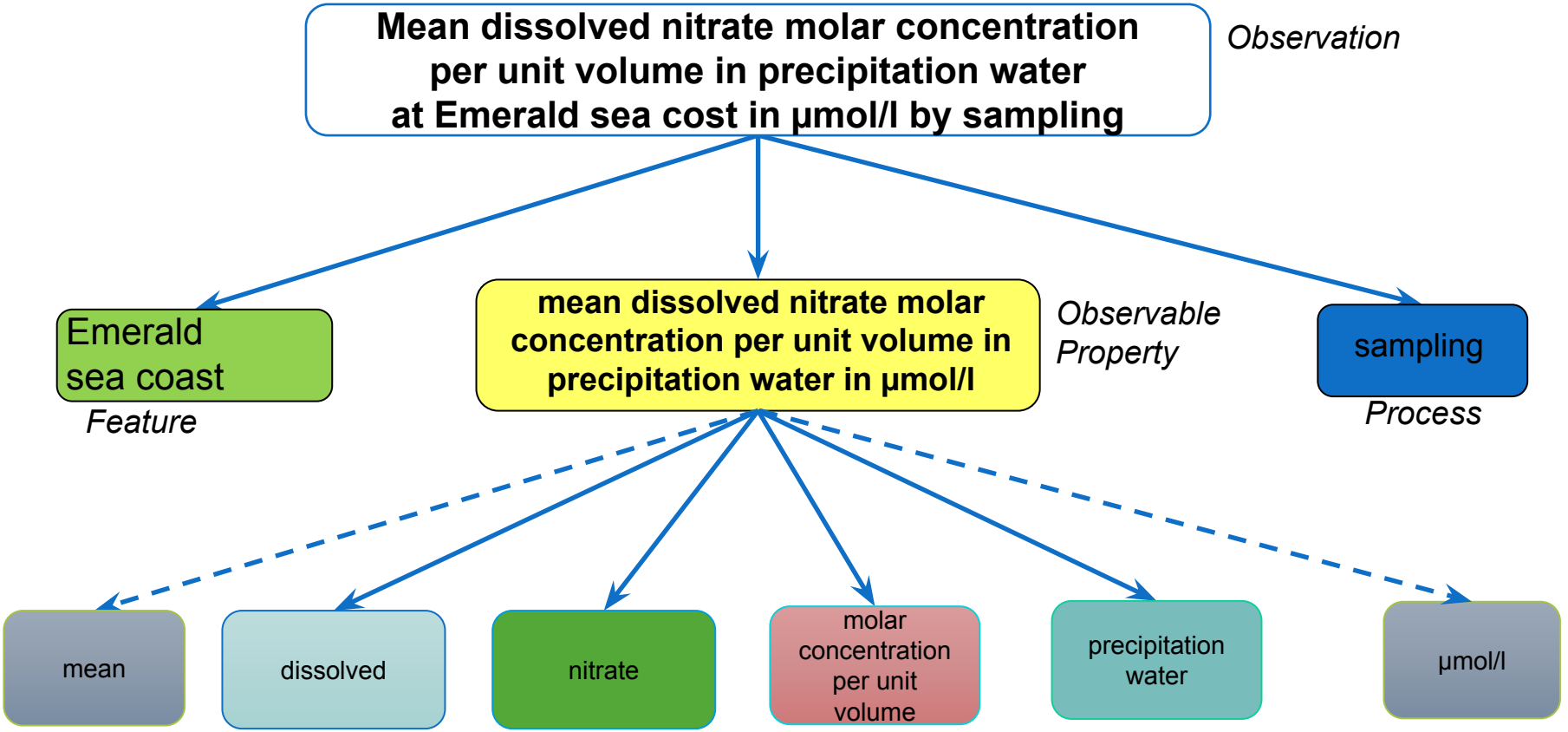

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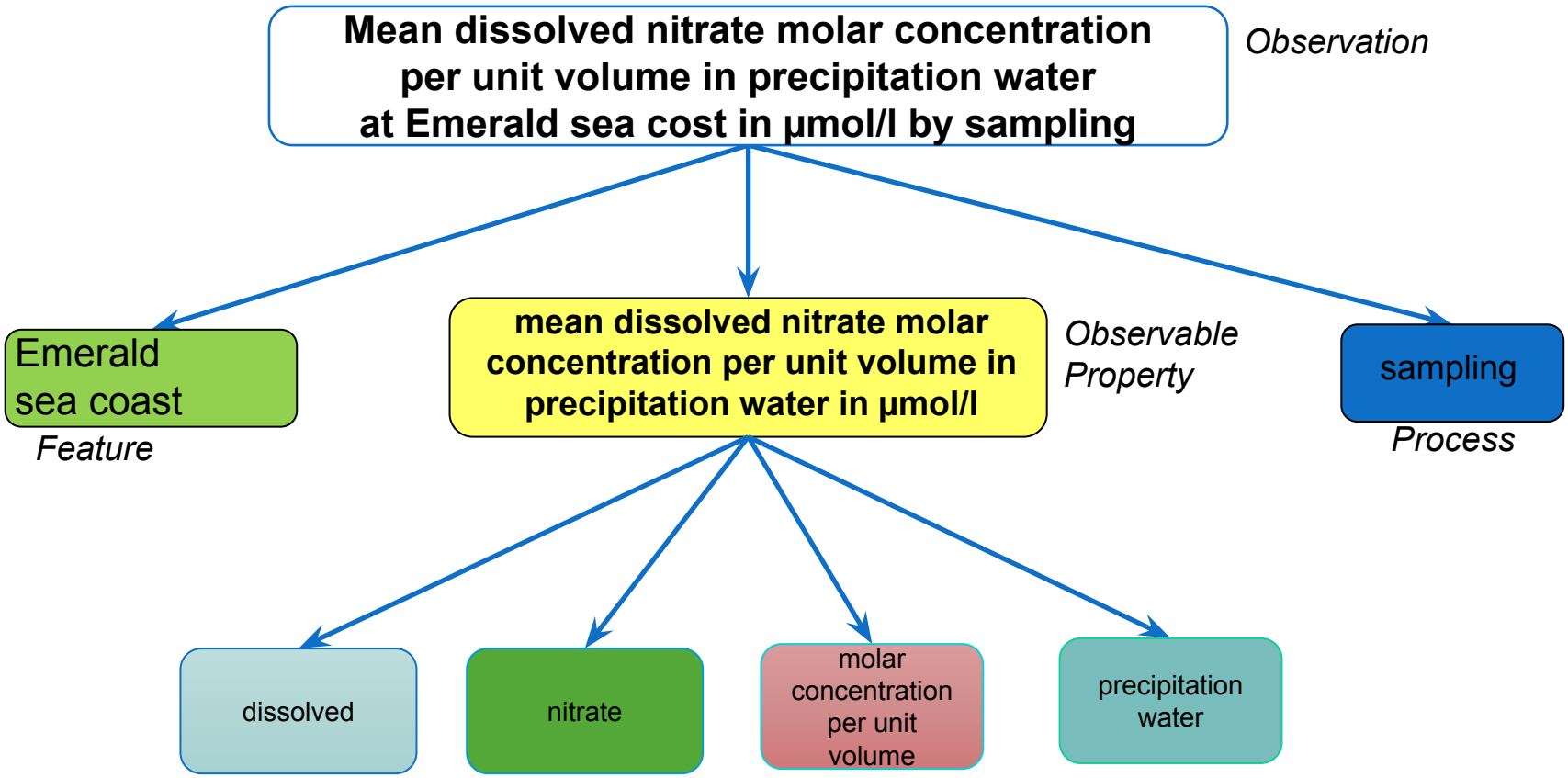

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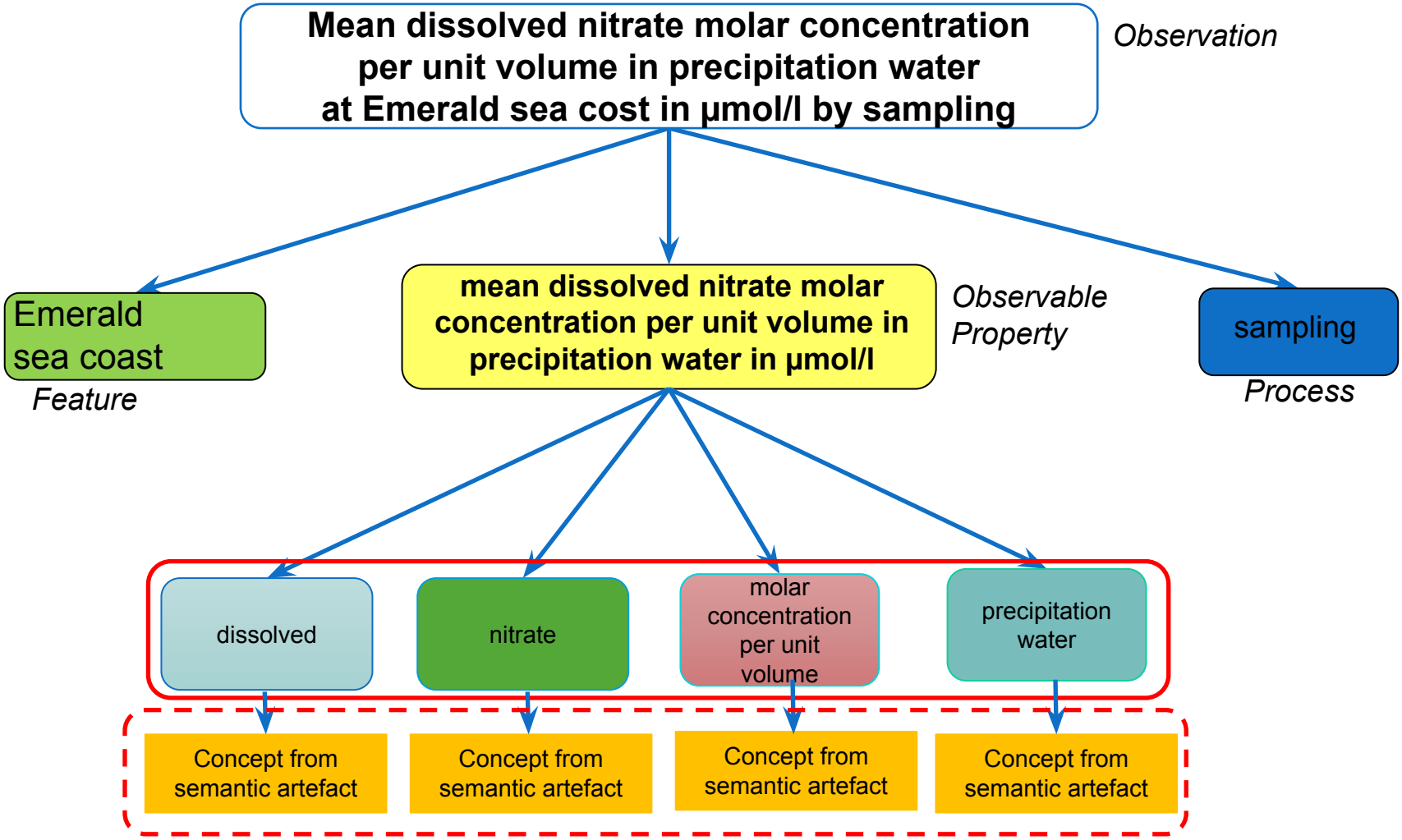
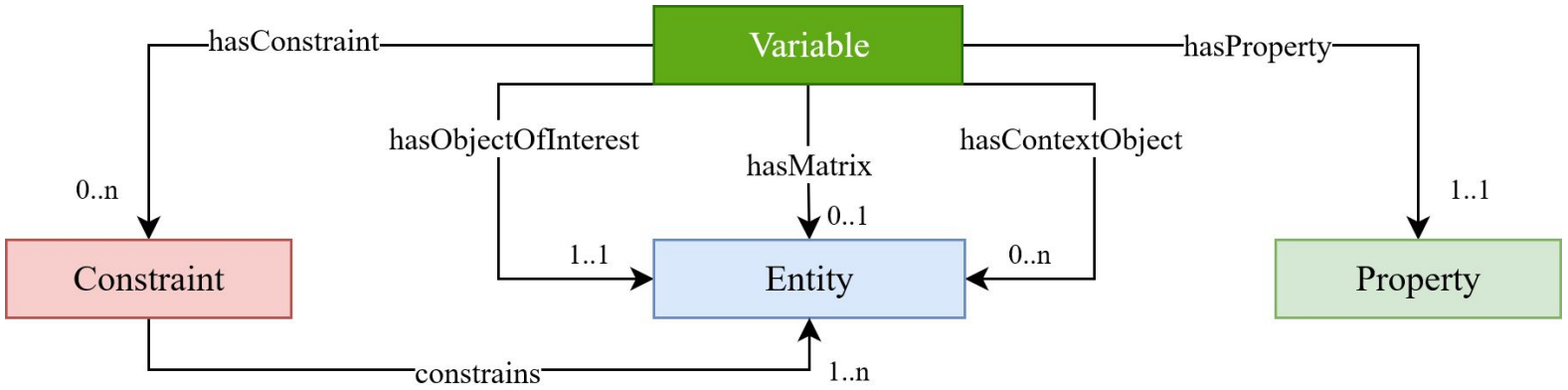


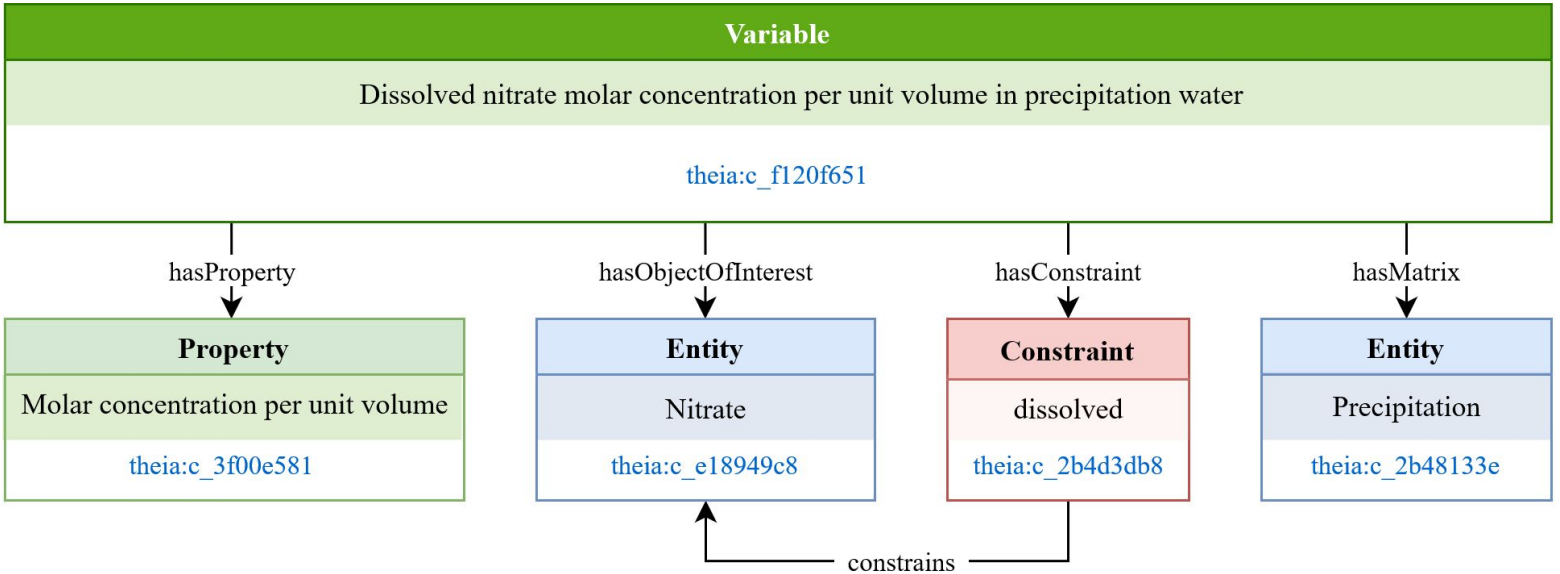
The I-ADOPT Framework

The I-ADOPT Ontology

https://w3id.org/iadopt



I-ADOPT Variable Descriptions - a Quantitative Example



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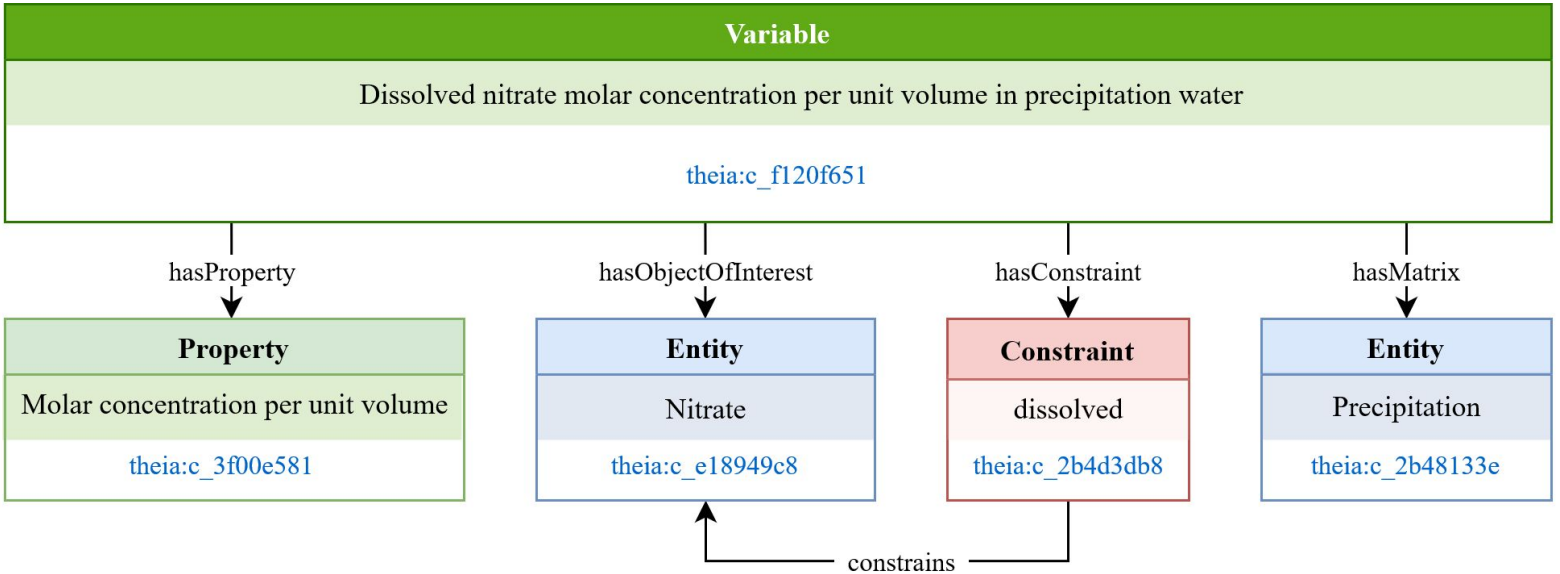


... > Atmosphere variable > Precipitation variable > Precipitation water chemistry > Precipitation water major ions > **Dissolved nitrate molar concentration per unit volume in precipitation water**

... > Atmosphere variable > Precipitation variable > Precipitation water chemistry > Precipitation water nitrogenus parameters > **Dissolved nitrate molar concentration per unit volume in precipitation water**

PREFERRED TERM	**Dissolved nitrate molar concentration per unit volume in precipitation water**
TYPE	Variable
BROADER CONCEPT	Precipitation water major ions Precipitation water nitrogenus parameters
HASCONSTRAINT	Dissolved
HASMATRIX	Precipitation
HASOBJECTOFINTEREST	Nitrate
HASPROPERTY	Molar concentration per unit volume
SIMPLIFIED LABEL	Nitrate concentration
URI	https://w3id.org/ozcar-theia/c_f120f651
DOWNLOAD THIS CONCEPT:	RDF/XML TURTLE JSON-LD Created 2/7/22, last modified 3/22/22

https://w3id.org/ozcar-theia/c_f120f651

I-ADOPT Framework – Benefits

Support interoperability between existing terminologies

- Enabling **semantically precise and FAIR descriptions of variables**
- **Decomposing descriptions** into atomic components and **link** those to **existing vocabularies** making these descriptions of observed variables **machine-actionable**
- **Providing abstract reusable semantic descriptions** for concrete observations

I-ADOPT Framework – A Semantic Broker

- Enabling **mappings** between variable descriptions **across terminologies**
- Requires **no change to existing structures**
- Adding rich (**human-readable and machine-actionable**) descriptions with **qualified references**
- Boosts **Findability** and **Reusability** of data too

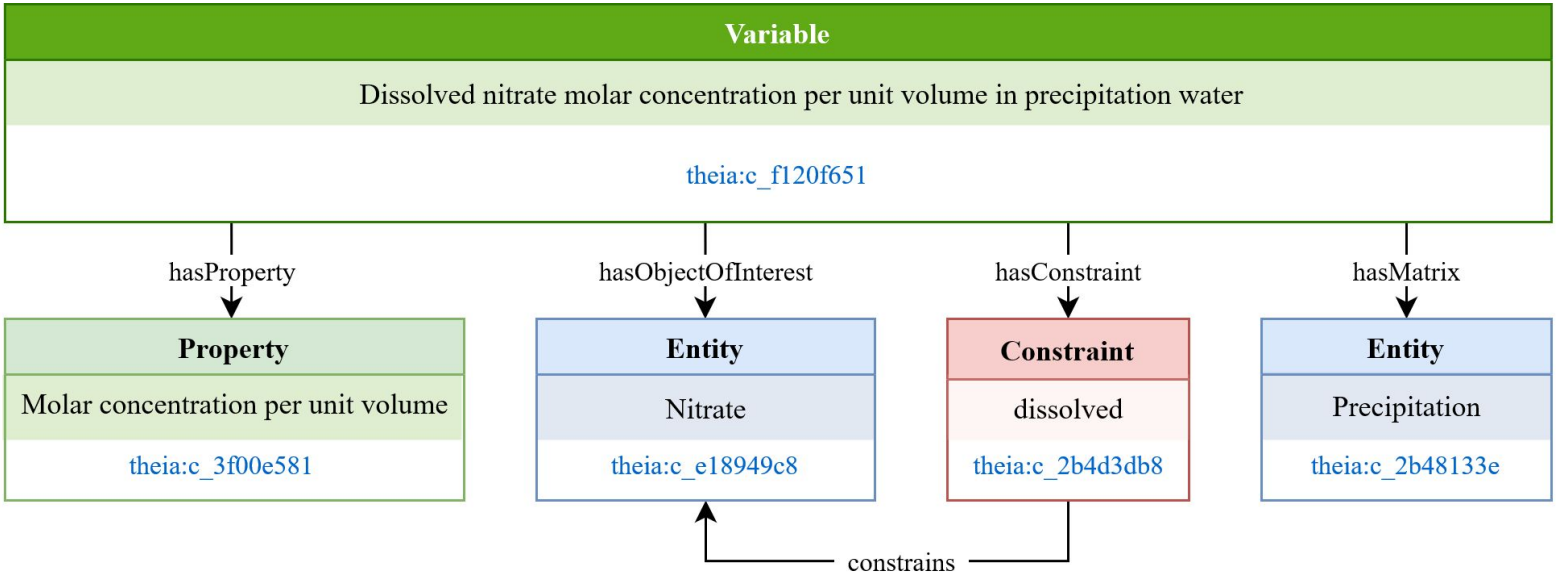
Variable Design Patterns (work in progress)

- **Implementation guidelines** for modelling I-ADOPT variables.
  - Templates
  - Inspiration for different modelling solutions

- **Domain-independent** and **abstract** templates
  - Need to be instantiated for I-ADOPT variables

- Do **not** include **Constraints**

Variable Design Patterns (work in progress)



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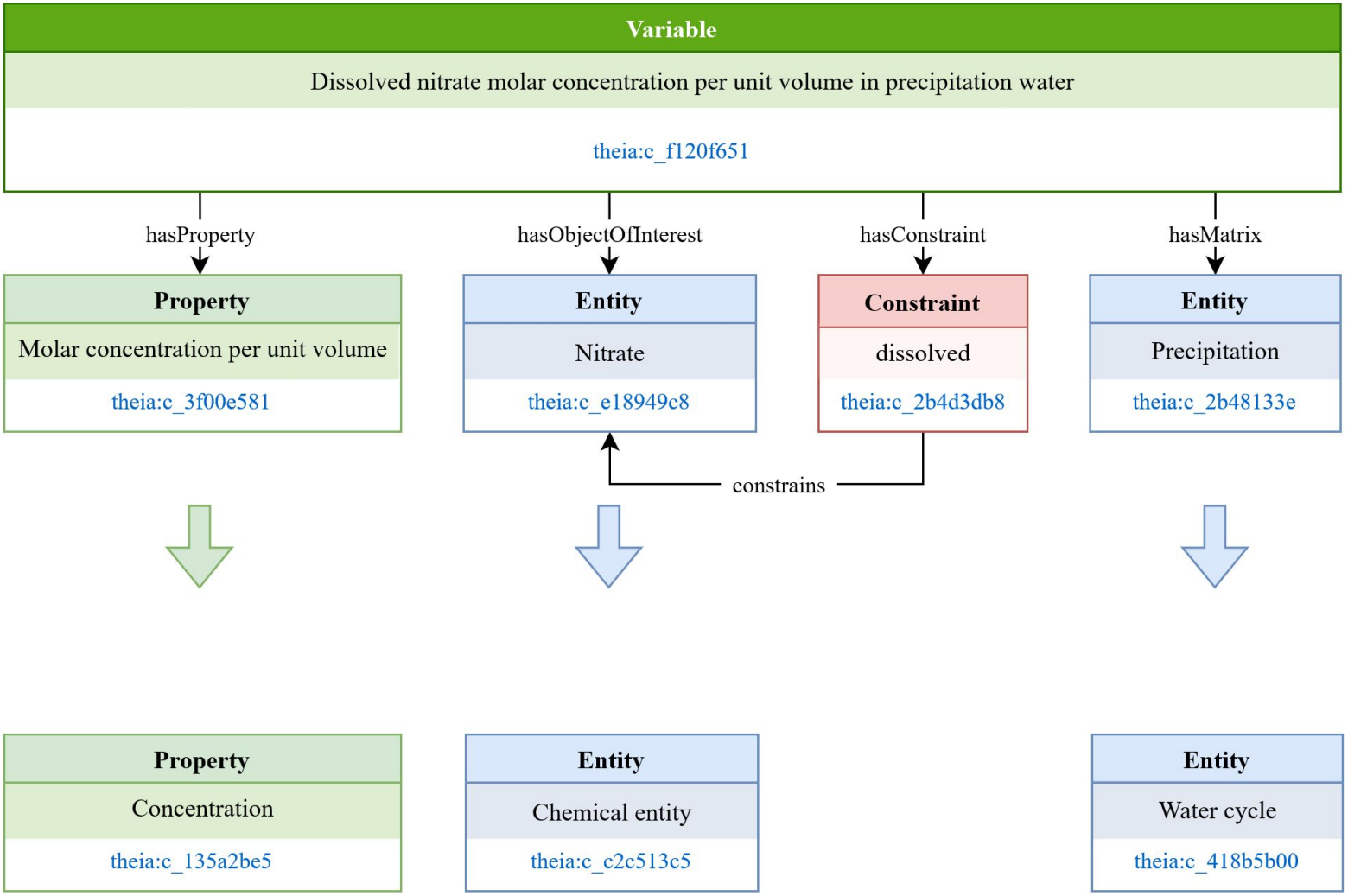

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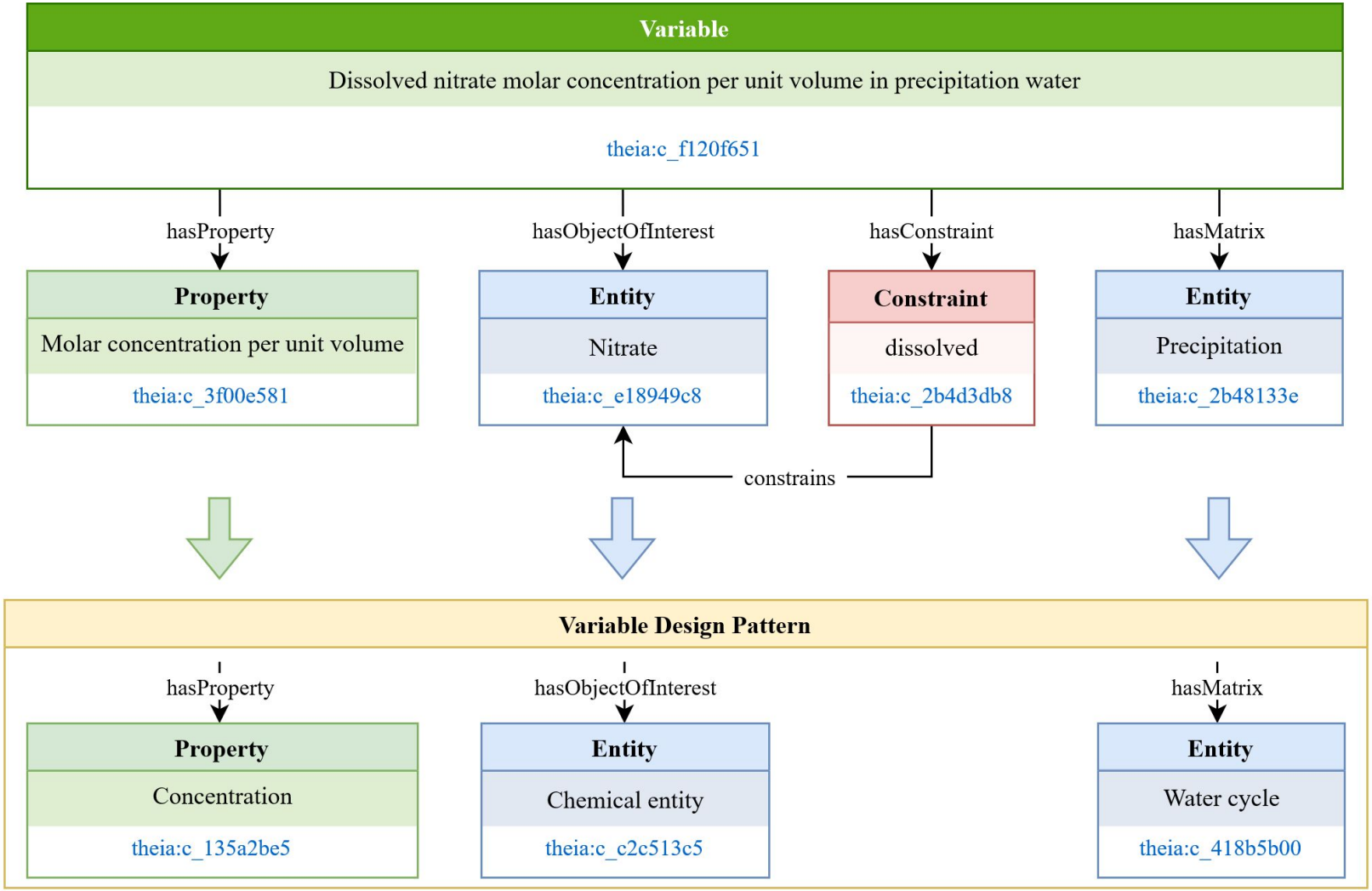

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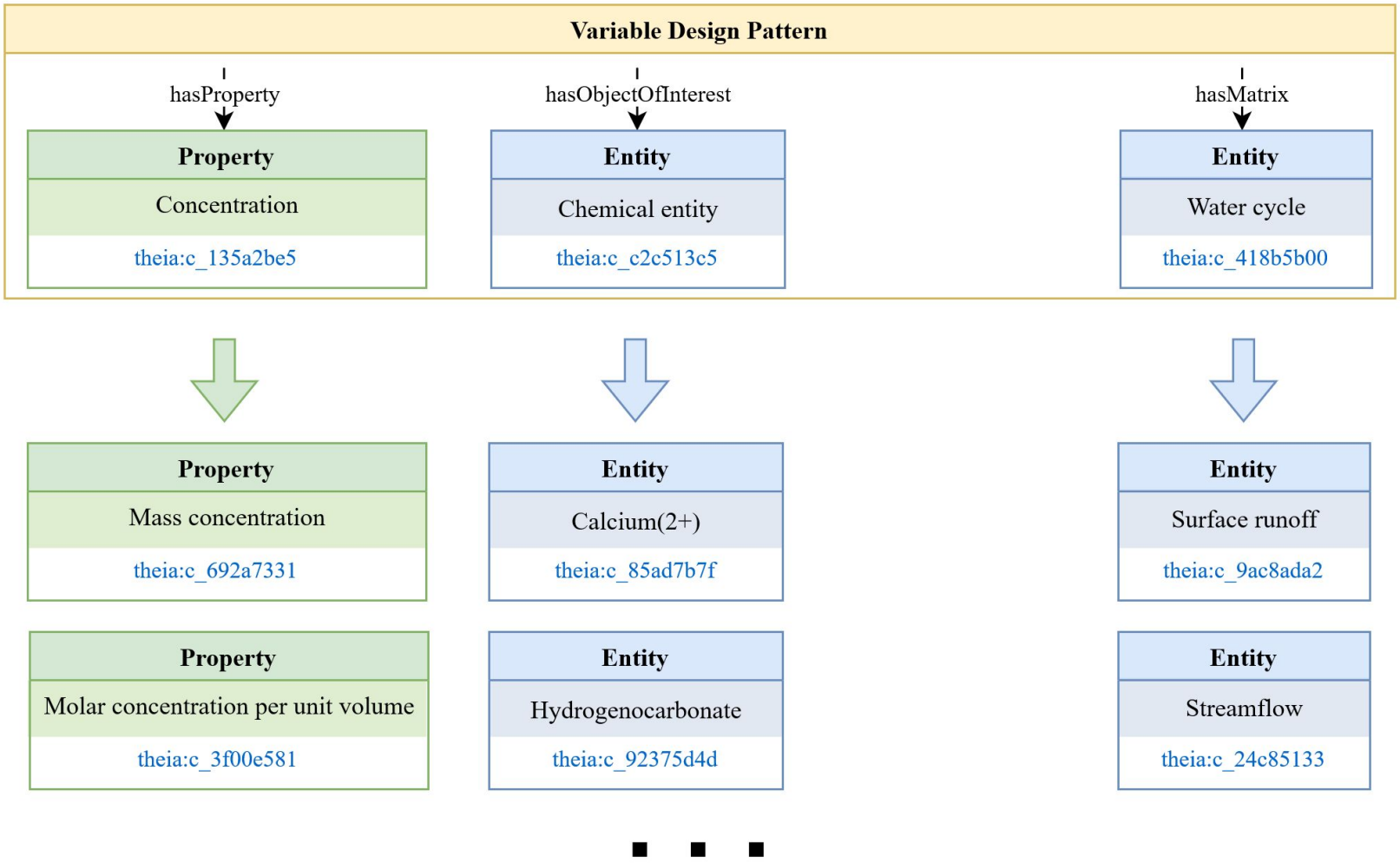


I-ADOPT Outputs

I-ADOPT recommendation report

- **The Interoperability Framework**
  (based on the I-ADOPT ontology)

- **Catalog of terminologies** for reuse in I-ADOPT variables on GitHub; including a unit-to-property lookup

- **Supplementary material** on GitHub with
  - Alignments
  - Variable Design Patterns
  - Existing Implementations

- **Step-by-step Guide** for minting new variables

Outlook

Diverse, specialised, precise terminologies are needed but disparity hinders interoperability.
—
Need to connect them systematically!

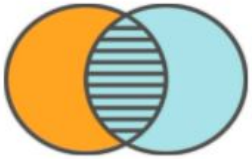
I-ADOPT Interoperability Framework

Develop semantic tools and services including:
Converters - semantic brokers
Connectors - semantic bridges
Dynamic mapping tools

ENABLE USERS TO:


Label / Annotate / Identify


Discover


Align/compare/ harmonise


Aggregate

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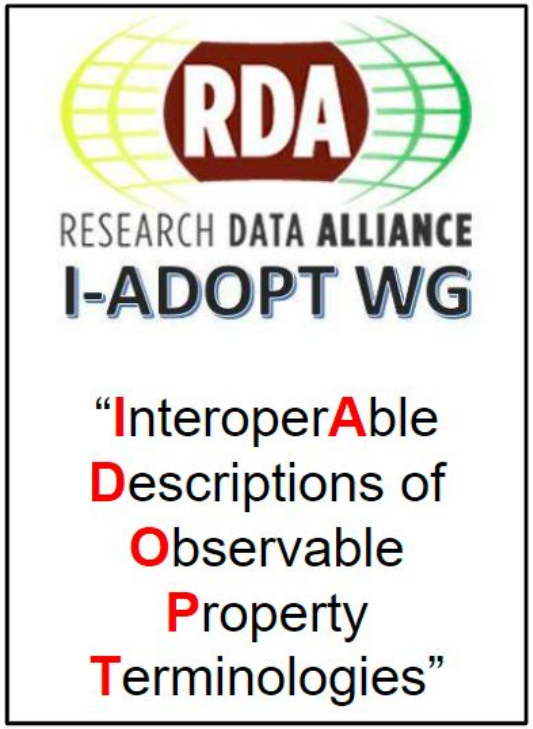

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- https://github.com/i-adopt
- https://www.rd-alliance.org/groups/interoperable-descriptions-observable-property-terminology-wg-i-adopt-wg