

# Terminologies in Earth System Science - State of the Art and Existing Applications

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BluePrints for the Integration of Terminology  
Services in Earth System Sciences





# Motivation

## Natural language is often vague

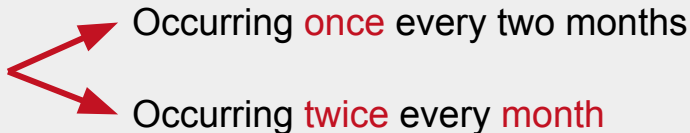
- Synonyms: same is meant but different words

### Temperature, Air Temperature, 2 m Temperature

“C”, “°C”, “degC”, “Celsius”, “Degree Celsius”, “Grad Celsius”, “Deg C”, “Deg\_C”

- Homographs: same word but different meanings

Bimonthly





# Standardise with Terminologies

## Terminology

- ☐ lat. "terminus"
- ☐ no technical specifications

## Examples

Dictionaries, Lexica

- a sample of "terms" and their meaning within a certain area
- term = word, expression, composita, abbreviation
- as Terminology Science a branch of Linguistics (the study of the origin and meaning of a term)

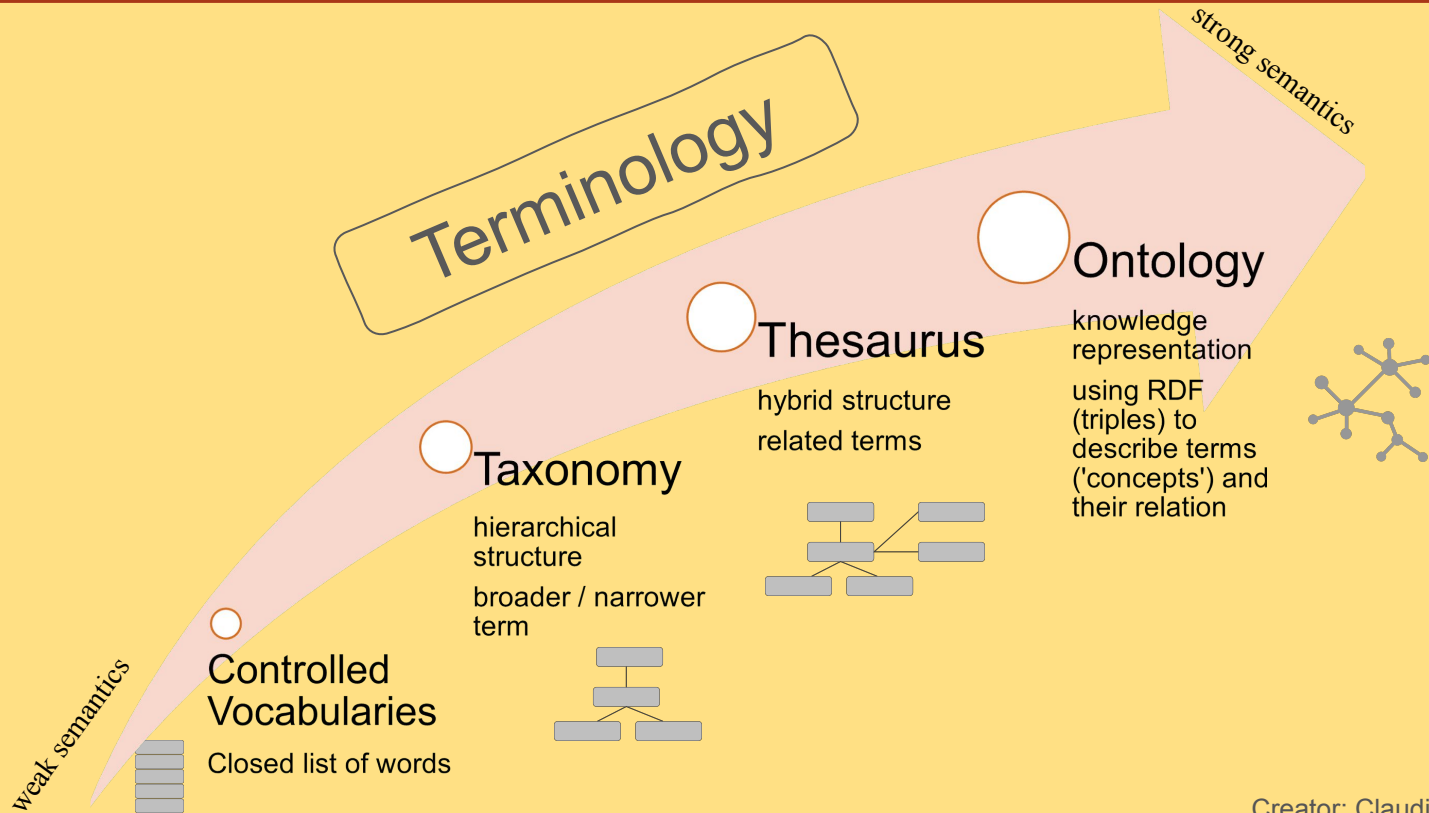


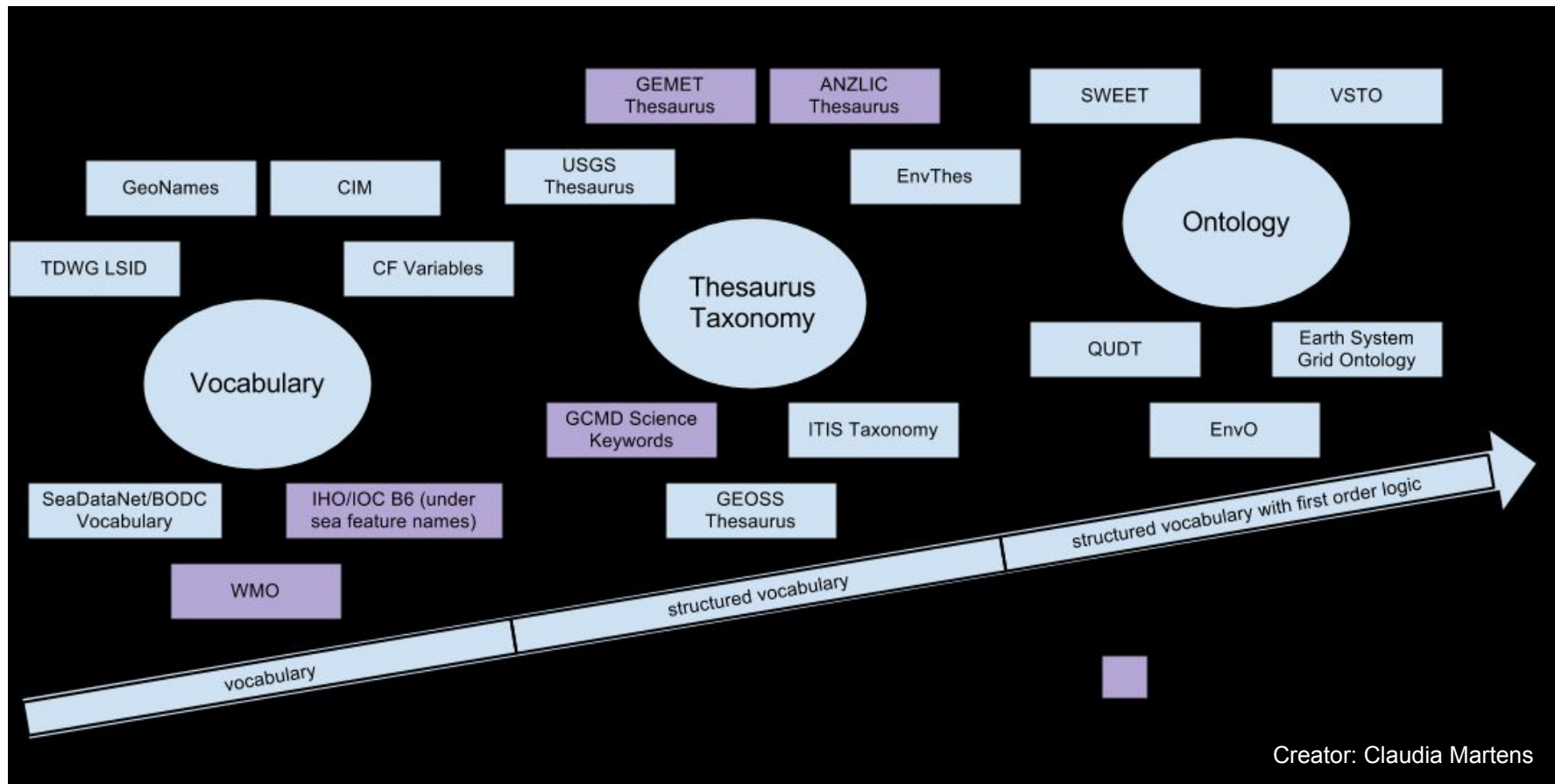
## Term examples

Term	Variation	Class/individual of a terminology
Degree Celsius	<code>"C"</code> , <code>"°C"</code> , <code>"degC"</code> , <code>"Celsius"</code> , <code>"Grad Celsius"</code> , <code>"Deg C"</code> , <code>"Deg_C"</code>	<a href="https://qudt.org/vocab/unit/DEG_C">https://qudt.org/vocab/unit/DEG_C</a> or: <a href="http://purl.obolibrary.org/obo/NCIT_C42559">http://purl.obolibrary.org/obo/NCIT_C42559</a>
Bimonthly	Occurring <b>once</b> every two months	<a href="https://w3id.org/idsa/code/BIMONTHLY">https://w3id.org/idsa/code/BIMONTHLY</a>



# Terminology







# Terminologies in Earth System Sciences (ESS)

**FAIRness of ESS data** is often limited due to non-standardised metadata

→ standardisation with terminologies needed

**Search in data repositories** not as friendly as it could be

→ improve data search with metadata from terminologies

**Terminologies are hard to find and use**

→ improve terminology search with a Terminology Service



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# The BITS Project (July 2023 - June 2026)

*Blueprints for the Integration of Terminology Services in Earth System Sciences*

Develop a Terminology Service for Earth Scientists (TS ESS)

- with two ESS repositories of our partners DKRZ and SGN
- blueprints for the integration of the service in other ESS repositories
- involve the ESS community to
  - identify terminologies relevant to ESS
  - finding and closing gaps in terminologies
  - development of supporting tools

More information at <https://projects.tib.eu/bits/home>

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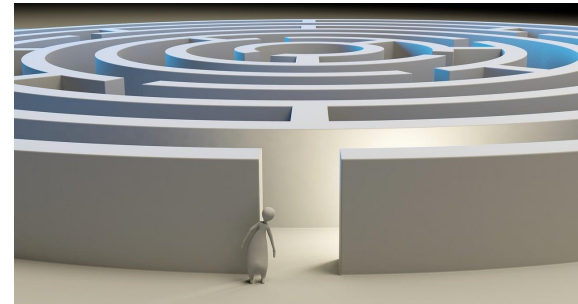


# Terminology Service: Definition

Web based platform that supports uptake and standardisation of terminologies

Used by **scientists, knowledge workers** and **RDM tools** as

- **Entry Point** to **prepare research data** for effective **reuse**
  - **Tag** data sets with **keywords** from terminologies
  - **Trace changes** of terminologies
  - **Search** query reformulation, term suggestion, ...
- **Hub** that fosters **awareness** and **alignment**
  - Bundles terminologies of a domain
  - Provides meta data and statistics





## Selected examples for ESS terminology services

Service	Link	Comment
BARTOC	<a href="https://bartoc.org/">https://bartoc.org/</a>	Largest repository for ontologies, no quality control!
BioPortal	<a href="https://bioportal.bioontology.org/">https://bioportal.bioontology.org/</a>	Repository of biomedical ontologies
EarthPortal	<a href="https://earthportal.eu/ontologies">https://earthportal.eu/ontologies</a>	Selected ontologies for ESS
ESIP COR	<a href="http://cor.esipfed.org/ont#/">http://cor.esipfed.org/ont#/</a>	Repository of the Earth Science Information Partners
NERC Vocabulary Server (NVS)	<a href="https://vocab.nerc.ac.uk/">https://vocab.nerc.ac.uk/</a>	Vocabularies for oceanographic and associated domains



# TIB Terminology Service

TIB TS Central: <https://terminology.tib.eu/ts>

TIB Central TS

Domain specific TS's

TIB Terminology Service



NFDi4ing



... further initiatives

**Base system:**

EBI - Ontology Lookup Service  
Apache 2.0 Licence

EMBL-EBI





# TIB Terminology Service

TIB TS Central: <https://terminology.tib.eu/ts>

- First version released July '21
- Central service instance holds all terminologies
- Statistics (8 May 24)
  - 13 domain specific collections
  - > 200 Terminologies
  - > 920.000 terms
  - > 29.000 properties





# TIB Terminology Service

TIB TS Central: <https://terminology.tib.eu/ts>



## Functional service offer

- Freetext search (for- and within ontologies)
- Browsing and filtering
- Visualisation
- Issue tracker
- Machine to machine communication (REST API)
- Collection Management





# Search

## in all terminologies

<https://terminology.tib.eu/ts/search?q=temperature&page=1>

TIB

TERMINOLOGY SERVICE

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[ONTOLOGIES](#)
[HELP](#)
[API](#)
[ABOUT](#)

☐ Exact match
 ☐ Obsolete terms
 ☐ Advanced search

Filter Results

[Clear All Filters](#)

Type

☐ class 2382
 ☐ individual 336
 ☐ property 61

Ontologies

☐ SNOMEDCT 446
 ☐ NCIT 343
 ☐ BRICK 273
 ☐ SWEET 120
 ☐ CHMO 117

+ Show More

Collections

☐ DataPLANT
 ☐ ESS
 ☐ NFDI4CHEM
 ☐ Educational Resources

2799 results found for "temperature"

Result Per Page 10

[class] Temperature NCIT\_C25206

http://purl.obolibrary.org/obo/NCIT\_C25206

A measure of the average kinetic energy of a system of particles. Temperature may be quantified, in the context of thermodynamics, as the potential of one system to transfer thermal energy to another system until both systems reach a state of thermal equilibrium.

Ontology: NCIT

[property] temperature temperature

http://www.w3id.org/ecseel-dr-OOSMP#temperature

Ontology: dr

[class] Temperature Temperature

https://saref.etsi.org/core/Temperature

Ontology: SAREF

Also in: SALIFT S4ENER S4EHAW

[property] Temperature E0000000216

https://w3id.org/listdb/onto#E0000000216

- types
  - classes
  - individuals
  - properties
- ontologies
- collections

[HOME](#) | 
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Search

☒ Exact match
☐ Obsolete terms
☐ Advanced search

## Filter Results

[Clear All Filters](#)

Type

- ☒ class 487
- ☒ individual 240
- ☐ property 20

Ontologies

- ☐ ENVO 128
- ☐ SWEET 114
- ☐ GEMET 76
- ☐ OM 66
- ☐ ECSO 63

+ Show More

Collections

- ☐ NFDICHME
- ☒ ESS
- ☐ NFDI4CHEM
- ☐ Educational Resources
- ☐ FID move
- ☐ NFDI4CAT

277 results found for "temperature"

[class] Temperature Temperature
Result Per Page 10 ▾

http://ecoinformatics.org/oboe/oboe.1.2/oboe-characteristics.owl#Temperature

---

Ontology: oboe

---

[individual] temperature 8366

http://www.eionet.europa.eu/gemet/concept/8366

当一个对象被纳入与其他物体热接触时决定热流方向的一个属性，热量从更高的地区流向温度低的地区。

Свойство, определяющее направление потока тепла, когда объект вступает в термический контакт с другими объектами. тепло распространяется из зоны с более высокой температурой в зону более низких температур.A property that determines the direction of heat flow when an object is brought into thermal contact with other objects: heat flows from regions of higher to those of lower temperatures.Качество, определяюще посоката на топлинния поток, когато обект е в термален контакт с други обекти: топлината се движи от зоните с висока към тези с по-ниска температура.Značilnost, ki določa smer toka vročine, ko je predmet v toplotnem stiku s drugimi predmeti - temperatura prehaja s področj iz višjo temperaturo v področja z nižjo temperaturo.Властивість, що визначає напрямк потоку тепла, коли об'єкт вступає у термічний контакт із іншими об'єктами: тепло поширюється із зони з більш високою температурою в зону більш низької температури.خاصية تحدد اتجاه سريان الحرارة عندما يتلامس الجسم جيمًا آخر ملائمة حرارية.

Svojstvo koje određuje smjer protoka topline kada se predmet dovede u toplinski dodir s drugim predmetima: toplina teče iz područja viših temperatura u područja nižih temperatura.własność determinująca kierunek przepływu ciepła, kiedy obiekt wchodzi w kontakt termiczny z innymi obiektami: ciepło przepływa z obszarów o wyższej temperaturze do tych o niższej





# Terminology Service: Ontologies

## Units of measurement ontology

<http://purl.obolibrary.org/obo/uo.owl>

Overview [Class Tree](#) [Property Tree](#) [Individuals](#) [Class List](#)

### Units of measurement ontology

Metrical units for use in conjunction with PATO

Version	2023-05-25
Version IRI	<a href="http://purl.obolibrary.org/obo/uo/releases/2023-05-25/uo.owl">http://purl.obolibrary.org/obo/uo/releases/2023-05-25/uo.owl</a>
IRI	<a href="http://purl.obolibrary.org/obo/uo.owl">http://purl.obolibrary.org/obo/uo.owl</a> <a href="#">copy</a>
HomePage	<a href="https://github.com/bio-ontology-research-group/unit-ontology">https://github.com/bio-ontology-research-group/unit-ontology</a> <a href="#">copy</a>
Issue tracker	<a href="https://github.com/bio-ontology-research-group/unit-ontology/issues">https://github.com/bio-ontology-research-group/unit-ontology/issues</a> <a href="#">copy</a>
License	CC-BY
Creator	
Subject	General, Physics, Life Sciences, biology, Earth sciences
Is Skos	false
Download	<a href="#">OWL</a> <a href="#">Ontology metadata as JSON</a>

[+ Show more information](#)

### Metrics

Number of Classes	572
Number of Properties	7
Number of Individuals	275

[Show Ontology Metadata as JSON](#)





# The REST API

<http://service.tib.eu/ts4tib/api>

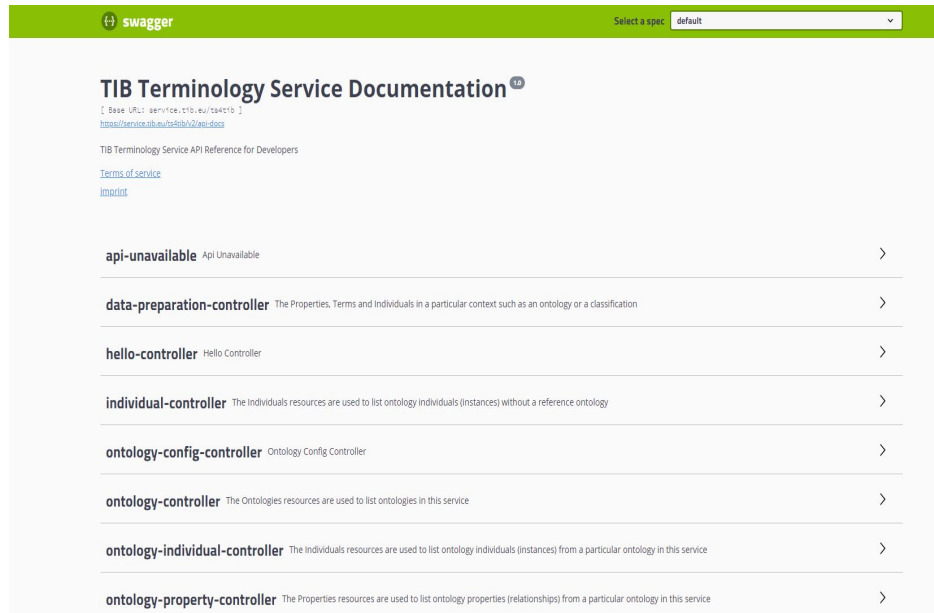
Documentation at

<https://service.tib.eu/ts4tib/swagger-ui.html>

Example

<https://service.tib.eu/ts4tib/api/search?q=temperature>

(all results from the entire TS)





# We need your participation

Please test our Terminology Service!

If You

- miss terminologies in our service
- miss terms in a terminology
- miss a special feature in our service
- want to use this TS for your repository

→ tell us now or write us an email at [Info.BITS@tib.eu](mailto:Info.BITS@tib.eu)

**You want to do more?**

Join the **FAIR ESS Terminologies Interest group**



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# Thank You!

<https://projects.tib.eu/bits/home>

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