

STANDARD

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Reference number

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Introduction

The KCEO Glossary of Terms and Definitions is a comprehensive resource that serves as an invaluable reference guide for seeking clarity and a deeper understanding of the field of Earth observation. This extensive compilation brings together a wide range of terms, concepts, and definitions that are directly relevant to Earth observation, encompassing various disciplines such as remote sensing, satellite imagery, geospatial analysis, climate adaptation, and more. By acting as a reliable compass, this glossary helps to navigate the intricate and specialized terminology associated with Earth observation, ensuring effective communication and knowledge sharing.

As a living document, the KCEO Glossary of Terms and Definitions is in a constant state of evolution and is continuously adapted to incorporate emerging concepts. This ensures that it remains up-to-date.

The KCEO Glossary of Terms and Definitions is serves as an indispensable tool to cater our needs, promote effective communication, and stay abreast of the ever-evolving landscape of Earth observation.

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1. General terms

1.1. Ancillary data

Ancillary data Data acquired on-board but not obtained from the main instrument itself (usually provided as part of Level 0 data). They have the primary purpose to serve the processing of main instrument data (e.g. orbit position and velocity of platform). [Source: ESA/CEOS?, modified]

Alternative:

Ancillary data Data other than instrument measurements, originating in the instrument itself or from the satellite, required to perform processing of the data. They include orbit data, attitude data, time information, spacecraft engineering data, calibration data, data quality information, and data from other instruments or earth system models. [Source CEOS-ARD PFS template 20220302]

Data acquired in context of an *observation* required to perform processing

1.2. Auxiliary data

Data which enhance processing and utilization of main instrument data. The auxiliary data are usually not captured by the same data collection process as the main instrument data. Auxiliary data include data collected by any other platform or process. Examples are e.g. meteorological data received from ECWMF/Met. Offices. Auxiliary data help in data processing, but are also data sets in their own right. [Source: ESA/CEOS?, modified]

Alternative: The data required for instrument processing, which does not originate in the instrument itself or from the satellite. Some auxiliary data will be generated in the ground segment, whilst other data will be provided from external sources. [Source CEOS-ARD PFS template 20220302]

1.3. Cell

Spatial, spatio-temporal zone or temporal unit of geometry with dimensionality greater than 0, associated with a zone NOTE1: All **term cells not resolved via ID cells** within a DGGS share the dimensionality of the DGGS's parent global geometry. DGGSs with dimensionality of 0 are not supported. NOTE 2: **term Cells not resolved via ID Cells** are the unit of geometry in a DGGS, and the geometry of the region of space-time occupied by a zone is a **term cell not resolved via ID cell**. NOTE 3: While the terms **term cell not resolved via ID cell** and zone are often used interchangeably, "zone" is the strictly preferred term. **term Cell not resolved via ID Cell** is entirely appropriate when specifically discussing a zone's geometry or topology. [SOURCE: ISO 19170:2021]

1.4. Duration

non-negative interval quantity of time equal to the difference between the final and initial instants of a time

NOTE 1: The duration is one of the base quantities in the International System of Quantities (ISQ) on which the International System of Units (SI) is based. The term “time” instead of “duration” is often used in this context and also for an infinitesimal duration. NOTE 2: For the term “duration”, expressions such as “time” or “time interval” are often used, but the term “time” is not recommended in this sense and the term “time interval” is deprecated in this sense to avoid confusion with the concept of “time interval”. NOTE 3: The exact duration of a time scale unit depends on the time scale used. For example, the durations of a year, month, week, day, hour or minute, may depend on when they occur [in a Gregorian calendar, a calendar month can have a duration of 28, 29, 30, or 31 days; in a 24-hour clock, a clock minute can have a duration of 59, 60, or 61 seconds, etc.]. Therefore, the exact duration can only be evaluated if the exact duration of each is known. NOTE 4: This definition is closely related to NOTE 1 of the terminological entry “duration” in IEC 60050-113:2011, 113-01-13. [SOURCE: ISO 8601-1:2019, 3.1.1.8]

##Earth observation Is a science domain dealing with technologies and methods of collecting and analysing _observations

NOTE 1: Earth Observation (EO) can be categorised by location of the sensor into space-borne, air-borne, sea-borne, ground-based, underwater and underground EO. [Source: modified GEO definition https://earthobservations.org/geo_wwd.php]

##Earth Observation product

A representation of a phenomenon that can be coded into information. A product serves multiple purposes and cross-domain applications. A characteristic of EO products is that they should undergo some data transformation for being considered decision-ready or inference-ready information.

NOTE 1: aka geophysical and biophysical parameters (surface temperature, leaf area index, etc.)

[SOURCE: KCEO]

Earth Observation based output

Any data or information derived from EO products. It may be generated for addressing specific use cases or user needs. It is the result of any type of data processing (classification, rearranging, sorting, aggregating, mathematical computation, filtering) and/or data integration (fusion, data assimilation) with other EO products and/or geospatial data that changes the property of the original EO product. It is the result of a non-invertible operation so that the original EO product can't be recovered.

[SOURCE: KCEO]

##Entity

Something that has separate and distinct existence and objective or conceptual reality

[SOURCE: [ISO 19119:2016](#), 4.1.6]

1.5. Geographic data

data with implicit or explicit reference to a location relative to the Earth

NOTE 1: *Geographic information* is also used as a term for information concerning phenomena implicitly or explicitly associated with a location relative to the Earth.

[SOURCE: [ISO 19109:2015](#), 4.13; ISO 19109:2005]

===

1.6. Geographic identifier

Spatial reference in the form of a label or code that identifies a location.

EXAMPLE: “Spain” is an example of a label (country name); “SW1- 3AD” is an example of a code (postcode).

[SOURCE: ISO 19112:2019, 3.1.2]

1.7. Geospatial data/information

Consisting of, derived from, or relating to *data* that is directly linked to specific geographical locations

[Source: <https://www.merriam-webster.com/dictionary/geospatial> ,
<https://isotc211.geolexica.org/concepts/202/>, accessed 20221010]

1.8. Grid

network composed of two or more sets of curves in which the members of each set intersect the members of the other sets in an algorithmic way NOTE 1: The curves partition a space into grid **term cells not resolved via ID cells**

[SOURCE: ISO 19123:2005, 4.1.23]

1.9. Information

The result of organisation, interpretation, categorisation, classification, or some other form of processing of *data* attaching to it a certain meaning that can be understood by the addressee.

NOTE 1: Information depends on *data* and is targeted.

[SOURCE: gEOGlos]

1.10. In-situ observation

‘In-situ’ describes *observations* performed in the same place where a phenomenon occurs, normally without isolating it from other systems (its environment) or altering its pre-observation state. The main characteristic of such observations is that distance has no or only negligible (within *uncertainty*) influence on the *value* of the *property* observed. In-situ *observations* therefore often require either direct physical contact or small distances between a *sensor* and the observed phenomenon.

NOTE 1: *Observations* not fulfilling these conditions are considered *Remote Sensing*.

[Source: own (Peter)]

1.11. Laboratory observation

Laboratory *observations* are (usually) in-situ observations in which the object or phenomenon is isolated from other systems or altered in its ‘original’ conditions or environment.

Note:

1.12. Location

Particular *place* referenced by an *identifier*

NOTE 1 to entry: While a (geo)location identifies a geographic place, it may also be associated with objects other than the Earth

NOTE 2 to entry: While location in principle covers 0- to 3-dimensional spatial geometries, it should not be used for 0- and 1-dimensional geometries (*positions* and *paths*)

EXAMPLE "Madrid", "California".

[SOURCE: [ISO 19112:2019](#), (E), 3.1.3, modified, note 2 added]

1.13. Measurement

A measurement is an *observation* of a *quantity*.

NOTE 1: The process of collecting a measurement is called **measuring**.

[Source: gEOGlos (VIM ?, modified)]

1.14. Period

Particular era or span of time

NOTE 1: Periods are intervals named with a period identifier

[SOURCE: ISO 19170:2021]

1.15. Period identifier

Temporal reference in the form of a label or code that identifies a period

NOTE 1: period identifiers are the temporal equivalent of geographic identifiers as specified in ISO 19912

[SOURCE: ISO 19170:2021]

1.16. Quantity

A *property* whose instances can be compared by ratio or only by order

[Source: gEOGlos(VIM4 Notes omitted)]

1.17. Remote Sensing (or Remote Observation)

Remote sensing is a type of *observation* performed at a significant distance from a *phenomenon*. 'Significant' in this context means that the distance has, or may have, a non-negligible impact on the *value* of the *property* observed. The effect of the distance on the acquired *data* is the main distinction criteria between 'remote' and 'in-situ' observations.

NOTE 1: the opposite of 'remote' is 'in-situ'

[Source: own (Peter)]

1.18. Representativity

[...]

NOTE 1: WIGOS metadata standard defines representativeness as the extent of the region around the observation of which it is representative

##Service provider

An institutional body, an organisation or programme that provides reliable, trusted (authoritative?) EO information and that has the financial resources to sustain the provision.

===

1.19. Uncertainty

Non-negative parameter, associated with data, which characterizes the dispersion of the values that could reasonably be attributed to the feature or phenomenon. In case of quantitative data, the uncertainty may be, for example, a standard deviation (or a given multiple of it), or the half-width of an interval having a stated level of confidence. For qualitative data uncertainty may be, for example, expressed by commission, omission and overall errors.

NOTE 1: in natural or ordinary language the term accuracy is often used to express qualitatively the uncertainty associated with data, such as 'the data from this thermometer is very accurate vs not very accurate'. This usage of the term 'accuracy', whilst it may be common in conversational context should be abandoned in technical discussions in favour of 'uncertainty' which does not require the knowledge of the 'real' value.

1.20. User

In the context of the KCEO, an entity (person, organization, institution, etc.) that is requesting data or information with certain characteristics described by needs and/or requirements.

[SOURCE: KCEO]

===

1.21. Validation

process of assessing, by independent means, the quality of the data products derived from the system outputs

Note 1 to entry: In this part of ISO 19159, the term validation is used in a limited sense and only relates to the validation of calibration data in order to control their change over time.

[SOURCE:ISO/TS 19101-2:2008, 4.41]

Alternative:

Validation aims to verify that the specified requirements are achieved or compliant. This involves comparing mission products with representative reference data, considering various observation conditions, ensuring the quality and traceability of the reference data used.

[SOURCE: BIPM; QA4EO; ESA ?, modified]

Alternative:

The assurance that a product, service, or system meets the needs of the customer and other identified stakeholders. It often involves acceptance and suitability with external customers.

[SOURCE: EU-US Land Imaging EO Collaboration]

1.22. Verification

provision of objective evidence that a given item fulfils specified requirements.

Note 1 to entry: When applicable, measurement uncertainty should be taken into consideration.

Note 2 to entry: The item may be, e.g. a process, measurement procedure, material, compound, or measuring system.

Note 3 to entry: The specified requirements may be, e.g. that a manufacturer’s specifications are met.

Note 4 to entry: Verification should not be confused with calibration. Not every verification is a validation.

[SOURCE:ISO/IEC Guide 99:2007, 2.44]

Alternative:

The evaluation of whether or not a product, service or system complies with a regulation requirement, specification, or imposed condition. It often an internal process.

[SOURCE: EU-US Land Imaging EO Collaboration]

Alternative:

Verification serves as a means to evaluate the reliability of the data in the absence of a reference dataset, allowing for an assessment of its standalone performance. It involves confirming the consistency and internal coherence of the data without direct comparison to external reference sources. c

[SOURCE: KCEO]

2. EO Product attributes

#[.underline]#Area of interest

It is the zone in 2D or 3D for which the information or data is requested. It can be discontinuous in space, in other words it can consist in the union of many separate zones (e.g., Natural Reserves in Africa, Urban environments, etc.).

The attribute indicates a request for spatially complete data within the AOI zone(s).

Table 1

Type	Entry format example	Valid units
Geographical/administrative identifier	NUTS3, LAU, Natura 2000 site	unitless

[SOURCE: KCEO]

===

2.1. Band central wavelength

A single wavelength value within the sensitivity interval of a spectroradiometric sensor which represents the respective band. It could be either the mean, the median, the maximum sensitivity, or any other reasonable value chosen to be representative.

Table 2

Entry format example	Valid unit
0.545 μm	micrometre (μm), millimetre (mm), centimetre (cm)

2.2. Confidence interval

The probability that the quantity lies in the interval, conditioned on the measuring or modelling assumptions.

[SOURCE: KCEO]

2.3. Coverage interval

Interval containing the set of [true quantity values](#) of a [measurand](#) with a stated probability, based on the information available

[SOURCE: BIPM-VIM]

#[\[.underline\]](#)#Latency

It is the period between the end of sensing of a phenomenon to the beginning of availability of a specific product.

Table 3

Entry format example	Valid unit
1 s, 2 h,	second, hour, day, month, year

NOTE 1: CEOS Wiki describes latency as “the time delay introduced by automated data processing or network transmission between the occurrence of an event and the use of the processed data.”

[SOURCE: KCEO]

2.4. Location error

Indicate the agreement between the represented location of an object and the true location.

[SOURCE: KCEO]

2.5. Measurement uncertainty

Uncertainty associated with the method of measurement.

[SOURCE: CEOS Wiki adopted from JCGM GUM]

2.6. Minimum Mapping Unit

The area of the smallest feature that is still represented on a map

Table 4

Entry format example	Valid unit
1 ha	Square meter (m ²), hectar (ha)

[SOURCE: CGLS]

2.7. Minimum Mapping Width

The width of the smallest linear feature that is still represented on a map

Table 5

Entry format example	Valid unit
20 m	Meter (m)

[SOURCE: CGLS]

#[.underline]#Quality indicator

A quality indicator shall provide sufficient information to allow all users to readily evaluate the “fitness for purpose” of the data or derived product. A Quality Indicator may be a number, set of numbers, graph, uncertainty budget, or a simple “flag”.

[SOURCE: CEOS Wiki]

#[.underline]#Spatial completeness

The presence or absence of gaps, which are missing values in an otherwise continuous spatial data series. For example, surface soil moisture retrieved from microwave satellite sensors may present gaps in mountainous terrains.

[SOURCE: KCEO]

2.8. Spatial consistency

It indicates that the spatial statistical properties of the data depend only on the underlying physical processes and don't depend on other factors such as fusing different products or sensors. Also, the validity of the assumptions of the procedure to produce information holds true across the whole spatial range.

[SOURCE: KCEO]

2.9. Spatial extent

The *zone* or region of space described by a *geographic identifier* in the form of a label or code, or by a bounding box. It consists in the maximum extent (the spatial boundary or limits) within which the user is requesting data.

The attribute represents the maximum spatial extent of the AOI, and in case the AOI is made of many discontinuous zones then it represents the maximum extent of the union of all the zones.

For example, if a user is requesting information about degradation of African protected sites, then the AOIs are the protected sites, and the spatial extent is the African continent.

NOTE 1: WIGOS metadata standard defines it as the typical spatial georeferenced volume covered by the observations

[SOURCE: Adapted from ISO 19170-1:2021]

2.10. Spatial reporting unit

The smallest spatial object of interest that may be used for reporting and for which the information should be aggregated.

Table 6

Type	Entry format example	Valid units
Geographical/administrative identifier	Africa, NUTS3, LAU, Natura 2000 site	unitless
Grid [x, y]	2 x 2 meter, 0.1 x 0.2 degrees ;	Meter, degrees

NOTE 1: WIGOS 2019 use 'spatial reporting interval' probably assuming the observations are reported on a grid with regular spacing/intervals.

[SOURCE: KCEO]

Spatial resolution

It is the spatial sampling scheme that determines the smallest object that can be identified or resolved in a gridded spatial discretization.

Table 7

Entry format example	Valid unit
2 x 2 m; 0.1 x 0.4 degrees	Meter, degrees

NOTE 1: Also called *grid spacing*

[SOURCE:]

2.11. Spectral resolution

Measure of the ability to resolve features in the electromagnetic spectrum.

[SOURCE: KCEO]

2.12. Spectral band

Part of the electromagnetic spectrum of specific wavelengths. In remote sensing usually described by central wavelength and bandwidth.

2.13. Spectral Bandwidth

the range of the spectral band

Table 8

Entry format example	Valid unit
0.429-0.457 μm	micrometre (μm), millimetre (mm), centimetre (cm)

Stability

It refers to the maximum acceptable change in uncertainty per decade.

NOTE 1: GCOS uses bias or systematic errors instead of uncertainty

[SOURCE: modified from GCOS 2022]

Temporal consistency

It indicates that the temporal statistical properties of the sample depend only on the underlying physical processes and don't depend on other factors such as fusing different products or sensors.

[SOURCE: KCEO]

2.14. Temporal extent

The period during which data was collected, observations were made, or model was run.

Table 9

Entry format example	Valid unit
Y/m/d — Y/m/d	Not Applicable

NOTE 1: In W3C is the definition of temporal coverage

NOTE 2: Time period covered by a series of observations inclusive of the specified date/ time indications (measurement history). Defined based on the beginning and end dates of observations. WIGOS Metadata]

[SOURCE: adapted from W3C]

2.15. Temporal reporting period

The time period used for reporting and for which the information should be aggregated from the native temporal resolution.

Table 10

Entry format example	Valid unit
1 s, 2 h, 1 d	second, hour, day, month, year

[SOURCE: modified WIGOS Metadata Standard 2019]

2.16. Temporal resolution

The observation or model output representing regular intervals and specifying the length of the interval that determines the smallest event or process that can be resolved. (e.g., the period between observations, the time steps in a model).

Table 11

Entry format example	Valid unit
1 s, 2 h, 1 m	second, hour, day, month, year

NOTE 1: WIGOS 2019 distinguishes between *sampling time period*, as the period over which a measurement is taken, and *temporal sampling interval* as the time period between the beginning of consecutive sampling periods. Temporal resolution in this Glossary is equivalent to sampling time period as used by WIGOS.

[SOURCE: KCEO]

2.17. Temporal revisit

The interval between successive observations

Table 12

Entry format example	Valid unit
1 s, 2 h	second, hour, day, month, year

NOTE 1: In remote sensing it is also called repeat cycle

NOTE 2: More generally it is known as **temporal sampling interval**

[SOURCE: KCEO]

2.18. Time of year

the time of the year that the variable is observed or simulated by a model

Table 13

type	Entry format example	Valid unit
timestamp	m/d	Not Applicable
timerange	m/d — m/d	Not Applicable

[SOURCE: KCEO]

2.19. Time of day

the time of the day that the variable or parameter is observed or simulated by a model

Table 14

type	Entry format example	Valid unit
timestamp	18:00 h (0-24)	Hours
timerange	18:00 – 20:00 h	Hours

NOTE 1: In remote sensing it is also known as time of overpass

[SOURCE: KCEO]

##Timeliness

It is the period between the moment of requesting information to the moment of availability of information.

- Near Real-Time (NRT): delivered less than 3 hours after requesting information
- Slow-Time Critical (STC): delivered within 48 hours after requesting information
- Non-Time Critical (NTC): typically delivered within 1 month after requesting information

NOTE 1: In some context also known as delivery time.

NOTE 2: C3S URDB describes timeliness as “the ability of the publish/subscribe middleware to provide the expected service within known time bounds”

[SOURCE: Adapted from ESA S3 User Guide]

#[.underline]#Vertical levels

Levels of a vertical discretization. Examples may be pressure levels in an atmospheric model reanalysis or height levels in a forest biomass EO product.

Table 15

Entry format example	Valid unit
1,5,10 meter; 1000, 850, 500 hPa	meter, hPa, unitless

[SOURCE: KCEO]

3. EO-derived/Application attributes

3.1. Baseline

It is the reference period, time or measure against which the information is assessed or compared. For example, in climate change projections a baseline may be any 30-year period of observations (1961-1990, etc.) used as reference to calculate the future change; In monitoring wetlands degradation one of the indicators of wetlands condition is wetland connectivity, so that setting the baseline year to compute the baseline indicator of wetlands connectivity can be used to report the indicator change for all the other years.

Table 16

Entry format example	Valid unit
2000; 1990-2020	year

[SOURCE: KCEO]

3.2. Classification system

The nomenclature used to classify the information in categorical thematic classes (ex: EUNIS, MAES ecosystems, Corine Land Cover, LCCS).

[SOURCE: KCEO]

3.3. Classification system levels

The levels in a hierarchical classification system. For example, Corine Land Cover is made up of three nested levels that classify land cover with increasing details:

2 Agricultural Areas

2.1 Arable lands

2.1.1 Non-irrigated arable land

2.1.2 Permanently irrigated land

2.1.3 Rice fields

[SOURCE: KCEO]

##Climate projection

A climate projection is the simulated response of the climate system to a scenario of future emission or concentration of greenhouse gases (GHGs) and aerosols, generally derived using climate models. Climate projections are distinguished from climate predictions by their

dependence on the emission/concentration/radiative forcing scenario used, which is in turn based on assumptions concerning, for example, future socioeconomic and technological developments that may or may not be realized.

[SOURCE: IPCC]

3.4. Forecast range

The forecasted period

[SOURCE: KCEO]

3.5. Forecast lead time

The length of time between the issuance of a forecast and the occurrence of the phenomena that were predicted. It is expressed in time intervals in a forecasted period, for example 6-hour intervals for a medium-range forecast.

Table 17

Entry format example	Valid unit
6 h, 1 d	Year, month, day, hour

NOTE 1: UNTERM, International Glossary of Hydrology, WMO/UNESCO, 2011 describes forecast lead time as “interval of time between the issuing of a forecast (warning) and the expected occurrence of the forecast event”

[SOURCE: KCEO]

3.6. Thematic resolution

The level of categorical detail of information expressed by the number of classes

[SOURCE: CGLS]

3.7. Thematic uncertainty

Uncertainty associated with the method of classification.

NOTE 1: Typically, it is computed from the error matrix.

NOTE 2: For a review of classification uncertainty metrics consult Ye et al. 2018.

[SOURCE: KCEO]

4. Climate Adaptation

4.1. Outcome & Impact

Outcome is regarded short-term, while impact is regarded long-term according to X. However, in the Horizon Europe Missions terminology, impact is regarded short-term.

5. Other

5.1. Data access

The service to disseminate data

[SOURCE: KCEO]

===

5.2. Data format

Structured data that is machine readable and can be automatically read and processed by a computer, such as HDF, NetCDF, CSV, JSON, XML, etc.

[SOURCE: CEOS Wiki]

5.3. Data licencing

A legal instrument by which a copyright holder may grant rights over the protected work. Data and content is open if it is subject to an explicitly-applied licence that conforms to the Open Definition. A range of standard open licenses are available, such as the Creative Commons CC-BY licence, which requires only attribution.

[SOURCE: CEOS Wiki]

5.4. Dwell time

The time that an antenna beam spends on a target.

NOTE 1: in the context of radar sensing

5.5. Policy

A deliberate system of guidelines to guide decisions and achieve rational outcomes. A policy is a statement of intent and is implemented as a procedure or protocol. Policies are typically promulgated through official written documents.

[SOURCE: Wikipedia]

5.6. Policy file(s)

One or more policy documents that represent the official written reference for a given Policy.

[SOURCE: KCEO]

5.7. Policy cycle

A well-established concept, which is typically taught as the rational model of policy decision-making. It is an idealised view of the policy process

[SOURCE: <https://digital-strategy.ec.europa.eu/en/library/quality-public-administration-toolbox-practitioners>]

5.8. Policy making

The process by which governments translate their political vision into programmes and actions to deliver 'outcomes' — desired change in the real world.

[SOURCE: <https://digital-strategy.ec.europa.eu/en/library/quality-public-administration-toolbox-practitioners>]

5.9. Policy milestone

Policy milestones mark significant progress in addressing specific issues, or crucial decision points where significant choices are made. Concrete examples of policy milestones are: policy planning and proposing, impact assessment, implementation, or implementation cycles (e.g.,

Water Framework Directive, Marine Strategy Framework Directive), achievement of policy objectives and policy targets, evaluating and improvement of existing laws.

5.10. [Source: KCEO]

===

5.11. Policy objective

Desired outcome that policymakers wish to achieve

5.12. Policy target

Specific level or rate set for the policy objective

5.13. Update frequency

The frequency at which the product is available to users.

NOTE 1: also known in product catalogues as dissemination frequency

[SOURCE: KCEO]

5.14. User Interface

Set of all the components of an interactive system that provide information and controls for the user to accomplish specific tasks with the interactive system

[SOURCE:ISO 9241-110:2020, 3.10]

6. Resources

— [], <https://www.ipcc.ch/sr15/chapter/glossary/>

— [], <https://unterm.un.org/unterm2/en/>

*[], OSGEO <https://osgeo.geolexica.org/>

— [], <https://w3c.github.io/sdw/bp>

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