



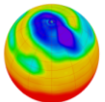
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# CF Standard Names

CF Meeting  
June 9-11 2020

Alison Pamment



**Centre for Environmental  
Data Analysis**

SCIENCE AND TECHNOLOGY FACILITIES COUNCIL  
NATURAL ENVIRONMENT RESEARCH COUNCIL



**National Centre for  
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INFRASTRUCTURE FOR THE EUROPEAN NETWORK  
FOR EARTH SYSTEM MODELLING





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**What is a standard  
name?**

# What is a standard name?

A standard name identifies the geophysical quantity in a data variable, e.g. air\_temperature.

Attach the standard name to a data variable using the CF **standard\_name** attribute:

```
float ps1(lat,lon) ;  
    ps1:units = "hPa" ;  
    ps1:standard_name = "pressure_at_mean_sea_level" ;
```

# Why use a standard name?

The names of data variables are **not** standardized in netCDF files.

For example:

- alison1, alison2, xyz345blah
- Temperature, temp, T

Standard names facilitate data exchange by providing unambiguous identification of variables.

We can tell whether variables from different data sources can be compared.

# CF standard name table

- Most recent (Version 72, March 2020) contains 4418 names
- Approximately 30 names under active discussion

Standard Name	Canonical Units
<p><b>air_temperature_anomaly</b></p> <p>“Anomaly” means difference from climatology. Air temperature is the bulk temperature of the air, not the surface (skin) temperature.</p>	<p><b>K</b></p>
<p><b>surface_upward_latent_heat_flux</b></p> <p>The surface latent heat flux is the exchange of heat between the surface and the air on account of evaporation (including sublimation). In accordance with common usage in geophysical disciplines, “flux” implies per unit area, called “flux density” in physics.</p>	<p><b>W m-2</b></p>

# CF standard names: basic rules

- Any variable labelled with the **standard\_name** attribute **must** use a value from the published standard name table
- Standard names consist of letters, digits and underscores, no whitespace.
- English language with US spellings
- Case sensitive
  - Mixed case used for chemical element symbols, e.g.  
**integral\_wrt\_time\_of\_radioactivity\_concentration\_of\_112Ag\_in\_air**
- (Almost) all standard names have an accompanying description
- Names are never removed once they have been added
  - Name can be modified using an 'alias'

# Building standard names

## GRAMMAR:

*[surface]**[component]*base\_quantity *[at surface]**[in medium]**[due to process]**[assuming condition]*

## EXAMPLES:

surface\_air\_pressure (hPa)

downward\_water\_vapor\_flux\_in\_air\_due\_to\_diffusion (kg  
m<sup>-2</sup> s<sup>-1</sup>)

net\_downward\_longwave\_flux\_in\_air\_assuming\_clear\_sky  
(W m<sup>-2</sup>)

# Canonical units

- Canonical units are agreed at same time as standard name – they go hand in hand, e.g.
  - mass\_concentration → kg m<sup>-3</sup>
  - mole\_concentration → mol m<sup>-3</sup>
- String valued
- Must be supported by Unidata UDUNITS2 package
- Conversion between recognized units – temperatures in degrees Celsius are OK!



# Standard name descriptions

- Descriptions are agreed at same time as the standard name
- Not intended to give full “text book” description of fundamental quantities such as temperature
- Give further explanation of name and components used to construct it
- Give references to articles in the literature
- For chemical species, give IUPAC name if it is unsuitable to use in the standard name itself

Example:

**surface\_albedo\_assuming\_deep\_snow** (Canonical units: 1)

‘The surface called “surface” means the lower boundary of the atmosphere. Albedo is the ratio of outgoing to incoming shortwave irradiance, where 'shortwave irradiance' means that both the incoming and outgoing radiation are integrated across the solar spectrum. A phrase assuming\_condition indicates that the named quantity is the value which would obtain if all aspects of the system were unaltered except for the assumption of the circumstances specified by the condition.’

# What **isn't** described in the standard name

- Vertical level and geolocation, e.g. 2m air temperature
  - Use coordinate variables or region labels
- Statistical processing, e.g. mean, maximum, etc.
  - Use cell\_methods attribute
- Portions of grid cell, e.g. mean surface albedo over snow area
  - Use cell\_methods attribute plus area\_type coordinate variable
- Units
  - Use units attribute



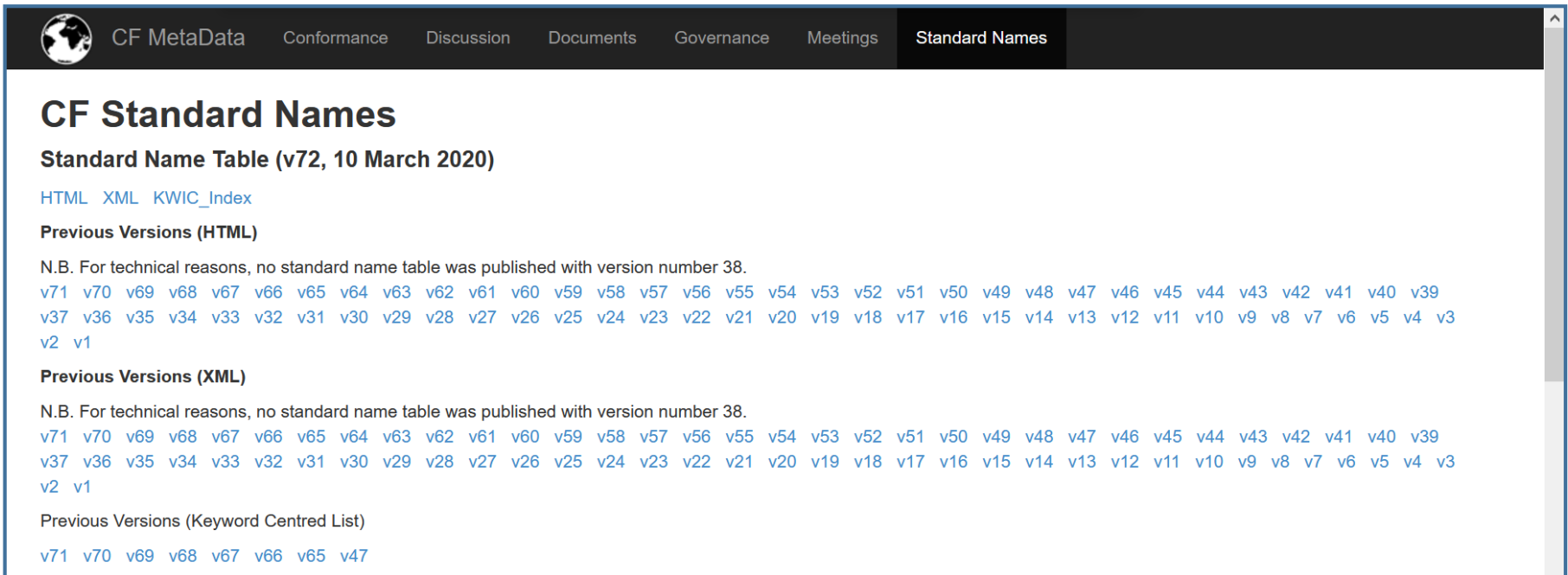


# Standard names process

# Browsing published names

All versions of standard name table are available on CF website:

<http://cfconventions.org/standard-names.html>



The screenshot shows the 'Standard Names' section of the CF website. The navigation bar includes links for CF MetaData, Conformance, Discussion, Documents, Governance, Meetings, and Standard Names. The main content area is titled 'CF Standard Names' and 'Standard Name Table (v72, 10 March 2020)'. It provides links for HTML, XML, and KWIC\_Index. Under 'Previous Versions (HTML)', it notes that version 38 was not published for technical reasons and lists versions v1 through v71. A similar note and list are provided for 'Previous Versions (XML)'. Finally, 'Previous Versions (Keyword Centred List)' lists versions v47 through v71.

CF MetaData Conformance Discussion Documents Governance Meetings **Standard Names**

## CF Standard Names

### Standard Name Table (v72, 10 March 2020)

[HTML](#) [XML](#) [KWIC\\_Index](#)

#### Previous Versions (HTML)

N.B. For technical reasons, no standard name table was published with version number 38.

[v71](#) [v70](#) [v69](#) [v68](#) [v67](#) [v66](#) [v65](#) [v64](#) [v63](#) [v62](#) [v61](#) [v60](#) [v59](#) [v58](#) [v57](#) [v56](#) [v55](#) [v54](#) [v53](#) [v52](#) [v51](#) [v50](#) [v49](#) [v48](#) [v47](#) [v46](#) [v45](#) [v44](#) [v43](#) [v42](#) [v41](#) [v40](#) [v39](#)  
[v37](#) [v36](#) [v35](#) [v34](#) [v33](#) [v32](#) [v31](#) [v30](#) [v29](#) [v28](#) [v27](#) [v26](#) [v25](#) [v24](#) [v23](#) [v22](#) [v21](#) [v20](#) [v19](#) [v18](#) [v17](#) [v16](#) [v15](#) [v14](#) [v13](#) [v12](#) [v11](#) [v10](#) [v9](#) [v8](#) [v7](#) [v6](#) [v5](#) [v4](#) [v3](#)  
[v2](#) [v1](#)

#### Previous Versions (XML)

N.B. For technical reasons, no standard name table was published with version number 38.

[v71](#) [v70](#) [v69](#) [v68](#) [v67](#) [v66](#) [v65](#) [v64](#) [v63](#) [v62](#) [v61](#) [v60](#) [v59](#) [v58](#) [v57](#) [v56](#) [v55](#) [v54](#) [v53](#) [v52](#) [v51](#) [v50](#) [v49](#) [v48](#) [v47](#) [v46](#) [v45](#) [v44](#) [v43](#) [v42](#) [v41](#) [v40](#) [v39](#)  
[v37](#) [v36](#) [v35](#) [v34](#) [v33](#) [v32](#) [v31](#) [v30](#) [v29](#) [v28](#) [v27](#) [v26](#) [v25](#) [v24](#) [v23](#) [v22](#) [v21](#) [v20](#) [v19](#) [v18](#) [v17](#) [v16](#) [v15](#) [v14](#) [v13](#) [v12](#) [v11](#) [v10](#) [v9](#) [v8](#) [v7](#) [v6](#) [v5](#) [v4](#) [v3](#)  
[v2](#) [v1](#)

#### Previous Versions (Keyword Centred List)

[v71](#) [v70](#) [v69](#) [v68](#) [v67](#) [v66](#) [v65](#) [v47](#)

# Browsing the newest version

Current version of standard name table:

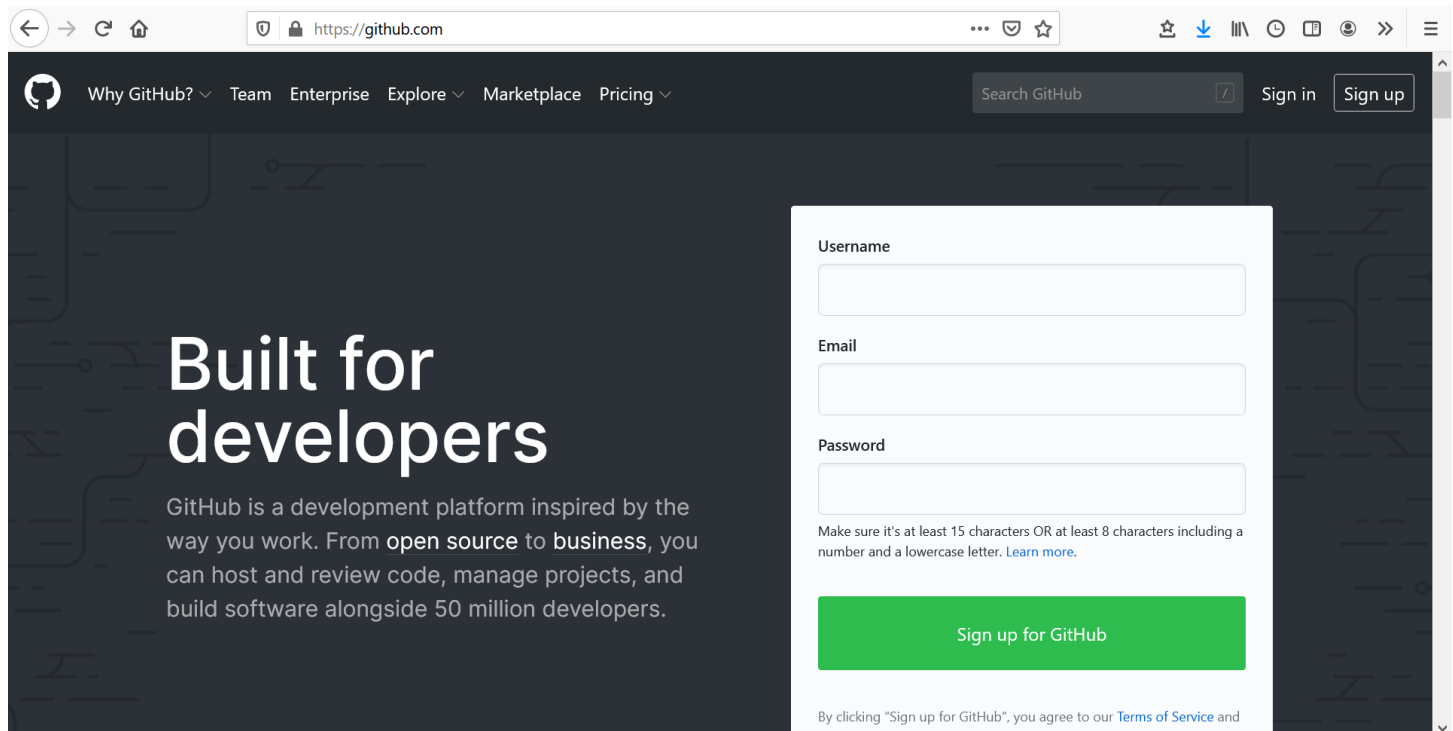
<http://cfconventions.org/Data/cf-standard-names/current/build/cf-standard-name-table.html>

New vocabulary terms are added as required to meet the needs of data producers

# How do I ask for a new standard name?

STEP 1

Sign up for an account on GitHub  
<https://github.com/>



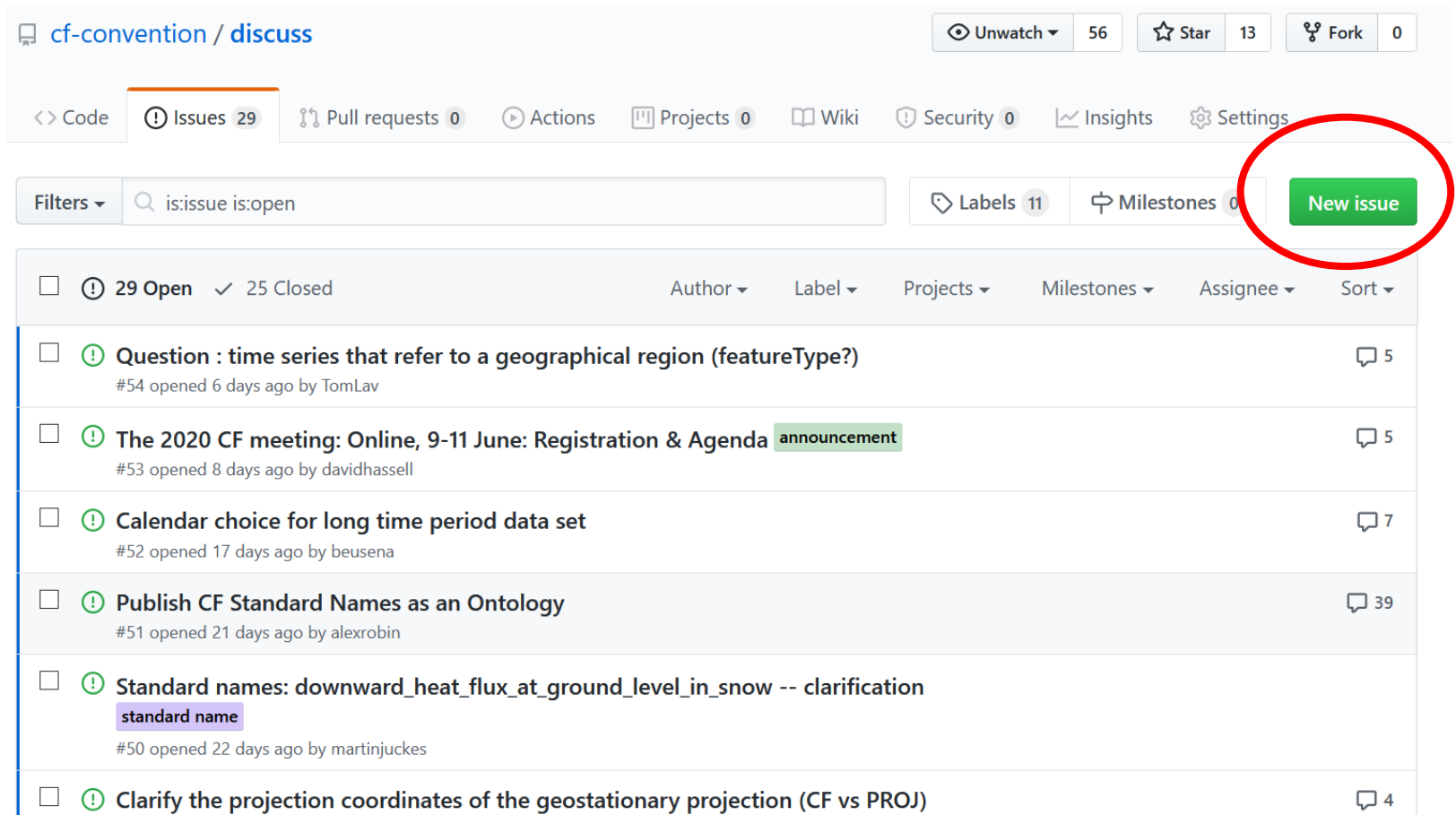
The screenshot shows the GitHub website's sign-up page. The browser's address bar displays "https://github.com". The page features a dark header with navigation links: "Why GitHub?", "Team", "Enterprise", "Explore", "Marketplace", and "Pricing". A search bar and "Sign in" / "Sign up" buttons are also present. The main content area has a large heading "Built for developers" and a subheading "GitHub is a development platform inspired by the way you work. From open source to business, you can host and review code, manage projects, and build software alongside 50 million developers." On the right side, there is a white sign-up form with three input fields: "Username", "Email", and "Password". Below the "Password" field, there is a note: "Make sure it's at least 15 characters OR at least 8 characters including a number and a lowercase letter. [Learn more.](#)" A green "Sign up for GitHub" button is located below the form. At the bottom of the form, there is a small disclaimer: "By clicking 'Sign up for GitHub', you agree to our [Terms of Service](#) and [Privacy Policy](#)."



# How do I ask for a new standard name?

STEP 3

Open a new issue



cf-convention / discuss

Unwatch 56 Star 13 Fork 0

Code Issues 29 Pull requests 0 Actions Projects 0 Wiki Security 0 Insights Settings

Filters is:issue is:open Labels 11 Milestones 0 **New issue**

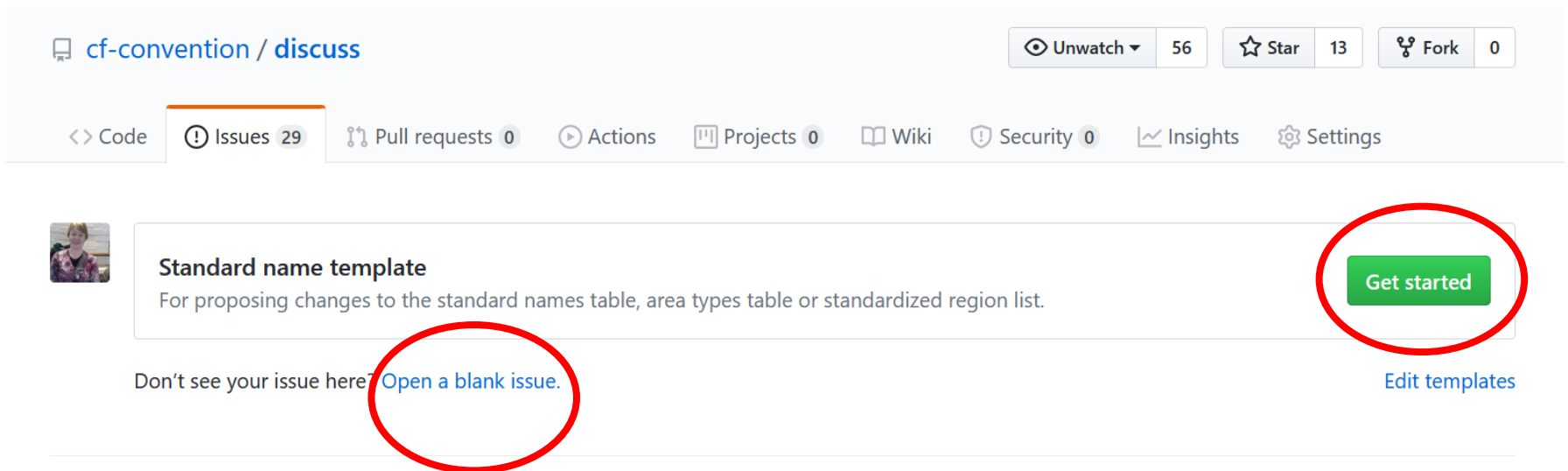
<input type="checkbox"/>	29 Open	25 Closed	Author	Label	Projects	Milestones	Assignee	Sort
<input type="checkbox"/>	Question : time series that refer to a geographical region (featureType?)							5
<input type="checkbox"/>	The 2020 CF meeting: Online, 9-11 June: Registration & Agenda			announcement				5
<input type="checkbox"/>	Calendar choice for long time period data set							7
<input type="checkbox"/>	Publish CF Standard Names as an Ontology							39
<input type="checkbox"/>	Standard names: downward_heat_flux_at_ground_level_in_snow -- clarification			standard name				
<input type="checkbox"/>	Clarify the projection coordinates of the geostationary projection (CF vs PROJ)							4



# How do I ask for a new standard name?

STEP 4


Select the standard name template



cf-convention / discuss

Unwatch 56 Star 13 Fork 0

<> Code Issues 29 Pull requests 0 Actions Projects 0 Wiki Security 0 Insights Settings

 **Standard name template**  
For proposing changes to the standard names table, area types table or standardized region list.

Get started

Don't see your issue here? [Open a blank issue.](#) [Edit templates](#)

# How do I ask for a new standard name?

STEP 5

Use the template to write your proposal

Standard names: \*add your own title here\*

Write Preview H B I @

Before submitting an issue be sure you have read and understood the rules for vocabulary changes:  
[http://cfconventions.org/standard\\_name\\_rules.html](http://cfconventions.org/standard_name_rules.html)

Please note that it is fine to group together a number of proposals in a single GitHub issue (i.e. it is not necessary to open a separate issue for each vocabulary term). Change proposals should include the following information as applicable.

**Proposer's name** This information will be used to add entries to the vocabulary editor:  
<http://cfeditor.ceda.ac.uk/proposals/1>. If you prefer not to add your name, your github id will be used instead.

**Date** Also used in the vocabulary editor.

For each term please try to give the following:

- Term** Proposed term to appear in the vocabulary
- Description** A brief description to explain the meaning of the term
- Units** (If applicable).

Attach files by dragging & dropping, selecting or pasting them.

Styling with Markdown is supported

**Submit new issue**

# CF standard name rules

- Any member of the community may comment on proposals
- Aim of the discussion is to achieve consensus (we now have two moderators!)
- Rules are laid out at [http://cfconventions.org/standard\\_name\\_rules.html](http://cfconventions.org/standard_name_rules.html)
- Provision for “fast tracking” new names that are very similar to existing terms, subject to checking
- CF standard names committee can be asked to vote if consensus cannot be achieved

# CEDA Vocabulary Editor

<http://cfeditor.ceda.ac.uk/proposals/1>

## surface\_northward\_sea\_water\_velocity

accepted

[View](#)

Proposer: Ute Brönnner

Proposed Date: May 30, 2017

Comments: Remove unnecessary sentence from definition: "Water" means water in all phases, including frozen i.e. ice and snow. This is not appropriate for sea water names.

CF mailing list link: [standard names under ice velocity of water](#)

Units: m s<sup>-1</sup> (UVAA)

[Updated term description](#)

The surface called "surface" means the lower boundary of the atmosphere. A velocity is a vector quantity. "Northward" indicates a vector component which is positive when directed northward (negative southward).

## surface\_eastward\_sea\_water\_velocity

accepted

[View](#)

Proposer: Ute Brönnner

Proposed Date: May 30, 2017

Comments: Remove unnecessary sentence from definition: "Water" means water in all phases, including frozen i.e. ice and snow. This is not appropriate for sea water names.

CF mailing list link: [standard names under ice velocity of water](#)

Units: m s<sup>-1</sup> (UVAA)

[Updated term description](#)

The surface called "surface" means the lower boundary of the atmosphere. A velocity is a vector quantity. "Eastward" indicates a vector component which is positive when directed eastward (negative westward).

## mass\_fraction\_of\_chloride\_dry\_aerosol\_particles\_in\_air

under discussion

[View](#)

Proposer: Daniel Neumann

Proposed Date: May 18, 2017

Comments:

CF mailing list link: [New standard names for atmospheric sea salt and for nitrogen deposition](#)

Units: 1 (UUUU)

[New Term](#)

# Rules for acceptance / rejection of proposals

- A proposal will be **accepted** if one of the following is true:
  - (a) it is similar to existing terms and has been checked for consistency by the moderator;
  - (b) consensus has been reached in favour of the proposal;
  - (c) the moderator's summary indicates that consensus in favour of the proposal has nearly been achieved;
  - (d) a majority of the standard names committee vote to accept the proposal.
- A proposal will be **rejected** if one of the following is true:
  - (a) it duplicates an existing vocabulary term;
  - (b) consensus has been reached against the proposal;
  - (c) the moderator's summary indicates that consensus against the proposal has nearly been achieved;
  - (d) a majority of the standard names committee vote to reject the proposal;
  - (e) the proposer withdraws the proposal.

# CF Area Types and Standardized Region List

## Area\_type table

- Lists acceptable values for standard name area\_type
- Used with cell\_methods attribute to describe statistics over portion(s) of grid cell
- Version 9: 53 entries

## Standardized Region List

- Names regions, e.g. north\_america, southern\_ocean
- Complex boundaries
- Not individual countries
- Version 4: 72 entries

# Publishing CF Vocabularies

- (Approximately) bi-monthly updates
- CF website - maintained and hosted via GitHub):  
<http://cfconventions.org/>
  - XML (used by CF checker)
  - HTML
  - KWIC Index
- Terms submitted as TSV files to NERC vocabulary server  
<http://vocab.nerc.ac.uk/collection/P07/current>
- Mappings submitted as CSV files to NVS2
  - Unit mappings P07 → P06
  - Synonyms for deprecated terms (aliases) P07 -> P07



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# Accessing published vocabularies



# Browse – HTML Table

## Search

Search Standard Names

Show All Standard Names

AND  OR (separate search terms with spaces)

Also search help text

## View by Category

<a href="#">Atmospheric Chemistry</a>	<a href="#">Atmosphere Dynamics</a>	<a href="#">Carbon Cycle</a>	<a href="#">Cloud</a>	<a href="#">Hydrology</a>
<a href="#">Ocean Dynamics</a>	<a href="#">Radiation</a>	<a href="#">Sea Ice</a>	<a href="#">Surface</a>	

### Standard Name

- [acoustic\\_signal\\_roundtrip\\_travel\\_time\\_in\\_sea\\_water](#)
- [aerodynamic\\_particle\\_diameter](#)
- [aerodynamic\\_resistance](#)
- [age\\_of\\_sea\\_ice](#)
- [age\\_of\\_stratospheric\\_air](#)
- [age\\_of\\_surface\\_snow](#)
- [aggregate\\_quality\\_flag](#)
- [air\\_density](#)
- [air\\_equivalent\\_potential\\_temperature](#)

<http://cfconventions.org/Data/cf-standard-names/current/build/cf-standard-name-table.html>

# Browse – KWIC Index (HTML)

a abiotic above absolute absorbed absorption accretion accumulated accumulation acetaldehyde acetic aceto acetone acid acids acoustic across added adiabatically adjusted adjustment advection aerodynamic aerosol aft age aggregate aggregation agricultural air albedo alcohols aldehydes alkalinity alkanes alkenes all along alpha altimeter altitude ambient ammonia ammonium amount amplitude analogue angle angstrom angular anomaly anthropogenic apparent approximation aqueous aragonite area aromatic artefacts artificial ash assuming astronomical asymmetry atmosphere atom atomic attenuation attenuated attenuation autoconversion automated available average aviation away azimuth

b background backscattering backwards bacteria balance band baroclinic barometric barotropic basal base based baseflow beam beaufort bedrock below benzene bergeron beta bias bidirectional biharmonic binary biogenic biological bioluminescent biomass black boundary boussinesq brightness bromide bromine brox brunt bulb burned burning butane

c calcareous calcite calving canopy capacity carbon carbonate carbonyl cations cell center central cfc11 cfc113 cfc113a cfc114 cfc115 cfc12 change channel charnock chemical chloride chlorinated chlorine chloroform chlorophyll classification clay clear clearance climatology cloud clox coarse coefficient collocation colony colored combustion commercial component compounds compressive concentration condensation condensed conductivity congelation conservative consumption contact containing content convection convective conversion coordinate coriolis corrected correction course covariance cover cox crest critical crop crosswave crystals current cyanide cyclone

mole\_concentration\_of\_carbonate\_abiotic\_analogue\_expressed\_as\_carbon\_in\_sea\_water  
mole\_concentration\_of\_dissolved\_inorganic\_carbon\_abiotic\_analogue\_in\_sea\_water  
sea\_water\_ph\_abiotic\_analogue\_reported\_on\_total\_scale  
surface\_carbon\_dioxide\_abiotic\_analogue\_partial\_pressure\_difference\_between\_sea\_water\_and\_air  
surface\_downward\_mass\_flux\_of\_13C\_dioxide\_abiotic\_analogue\_expressed\_as\_13C  
surface\_downward\_mass\_flux\_of\_14C\_dioxide\_abiotic\_analogue\_expressed\_as\_carbon  
surface\_downward\_mass\_flux\_of\_carbon\_dioxide\_abiotic\_analogue\_expressed\_as\_carbon  
surface\_partial\_pressure\_of\_carbon\_dioxide\_abiotic\_analogue\_in\_sea\_water  
flood\_water\_duration\_above\_threshold  
fraction\_of\_time\_with\_sea\_ice\_area\_fraction\_above\_threshold  
geoid\_height\_above\_reference\_ellipsoid  
height\_above\_geopotential\_datum  
height\_above\_geopotential\_datum\_at\_top\_of\_atmosphere\_model  
height\_above\_mean\_sea\_level  
height\_above\_reference\_ellipsoid  
height\_above\_sea\_floor  
histogram\_of\_backscattering\_ratio\_in\_air\_over\_height\_above\_reference\_ellipsoid  
histogram\_of\_equivalent\_reflectivity\_factor\_over\_height\_above\_reference\_ellipsoid  
number\_of\_days\_with\_air\_temperature\_above\_threshold

# CF Standard Name Table XML

```
<entry id='`mass_fraction_of_ozone_in_air`'>  
  <canonical_units>1</canonical_units>  
  <description> Mass fraction is used in the  
  construction mass fraction of X in Y. It  
  means the ratio of the mass of Y to the mass  
  of X (including Y)</description>  
</entry>
```

```
<alias id='`mole_fraction_of_o3_in_air`'>  
  <entry_id>mole_fraction_of_ozone_in_air</entry  
  _id>  
</alias>
```

# NERC Vocabulary Server (NVS2)

**Collection (complete vocabulary):**

[vocab.nerc.ac.uk/collection/P07/current/](http://vocab.nerc.ac.uk/collection/P07/current/)

(CF standard names)

**Single term:**

<http://vocab.nerc.ac.uk/collection/P07/current/CFV16A1/>

(age\_of\_sea\_ice)

OR

**Single term:**

[http://vocab.nerc.ac.uk/standard\\_name/age\\_of\\_sea\\_ice/](http://vocab.nerc.ac.uk/standard_name/age_of_sea_ice/)

# NVS2 Example

## ↑ -- age\_of\_sea\_ice --

URI <http://vocab.nerc.ac.uk/collection/P07/current/CFV16A1/>

Identifier () SDN:P07::CFV16A1

Preferred label (en) **age\_of\_sea\_ice**

Alternative label ()

Definition (en) "Age of sea ice" means the length of time elapsed since the ice formed. "Sea ice" means all ice floating in the sea which has formed from freezing sea water, rather than by other processes such as calving of land ice to form icebergs.

Version Info () 2

Has Current Version <http://vocab.nerc.ac.uk/collection/P07/current/CFV16A1/2/>

Has Version <http://vocab.nerc.ac.uk/collection/P07/current/CFV16A1/1/>

PAV Version () 2

PAV Authored On () 2018-07-03 16:09:23.0

Deprecated() false

Same as [http://mmisw.org/ont/cf/parameter/age\\_of\\_sea\\_ice](http://mmisw.org/ont/cf/parameter/age_of_sea_ice)

Same as [http://vocab.nerc.ac.uk/standard\\_name/age\\_of\\_sea\\_ice/](http://vocab.nerc.ac.uk/standard_name/age_of_sea_ice/)

Broader <http://vocab.nerc.ac.uk/collection/P02/current/IAGE/>

Related <http://vocab.nerc.ac.uk/collection/P06/current/UYRS/>

Date () 2018-07-03 16:09:23.0

**MAPPINGS (SKOS)**

# CF collections in NVS2

CF standard\_names: P07

CF area\_type list: P29

CF standardized region list: P30

CF cell\_methods list: P15

CF calendars: P37

CF vertical coverages: P38

Access methods: URL, SOAP, SPARQL endpoint

SPARQL: XML, JSON, text, CSV and TSV



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# **CF standard names – what next?**

# What next? (1)

- The CF standard name table continues to grow – names for both modelled and observed quantities will continue to be added
- A few standard names are used as pointers to external vocabularies:
  - Land cover
  - Biological taxa

This provides a mechanism for benefitting from the work of other communities and may be needed increasingly in the future



# What next? (2)

- Ontologies

<https://github.com/cf-convention/discuss/issues/51>

- RDA “I-ADOPT” Working Group – “Interoperable Descriptions of Observable Property Terminologies”

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

- Joining the dots: there is no question that CF, including standard names, must interface gracefully with the work of other communities. There is much to be done!

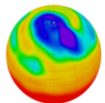


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# Thank you!

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