CF Standard Names

CF Meeting
June 9-11 2020

Alison Pamment

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 psl(lat,lon) ;
   psl:units = “hPa” ;
   psl: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
air_temperature_anomaly “Anomaly" means difference from climatology. Air temperature is the bulk temperature of the air, not the surface (skin) temperature.	**K**
surface_upward_latent_heat_flux 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.	**W m-2**

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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’

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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-2 s-1)

net_downward_**longwave_flux**_in_air_assuming_clear_sky (W m-2)

Canonical units

- Canonical units are agreed at same time as standard name – they go hand in hand, e.g.
    - mass_concentration → kg m-3
    - mole_concentration → mol m-3
- 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

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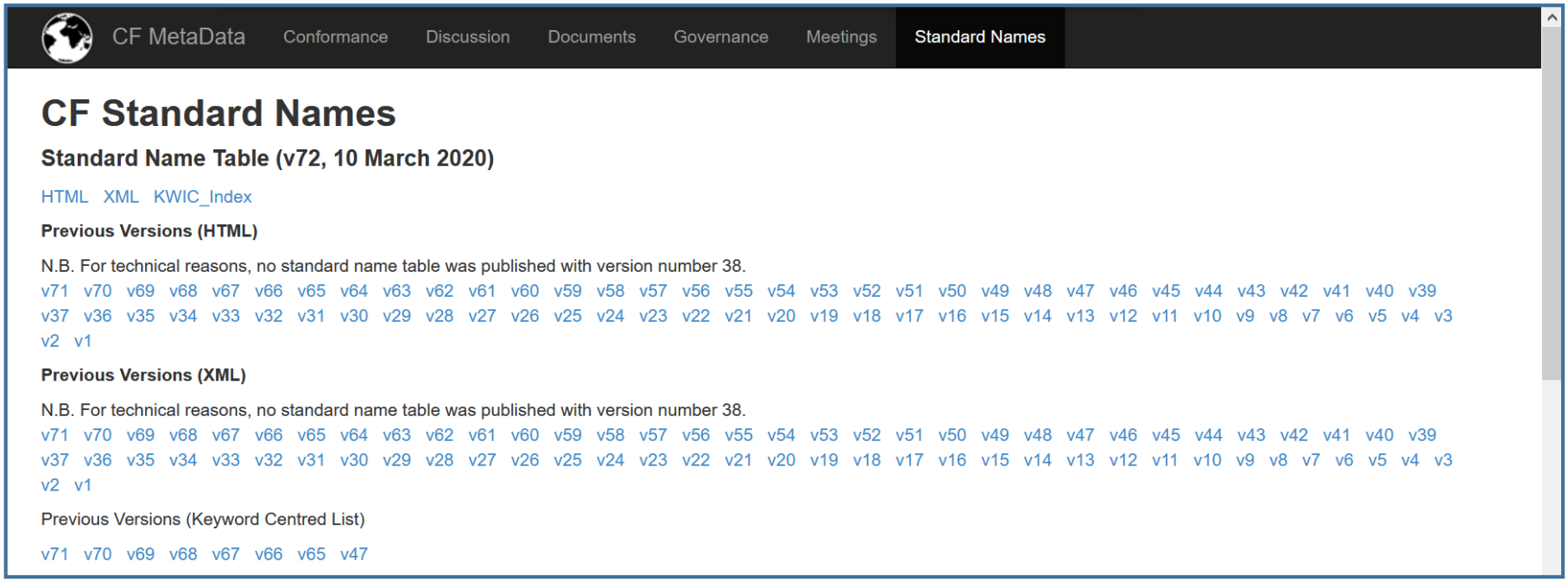
Standard names process

Browsing published names

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

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



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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

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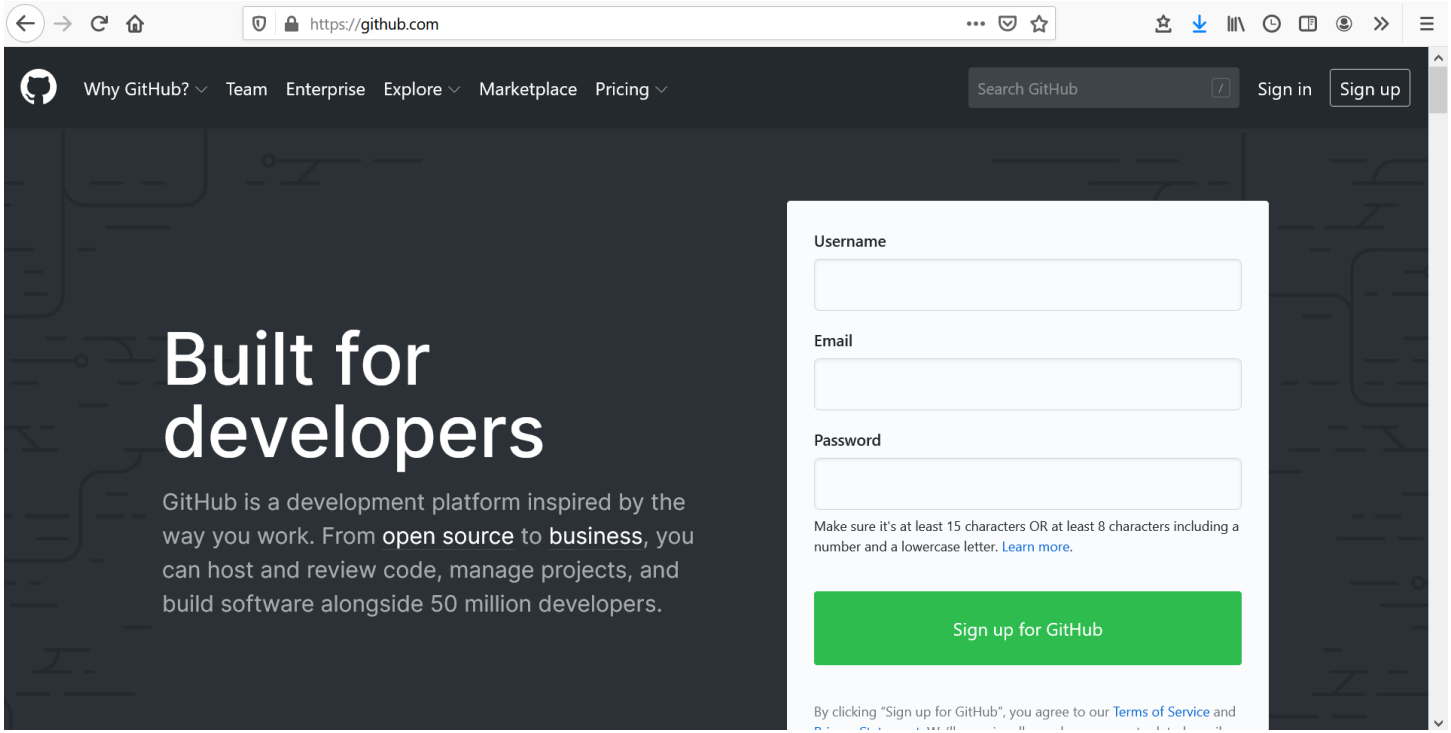
How do I ask for a new standard name?

STEP 1

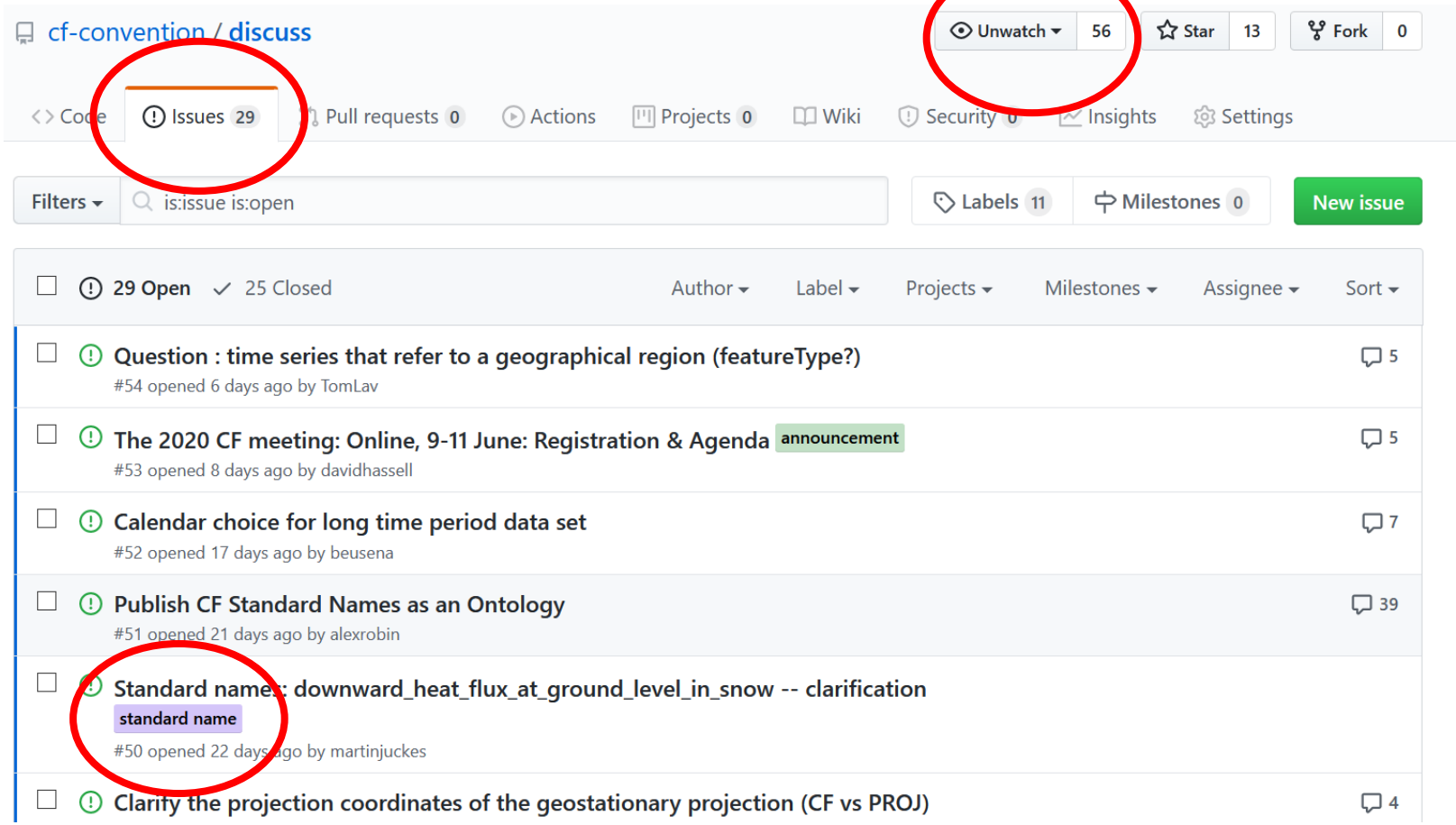
Sign up for an account on GitHub
https://github.com/



How do I ask for a new standard name?

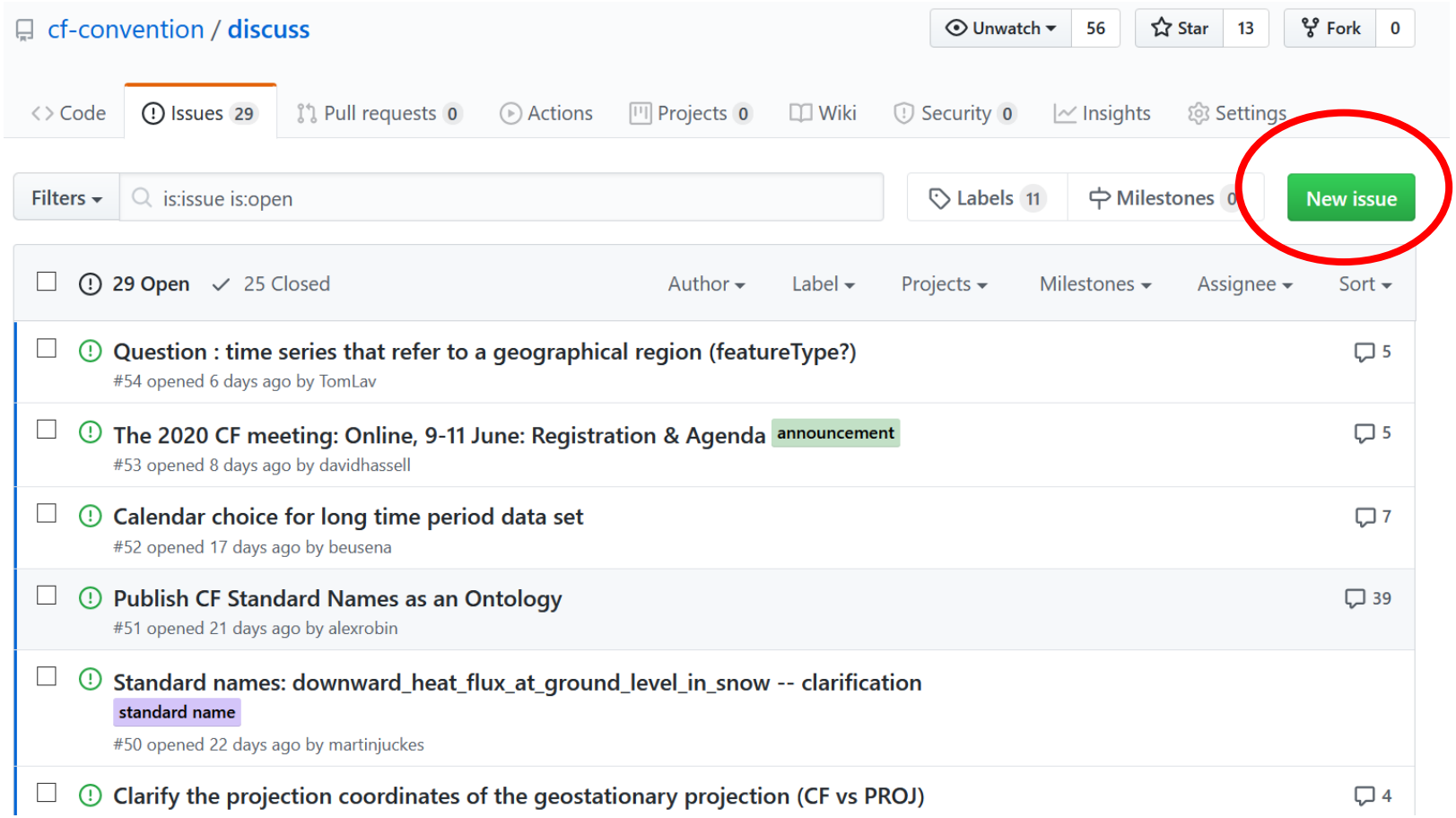
STEP 2

Navigate to the CF “discuss” repository (repo)
https://github.com/cf-convention/discuss



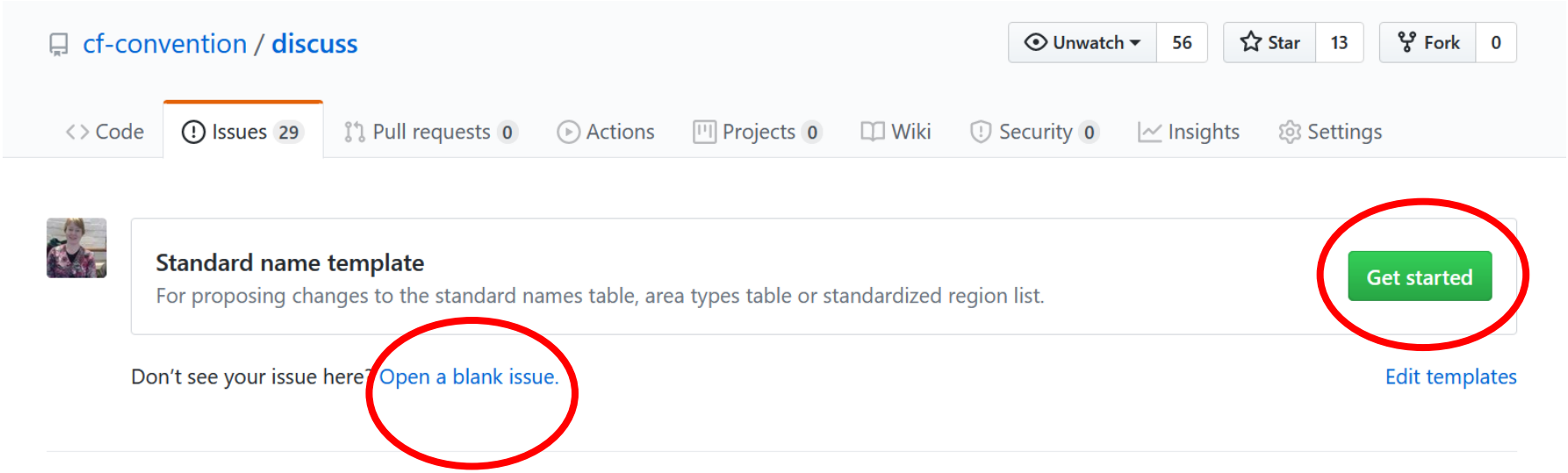
How do I ask for a new standard name?

STEP 3 Open a new issue



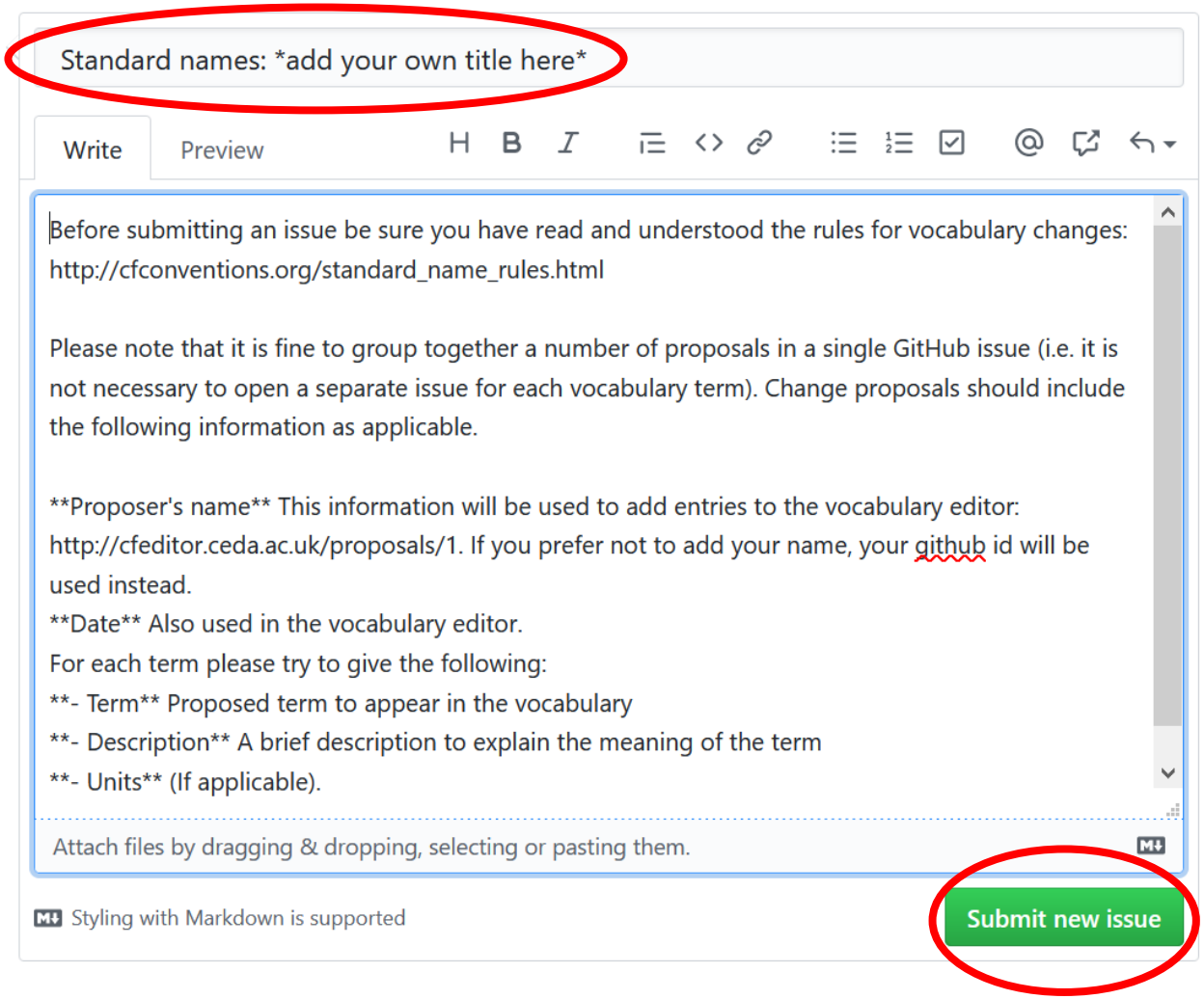
How do I ask for a new standard name?

STEP 4 Select the standard name template



How do I ask for a new standard name?

STEP 5 Use the template to write your proposal



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
- 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 Brönner

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-1 (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 Brönner

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-1 (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.

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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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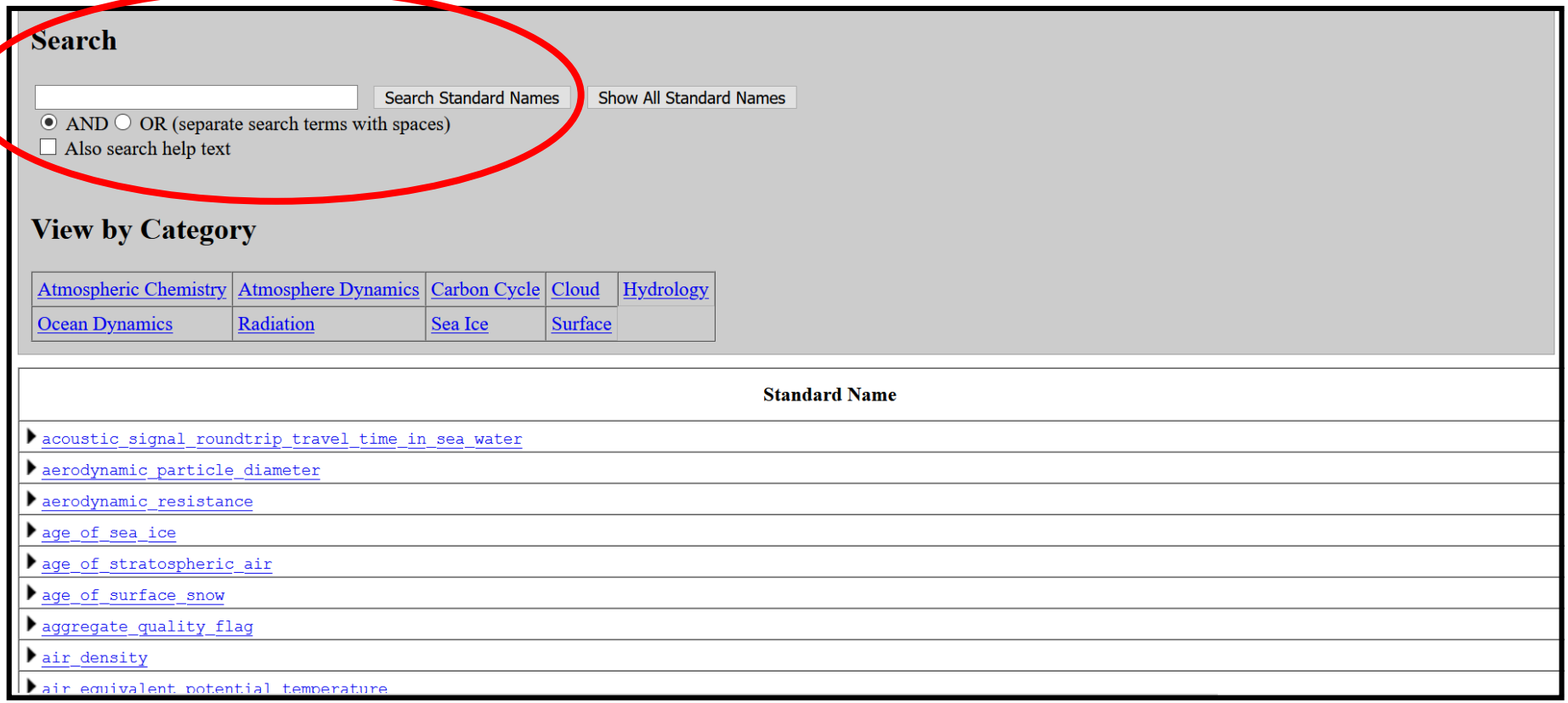
Accessing published vocabularies

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

Atmospheric Chemistry	Atmosphere Dynamics	Carbon Cycle	Cloud	Hydrology
Ocean Dynamics	Radiation	Sea Ice	Surface	

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

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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 attenuance 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

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http://cfconventions.org/Data/cf-standard-names/current/build/kwic_index_for_cf_standard_names.html

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>
```

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NERC Vocabulary Server (NVS2)

Collection (complete vocabulary):
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/

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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
Same as	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)

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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

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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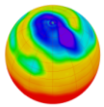
Thank you!

NCAS work on CF is additionally supported by the IS-ENES3 project funded by the European Union's Horizon 2020 research and innovation programme under grant agreement No 824084.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is-enes
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