Standard names analyses and tooling: aims and preliminary work

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Building on related work by Jonathan Gregory (NCAS, UoR & MOHC)

2021 CF Workshop, CF Standard Names session
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Outline

- The set of all CF Standard Names forms a *very interesting data set* from numerous perspectives!
  - Can be seen (largely) as a list of the precise and systematically-formed names of physical geophysical quantities in active usage
  - **Grammar**: both the phrases that make up each name (**lexicon**) and their **syntax** (rules for assembling the phrases) are informative
- Can we pick out patterns across the latest table? What can this analysis of the full set of names tell us?
- Ultimately, we hope analysis of the names can allow us to develop tools to streamline the proposal and/or acceptance process e.g. a bot to make suggestions

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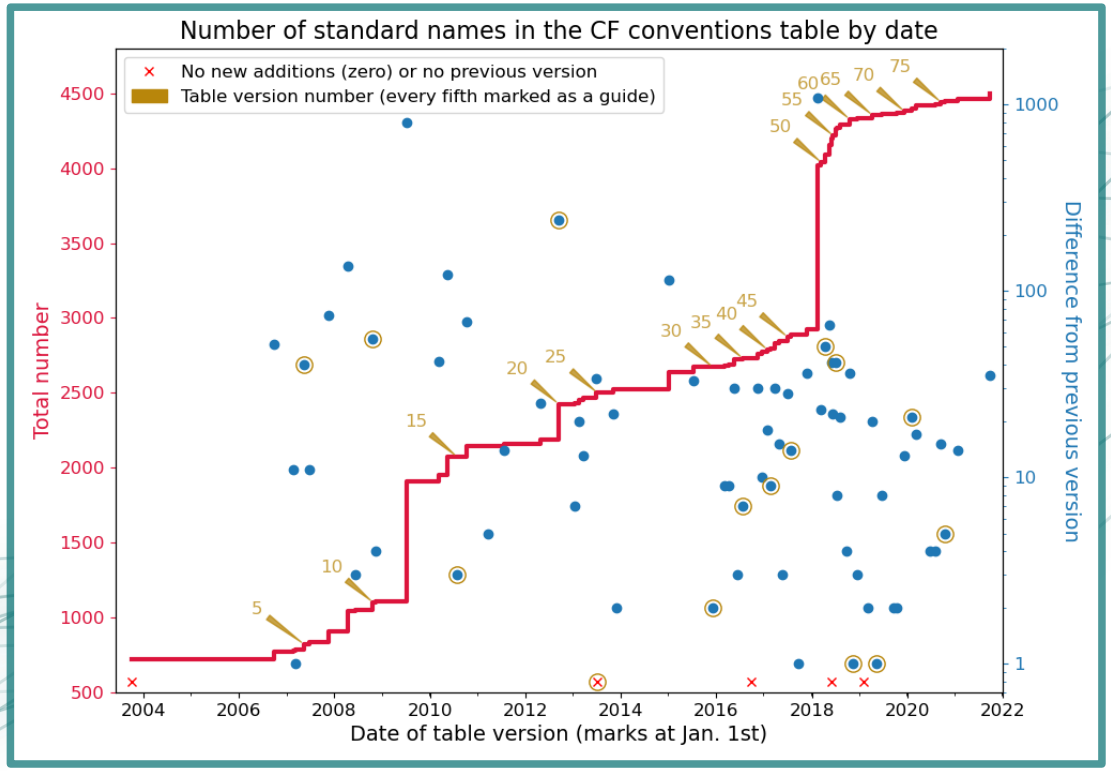
History

Table v.78 released today has **4495** Standard Names! That is 35 more than v.77 released back in January ‘21.



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Background

- Several years ago, Jonathan conducted grammatical study & analyses for table v.14 (released ~2010); we'd like to take it forward with the current, much larger table, and extend it.
- For example, let's discuss a tiny sub-sample of the table:
  - downward_northward_momentum_flux_in_air
  - downward_northward_momentum_flux_in_air_due_to_diffusion
  - downward_water_vapor_flux_in_air_due_to_diffusion
  - downwelling_longwave_flux_in_air
  - downwelling_longwave_flux_in_air_assuming_clear_sky
  - downwelling_longwave_radiance_in_air
  - downwelling_radiance_per_unit_wavelength_in_air
  - downwelling_radiative_flux_per_unit_wavelength_in_air

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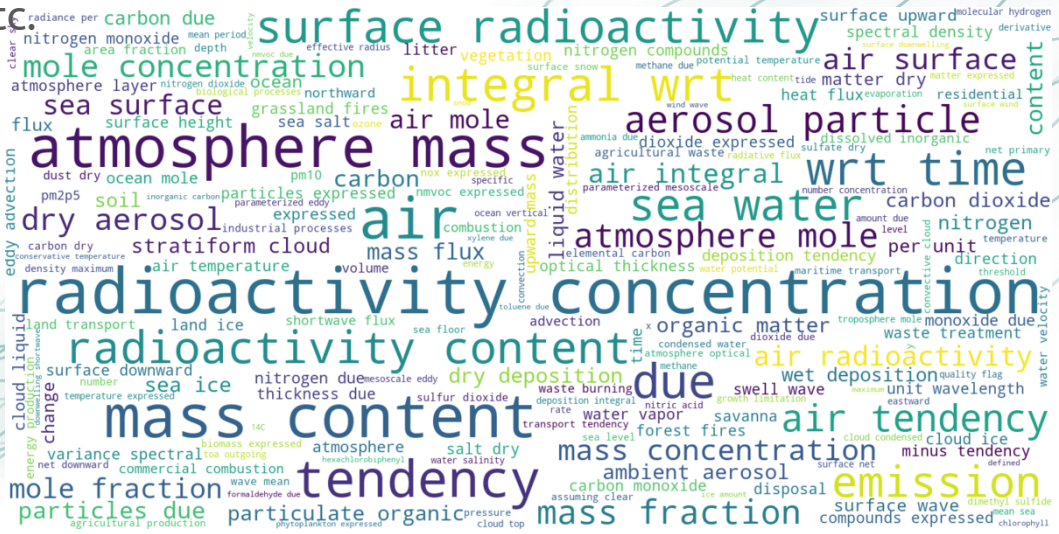
Analysis methods

- Such analysis comes under the umbrella of **linguistics**
- Luckily there are numerous mature and powerful tools for doing this kind of analysis (i.e. computational linguistics) with our language of choice, Python
- Libraries that can help analyse the names include NLTK (Natural Language Toolkit), SpaCy, Pattern, TextBlob
- I have started with the lighter tool TextBlob (see textblob.readthedocs.io/en/dev/) which wraps NLTK with simpler syntax, though will move to a more comprehensive and powerful tool next

Some preliminary results

- Initial analysis was on the *lexical* side (looking at the underlying *phrases*) and focused on finding the so-called **n-grams, contiguous sequences of words**
  - e.g. a single word is *n=1*, a *uni*gram, a two-word phrase is *n=2*, or a *bi*gram, etc.



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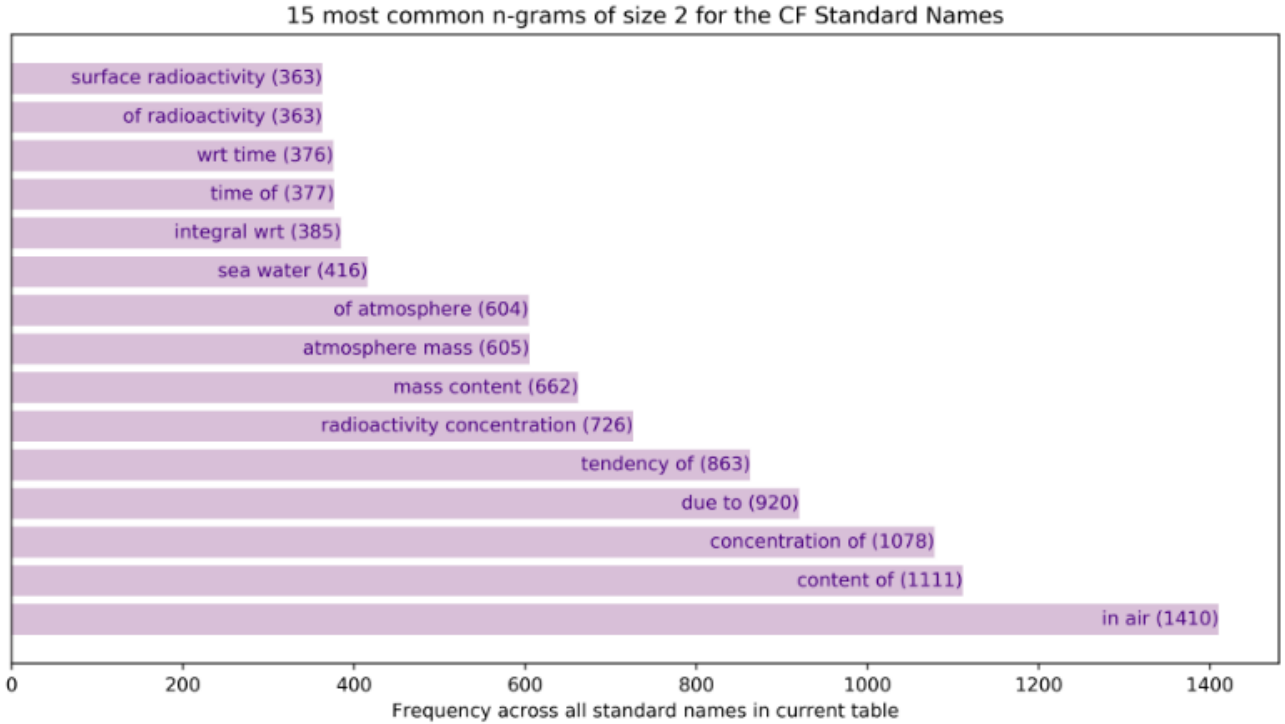
Some preliminary results



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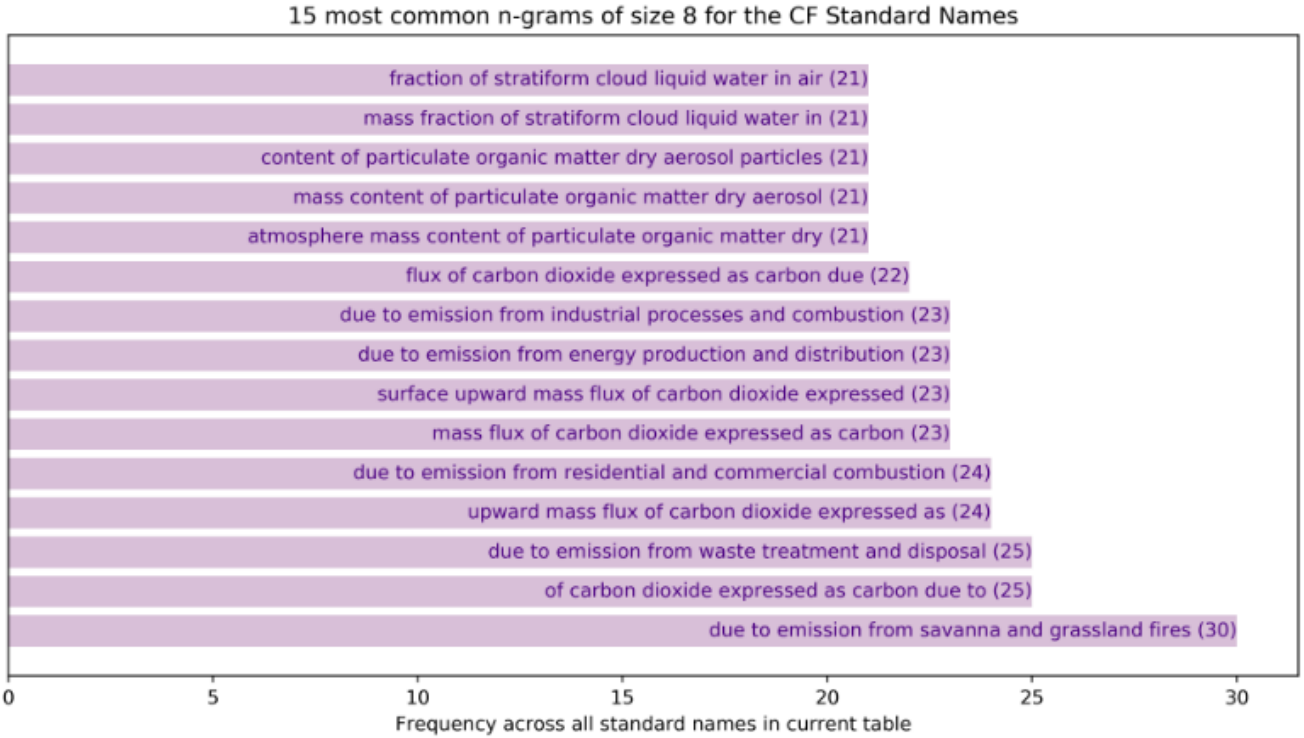

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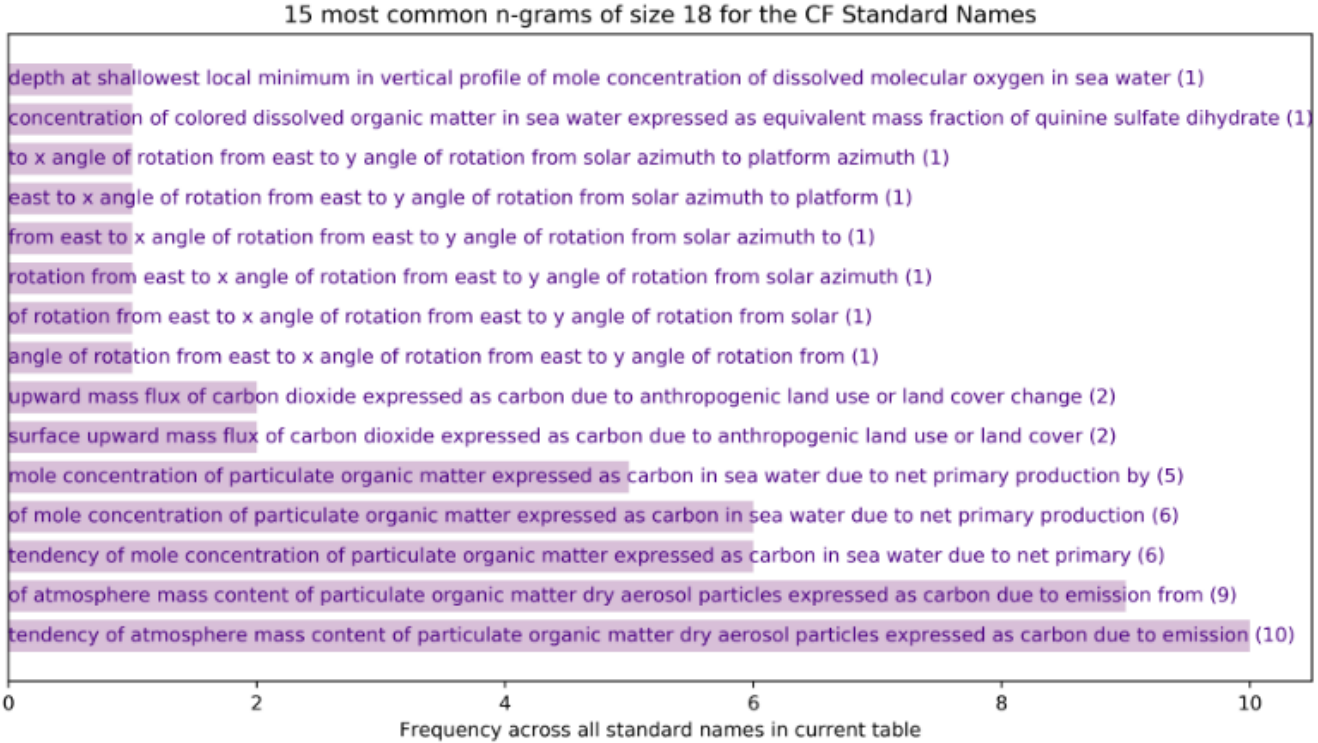

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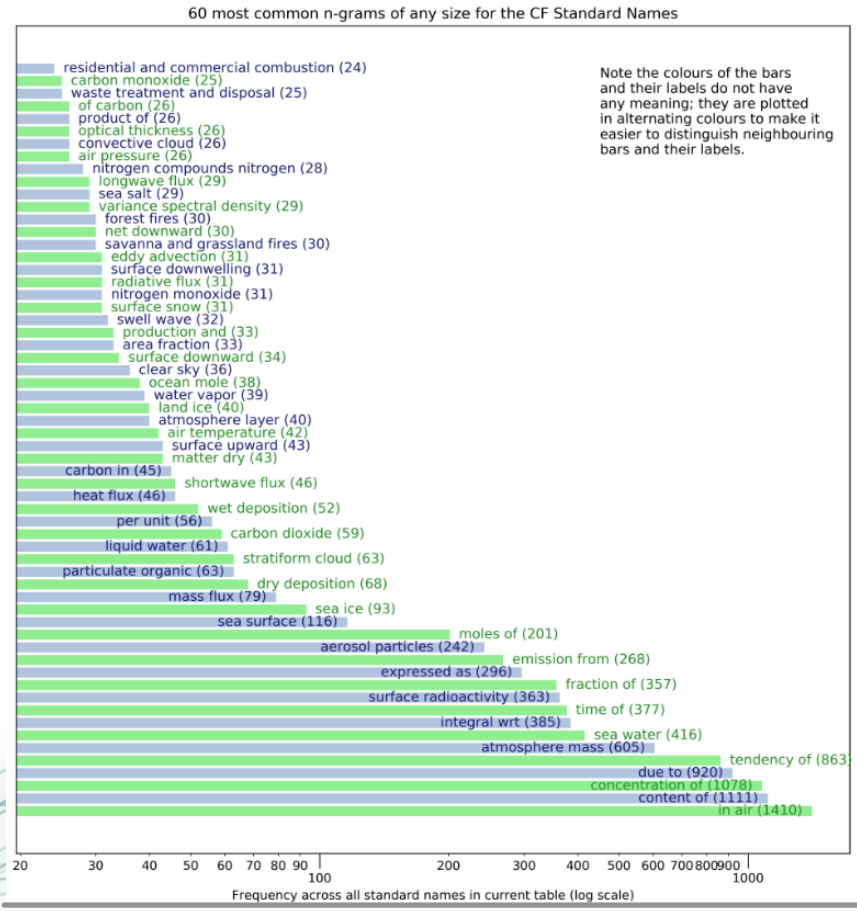

Some preliminary results

- In this case, we look for most common *n*-gram of any *n*, but removing it once found

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Thanks for listening. Any questions?

Do you have any ideas about tools that you think could streamline the standard names proposal process? If so, please email *sadie.bartholomew@ncas.ac.uk*. I'd be interested to hear your thoughts!

- Quick links related to the talk:
  - Jonathan's original work on 'Parsing CF standard names': www.met.rdg.ac.uk/~jonathan/CF_metadata/14.1/
  - Repository where I am storing code for the analyses: github.com/sadielbartholomew/cf-standard-names-linguistics
  - Dedicated webpage to display key results from the above: sadielbartholomew.github.io/cf-standard-names-linguistics/
  - A relevant open issue regarding Standard Name tooling: github.com/cf-convention/discuss/issues/88

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