

SGRID Conventions

<https://github.com/cf-convention/cf-conventions/issues/357>

The existing SGRID convention is published here:

<https://sgrid.github.io/sgrid/>

And managed in this gitHub project:

<https://github.com/sgrid/sgrid>

There is a (old!) issue here about bringing it into CF:

<https://github.com/sgrid/sgrid/issues/17>

Summary Notes:

The SGRID (Staggered Grid) conventions were developed over ten years ago to provide a way to specify the relationship between variables associated with logically rectangular grids.

- Rectangular, curvilinear ...
- Variables can be “on” different parts of a grid cell:
 - “On” the nodes:
 - “On” the edges: e.g. flux through a cell side
 - “On” the cell itself: e.g. average over a cell, etc.

Primarily for the results from oceanographic and meteorological models.

It is mostly meta-data that clearly specifies what models currently output – little change expected in what gets written.

- The connectivity of the cells is defined by the logically rectangular structure: i.e. cell i is next the cells $i-1$ and $i+1$

SGRID has been in use by at least a few communities for some years: many ROMS model implementations, e.g. XCGM, python gridded package.

Parallels the inclusion of the UGRID standard for unstructured grids.

An Issue was started on the topic of CF inclusion in gitHub many years ago. Discussion is continuing there:

- <https://github.com/sgrid/sgrid/issues/17>

Topics for Discussion in this Hackathon:

High level Topics:

(maybe self explanatory)

- Why should SGRID be in CF at all? What problem(s) does it solve?
- Is there an alternative standard out there?

Specifics:

What are folks currently using?

- Komodo conventions – still supported? (XGCM went to SGRID)
- SGRID has been *somewhat* adapted.

Handle 3D?

- Not discussed

The XGCM docs have a fair bit of explanation around grid structures and averaging operations: <https://xgcm.readthedocs.io/en/latest/index.html>

How many grids are implied by the model that produces the data?

- One, or one per stagger?
- It's one grid in the sense that we call it an "Arakawa-C grid"

Is it *adding* to description by describing the relationship between existing coordinates

- Should CF require the existing metadata, even though some of it can be inferred from the SGRID description?

Many use cases (e.g. CMIP that has one variable profile) do not need the SGRID relationships.

CF can be confusing when it does not express the physical relationship between variables at different stagger locations

- Can't "just interpolate" at boundaries.

Do we think that this is a worthwhile venture?

- Use case: oil spill modelling. I want to know the velocities everywhere, and T, salinity, etc. I need to accurately interpolate the values coming out of the model as best as I can, and I can only do that if I know the structure of the actual grid. The model does things on the face (for conservation)
 - Why can't you just interpolate (u onto T grid)?
 - How does knowing the staggering change how you would do the interpolation?
 - The model advects parcels of water (not particles)
- Some code today says "if ROMS model, do this..." it would be nice for this to be self describing so you don't need to specify ROMS

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It seems that there isn't a way to know which are the "horizontal" and "vertical" edges . Is that right?

- One's latitude, one's longitude. (that sounds odd to me DCH)
- *Missed a bit ...*

SGRID only applies to logically rectangular grids.

The distinction between a value on an edge or point is clear....

Is there a less general way of solving the problem for stagger grid models?

It would be good to go back to Bert Jaegers to find out about the motivations for developing SGRID in the first place: e.g why not just specifically Arakawa grids, for example? Are there other options.

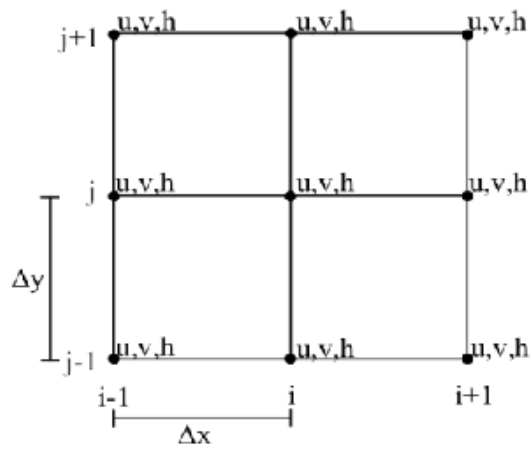
Is SGRID actively maintained?

- We're not sure, but that's probably OK either way (cf. UGRID)

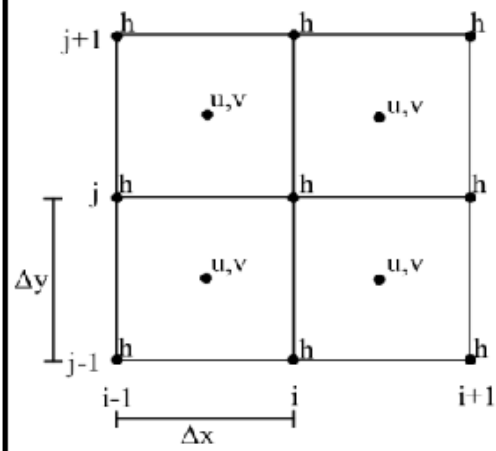
We encounter a similar problem where we have multi-resolution UGRID-like grids with one grid further dividing the previous : we need some way (language) to describe how the grids relate. It's a totally similar question whether you can generalise that, or just label a simple common case

S. N. Collins, R. S. James, P. Ray, K. Chen, A. Lassman, and J. Brownlee (2013): Grids in Numerical Weather and Climate Models', Climate Change and Regional/Local Responses. InTech, May 22, 2013. doi:
<http://dx.doi.org/10.5772/55922>

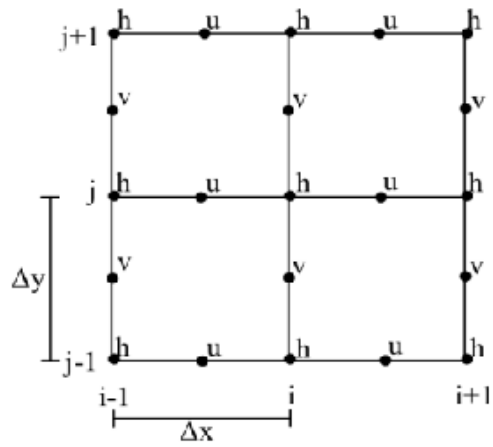
(a) A grid



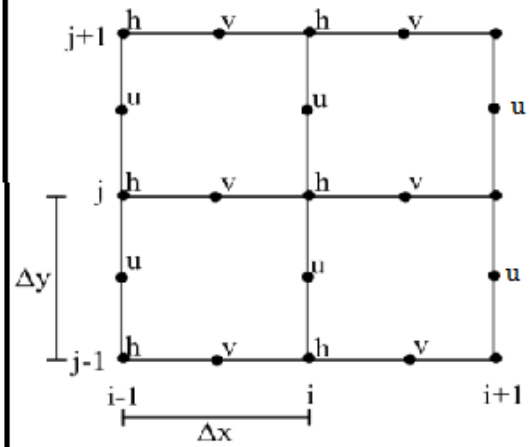
(b) B grid



(c) C grid



(d) D grid



(e) E grid

