Resolutions

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LFM Grid Resolution

The LFM grid is available in several resolutions and operates most efficiently on the following processor counts:

- single: 53x24x32 cells on 8 processors
- double: 53x48x64 cells on 24 processors
- quad: 106x96x128 cells on 144 processors

Grid resolution and processor distribution must be specified at compile time. You can compile a particular model at a particular resolution via the following command:

```
gmake [input-code] RESOLUTION=[input-resolution]
```

where `[input-code|input-code]` is one of:

- LFM
- LFM-MIX
- LFM-RCM
- CMIT
- TIEGCM

and `RESOLUTION=[input-resolution|input-resolution]` is one of:

- RESOLUTION=single
  - 53x24x32 grid points
  - Distributed on 8 processors
- RESOLUTION=double
  - 53x48x64 grid points
  - Distributed on 24 processors
- RESOLUTION=quad
  - 106x96x128 grid points
  - Distributed on 144 processors
- custom (advanced users only): You can specify any custom resolution directly by specifying the number of grid points in each direction and number of processors. For example:

  ```
  NI=106 NJ=48 NK=64 NP=32
  ```

Custom resolutions are for advanced users only

It is easy to do something wrong with a custom resolution. The code scales to non-obvious processor counts. For example the double resolution (53x48x64) runs well on 24 processors and scales very poorly on 48. Tread with caution when using custom resolutions.

What is the physical domain of the grid?

Nearly all LFM grids extend to approximately (min, max) Earth Radii along the following axes:

- X-axis (sun-earth line): (-335, 30)
- Y-axis (in ecliptic plane): (-125, 125)
- Z-axis (normal to ecliptic plane): (-125, 125)

We have custom grids for special purposes. These are:

- 64x48x64: Same as above, but the X boundary is exteded to (-335, 90) Earth Radii

> **Note**
>
> Custom physical domains are unsupported. Please talk with us if you would like to run the LFM on this physical domain.

What is the maximal number of processors I can use for my grid?

There are three constraints to determine the maximum number of processors that should be used for a particular grid:

- The LFM uses a 8th-order spatial method in each of the i, j and k directions. Therefore, each processor should have a "minimum of 8 cells" in each direction.
- The grid is decomposed spatially in terms of XY planes (i.e. in i-j space). The grid is currently not parallelized in the k direction.
- The grid decomposition only works for `np > 1`. Using a single processor (`np=1`) may give unexpected results.

A formula to determine the number of processors is:

Unknown macro: 'latex'

Example 1: 53x24x32

For example, using the default Unknown macro: 'latex' on a 53x24x32 grid, Unknown macro: 'latex' and Unknown macro: 'latex'. So

Unknown macro: 'latex'

So you can use up to 18 processors on a 53x24x32 grid.

Example 2: 106x48x64

On a 106x48x64 grid, Unknown macro: 'latex' and Unknown macro: 'latex'. So

Unknown macro: 'latex'

So you can use up to 78 processors on a 106x48x64 grid.