

Description of the planar torus grid

Author 05/2016: F. Prill, DWD

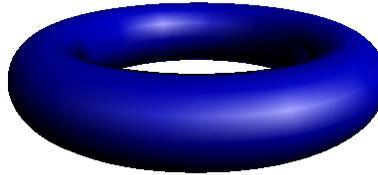


Figure 1: Topological representation of the torus geometry.

The torus grid consists of equal-sided triangles, with edge length `edge_length`, which is a namelist parameter of the grid generator, and height $\frac{\sqrt{3}}{2} \text{edge_length}$, cf. Fig. 2.

The lon-lat parameterization of the torus is

$$(\text{lon}, \text{lat}) = [0, 2\pi] \times [-\text{max_lat}, \text{max_lat}]$$

where $\text{max_lat} := \frac{\pi}{18} \equiv 10$ degrees (hard-coded in the torus grid generator). Variables related to the lon-lat parameterization are stored as the data type `t_geographical_coordinates` in the ICON code.

The Cartesian coordinates of the torus grid are: $v = (x, y, 0)$ where

$$(x, y) = [0, \text{domain_length}] \times [0, \text{domain_height}]$$

The lengths `domain_length`, `domain_height` are stored as global attributes in the grid file. Related to the namelist parameters `x_no_of_columns`, `y_no_of_rows` of the grid generator we have

- `domain_length := edge_length * x_no_of_columns`
- `domain_height := $\frac{\sqrt{3}}{2} * \text{edge_length} * \text{y_no_of_rows}$`

Variables related to the Cartesian mesh are stored as the data type `t_cartesian_coordinates` in the ICON code.

Note The torus geometry and the corresponding global meta-data (NetCDF attributes) are *not* generated by the "standard grid generator" in `src/grid_generator`, but require L. Linardakis' grid generator tool (e.g. available in `branches/icon-test-torus`).

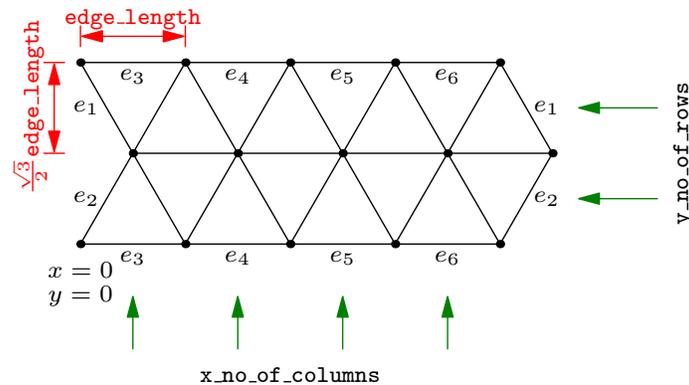


Figure 2: Triangulation of the torus mesh.