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Introduction to element-based computing, finite volume and finite element methods

Wednesday, 11 March 2020 13:30 (1 hour)

The aim of two lectures is to introduce basis of finite volume and continuous finite element discretisations and relate them to corresponding data structures and mesh generation techniques. The main focus will be on unstructured meshes and their application to global and local atmospheric models. Flexibility, communication overheads, memory requirements and user friendliness of such meshes with be contrasted with those of structured meshes. The most commonly used mesh generation techniques will be highlighted, together with mesh manipulation techniques employed in mesh adaption approaches and will be followed by a discussion of alternative geometrical representations of orography. An example of unstructured meshes' implementation to non-hydrostatic and hydrostatic atmospheric solvers will provide an illustration of their potential and challenges.

By the end of the lecture you should be able to:

• understand applicability, advantages and disadvantages of selected mesh generation techniques for a given type of application.

• appreciate importance of data structures in relation to atmospheric models and mesh generation.

• gain awareness of issues related to flexible mesh generation and adaption.

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