Numerical Techniques 2024–2025

0. Welcome

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Postgraduate Studies in Weather and Climate Modeling

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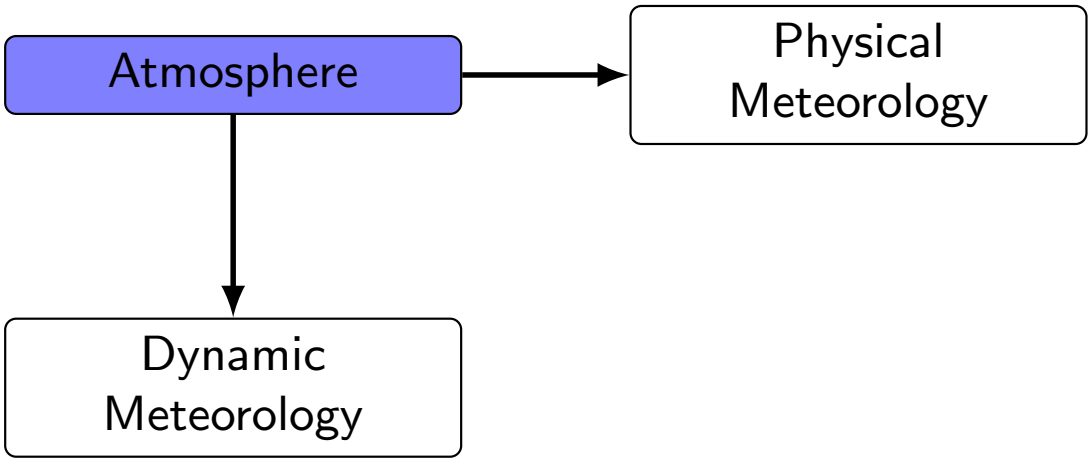
Content

- Welcome
- Context: why numerical techniques
- Objectives of this course
- Course material
- Practical information

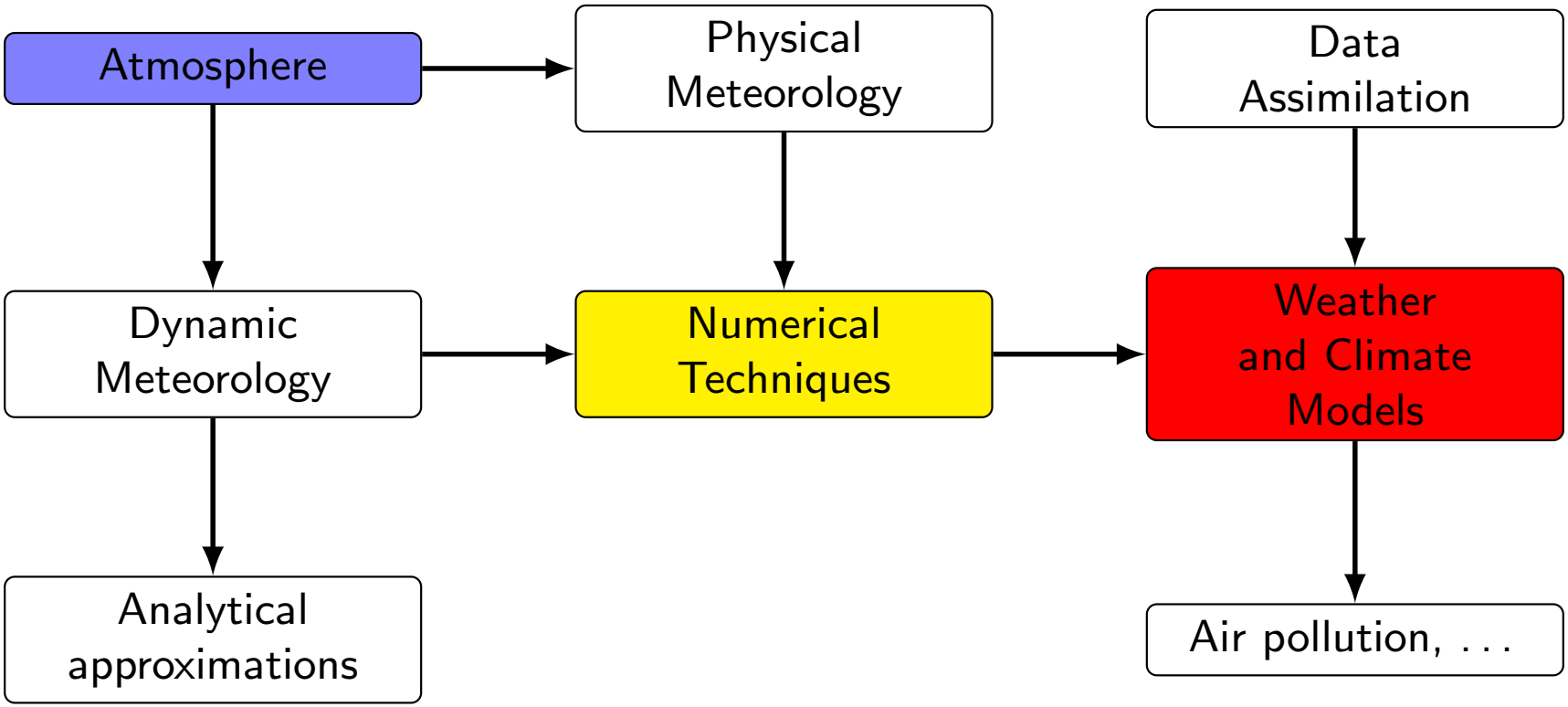
Why numerical techniques?

Atmosphere

Why numerical techniques?



Why numerical techniques?



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- Don't be frightened by code
  . . . but it's no course on programming either!

Course agenda

date	16h00	17h30
23/09	Introduction, Stability	
07/10	Time discretization	(optional) Practicum Python basics
14/10	Space discretization	Practicum Oscillation equation
21/10	Spectral models	Practicum Advection equation
04/11	Nontrivial aspects	Practicum Linux & Fortran
25/11	Semi-Implicit and Semi-Lagrangian models	Project assignment + finish practica
02/12	Parallel computing	Project support session
09/12	AI in Numerical Weather Prediction	Project support session
16/12	Student project presentations	

Course material

- Slides will appear on Ufora
- All material (slides sources, Jupyter notebooks) available on `https://github.com/ddegrauwe/ugent_numtech`
- References:
  - *Numerical Methods for Wave Equations in Geophysical Fluid Dynamics*, Dale R. Durran, Springer, 1999, ISBN 0-387-98376-7.
  - *Chebyshev and Fourier Spectral Methods*, John P. Boyd, Springer, 2001, ISBN 978-3-540-51487-9.
- Some papers (depending on project)

Practical information

- (Check Ufora for modifications to time schedule)
- Practical sessions
  - We will use High-Performance Computing (HPC) infrastructure of UGent: create account on

    `https://www.ugent.be/hpc/en/access/faq/access`
  - access through browser via `https://login.hpc.ugent.be`
  - . . . or you can just install Linux on your laptop
- Programs needed: python, Jupyter notebooks
- Evaluation: student project (2/3/4 persons) on simple model
  - presentation for other students
  - (small) report

Questions?