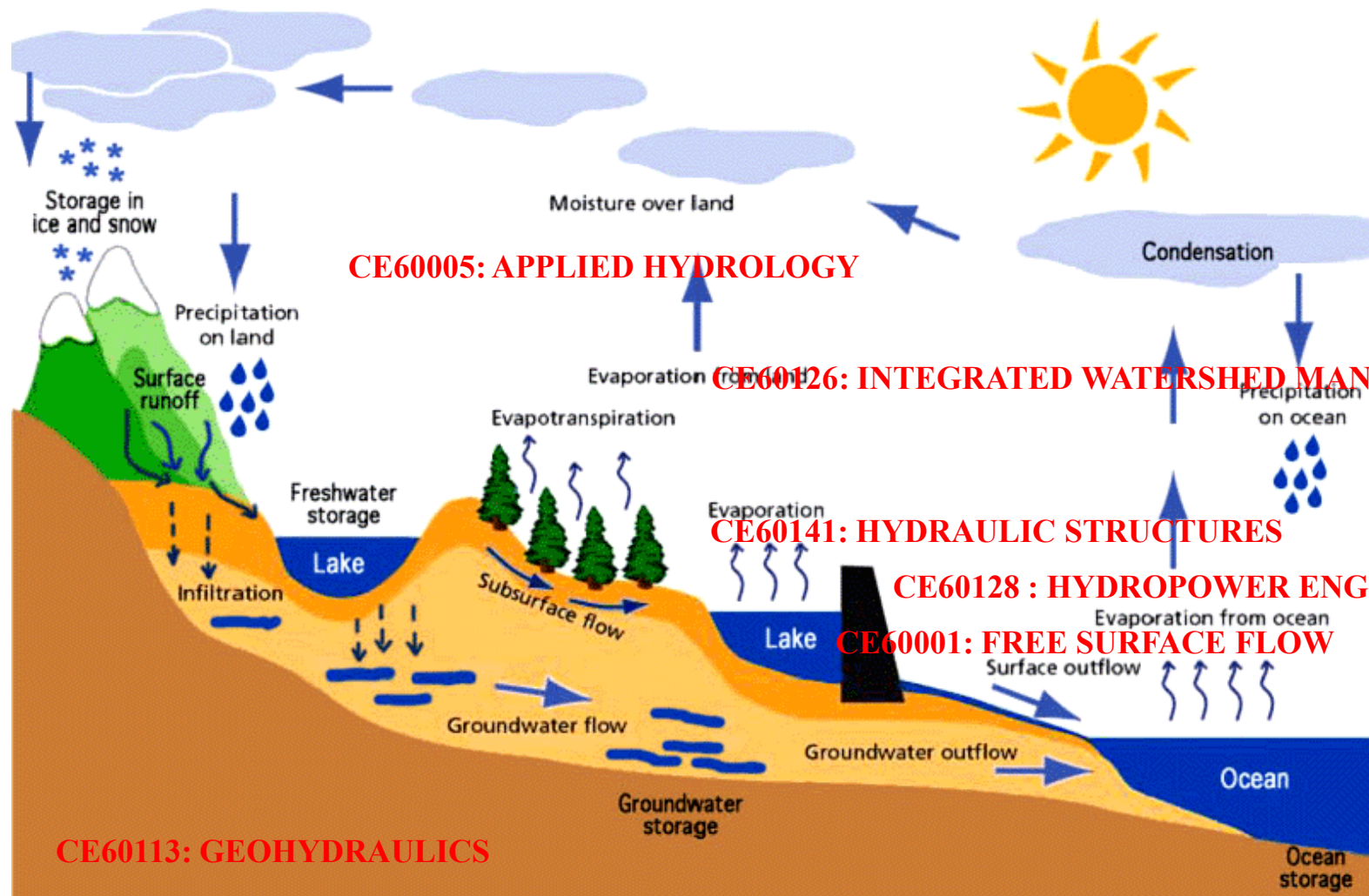# Week 01

Computational Hydraulics| CE60242
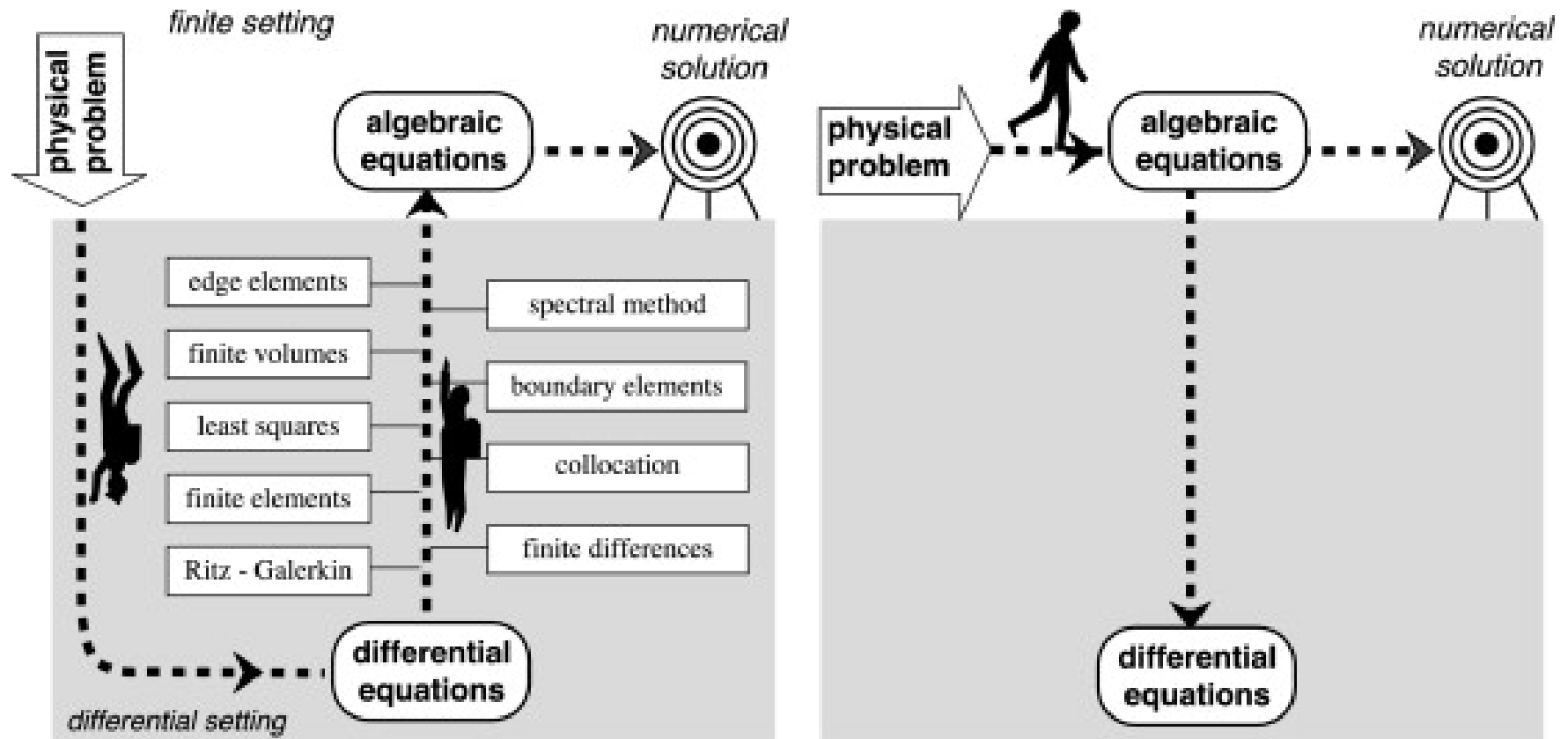
Class: 01

Course Details

- **Instructor:** Anirban Dhar

- **IIT Kharagpur Course Number:** CE60242

- **As Taught In:** Spring 2022-2023

- **Level:** Under Graduate/Post Graduate/Research

- **Teaching Assistant(s)**: -

CE20006: WATER RESOURCES ENGINEERING

CE60005: APPLIED HYDROLOGY

CE60126: INTEGRATED WATERSHED MANAGEMENT

CE60141: HYDRAULIC STRUCTURES

CE60128 : HYDROPOWER ENGINEERING

CE60001: FREE SURFACE FLOW

CE60113: GEOHYDRAULICS

Course Objective

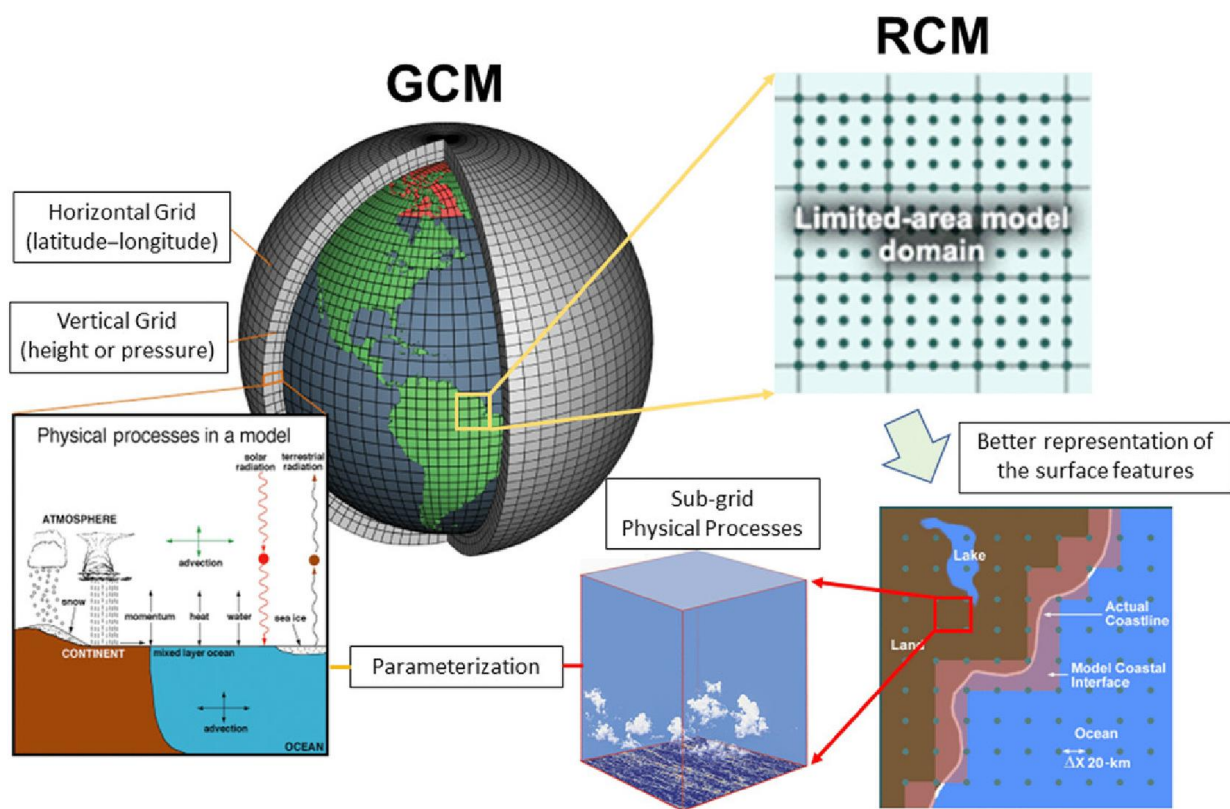# Syllabus

- Introduction to Computational Hydraulics: Problem Definition and Governing Equations, Classification of Problems based on Initial Condition (IC) and/or Boundary Condition (BC), Classification of Differential Equations,

- Numerical Methods: Finite Difference Method, Finite Volume Method, Mesh-Free Method,

- Discretization of IVP, BVP, IBVP, Numerical Stability, Convergence,

- Solution of Algebraic Equation (Linear and Nonlinear solvers),

- Groundwater Flow,

- Pipe Flow,

- 1D Open Channel Flow: GVF, SVF, RVF, Network,

- 2D Surface Water Flow: SWE,

- Interaction Hydraulics: Groundwater Flow, Surface Flow, Pipe Flow, Channel Flow

General Circulation Model
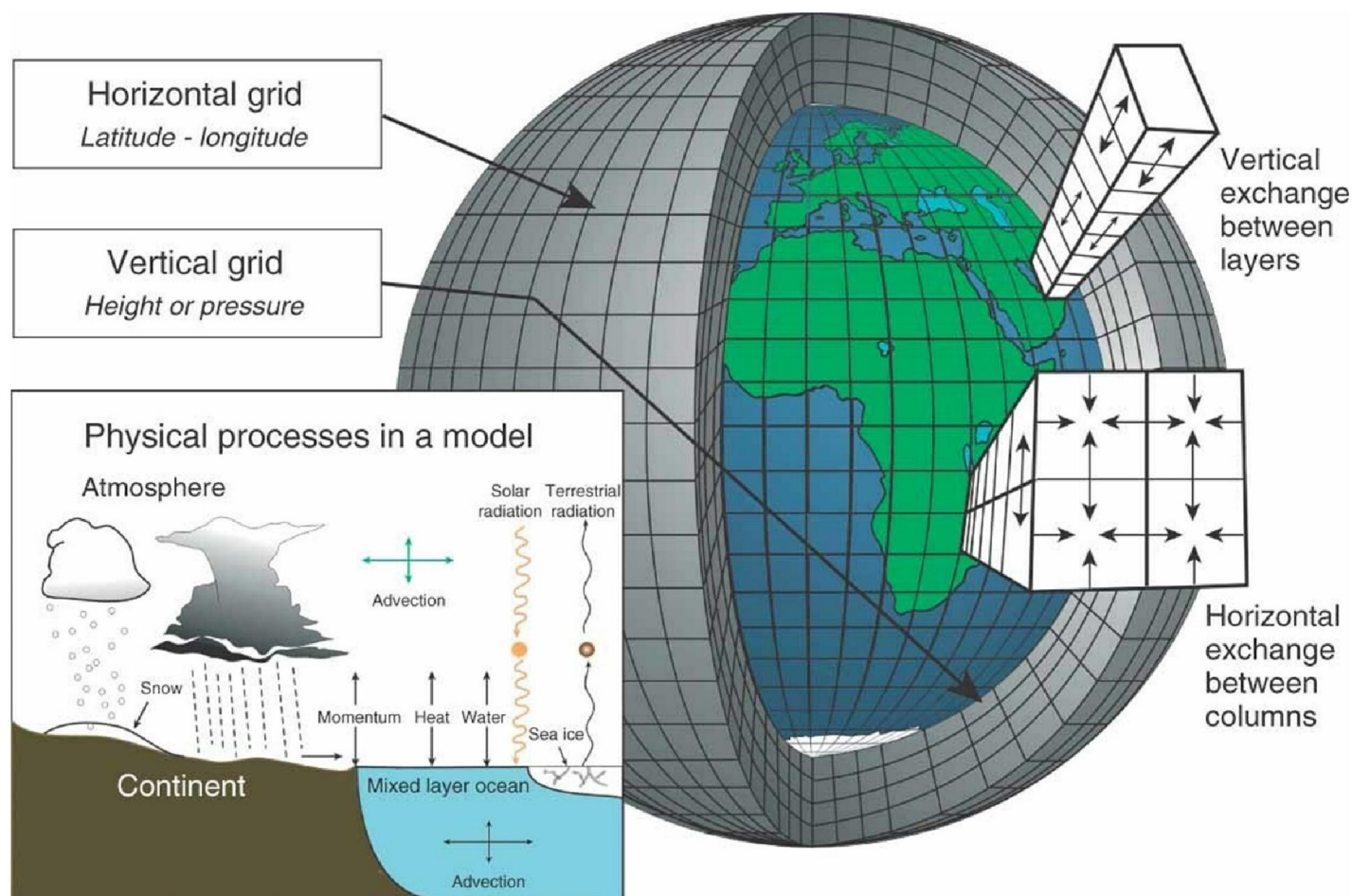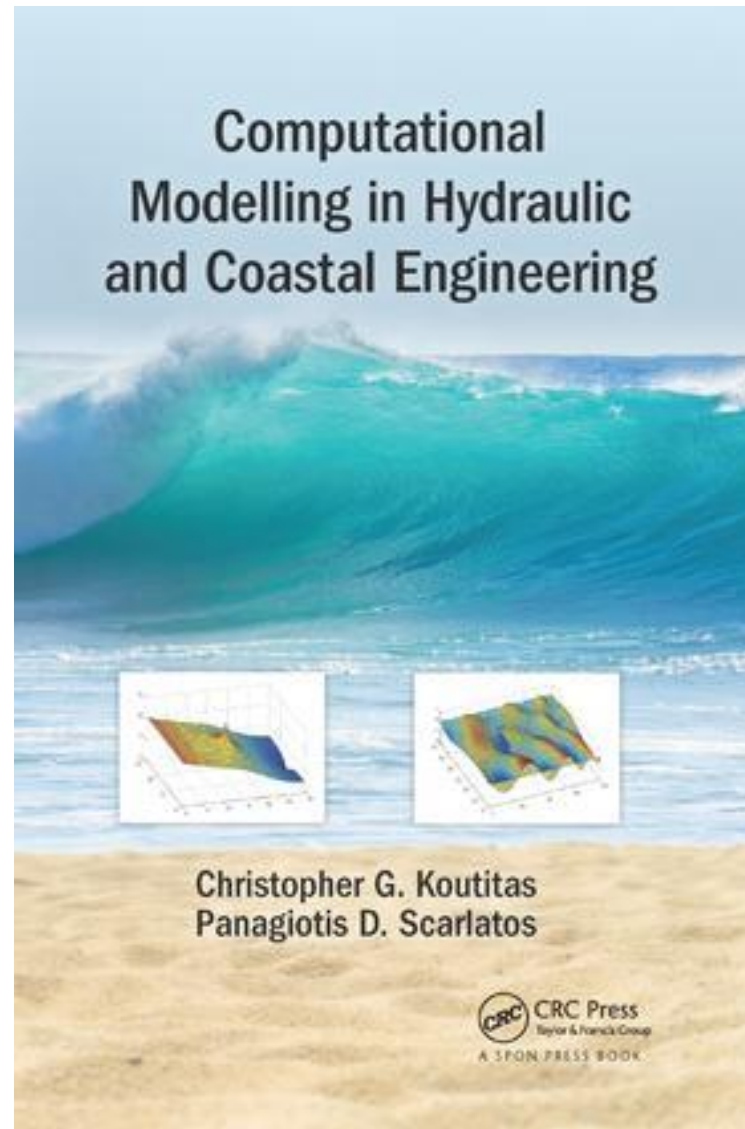
Regional Climate Model

Discretization

- The discretization should be guided by physical principles as much as possible.

- All good models are fast model but all fast models are not good model

- Computational efficiency is crucial.

Text Book

Computational
Modelling in Hydraulic
and Coastal Engineering

Christopher G. Koutitas
Panagiotis D. Scarlatos

CRC Press
Taylor & Francis Group

A SPON PRESS BOOK

Evaluation Policy

- 10 Assignments/ Minor Class Tests: 50%
- 2 Major Class Tests: 50%
  - Marks: 20 +30
  - Duration: 2 hours + 3 hours

Week 01

- **Module 01: Introduction to Computational Hydraulics**
  - Unit 01: Overview
  - Unit 02: Problem Definition and Governing Equations (GE)
  - Unit 03: Classification of Problems based on Initial Condition (IC) and/or Boundary Condition (BC)
  - Unit 04: Classification of Differential Equations
- **Module 02: Numerical Methods**
  - Unit 01: Overview

Thank you