

AS-313: NONLINEAR MODELS IN CLIMATE SCIENCES

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INSTRUCTOR: Ashwin Seshadri

An introduction to nonlinear dynamics: linearization, bifurcation, chaos; Numerical methods in brief; Model reduction techniques; Derivation and analysis of low order models for the atmosphere, ocean, climate dynamics, and geophysics (e.g., Rayleigh-Bénard convection, vorticity, examples from general circulation, ocean thermohaline circulation, planetary dynamos, energy balance and global warming, ice sheets, ENSO, carbon cycle, examples from paleoclimate), observability and state estimation.

Primary References:

A Provenzale and N Balmforth, Chaos and Structures in Geophysics and Astrophysics

H Dijkstra, Nonlinear Climate Dynamics

E Ott, Chaos in Dynamical Systems

S Strogatz, Nonlinear Dynamics and Chaos, CRC Press

Course notes