

Earth System Science 200: Global Physical Climatology (Fall 2025)
(<http://www.ess.uci.edu/~yu/ess200.html>)

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Tuesdays & Thursdays 12:30-1:50pm, RH184

COURSE DESCRIPTION

This course builds a physical understanding of Earth's climate system. An overview of Earth's climate system and energy budget. Large-scale circulations, key physical processes, and climate sensitivity of the atmosphere, ocean, land surface, and cryosphere.

TEXTBOOKS

Global Physical Climatology (2nd Edition), by Dennis Hartmann, Elsevier Inc. **(required)**

The Earth System (3rd Edition), by Kump et al., Prentice Hall **(optional)**

Meteorology Today (11th Edition), by Donald Ahrens, Brooks/Cole **(optional)**

GRADES

Homework (30%); midterm (35%); Final (35%)

HOMEWORKS

Issue and due every Tuesday

SYLLABUS

Week 1	Introduction to the Climate System (Ch.1) Atmospheric properties and structures World Ocean, land surface, and cryosphere
Week 2	The Global Energy Balance (Ch.2) Planetary energy balance, greenhouse effect Global radiative energy balance, poleward energy flux
Week 2	Atmospheric Radiative Transfer and Climate (Ch.3) Solar and infrared radiation, selective absorption and emission Cloud and radiation, radiative-convective equilibrium
Week 3	The Energy Balance of the Surface (Ch.4) Surface Properties, Storage, Heating, Albedo, Emission Planetary boundary layer, drag, mixing, fluxes
Week 4	Atmospheric General Circulation and Climate (Ch.6) Zonal-mean circulation, eddies Angular momentum, moist static energy
Week 5	The Ocean General Circulation and Climate (Ch.7) Ocean properties and structures, water mass Wind-driven circulation, thermohaline circulation, and transports
Week 6	cont. (Ch.7) & Midterm
Week 7	Cryosphere (Kump et al. 2016; Ch. 6) Glaciers, ice sheets, mass balance, sea-Level
Week 8	Natural Intraseasonal and Interannual Variability (Ch.8) Internal atmospheric variability, El Niño and the southern oscillation, Decadal variations of weather and climate
Week 9	Climate Sensitivity and Feedback Mechanisms (Ch.10) Sensitivity and feedback Water vapor, ice-albedo, cloud, dynamical
Week 10	Natural Climate Change (Ch.12) Natural solar, aerosol, volcanic forcing Past climate changes