

Radiation balance of the Earth and Ocean

Energy balance in the tropics – radiative-convective equilibrium

Radiative-convective model

Surface radiation balance and fluxes

    Turbulent heat fluxes and their parameterized versions

    Momentum fluxes

Net buoyancy at the ocean surface

The oceanic mixed layer

    Monin-Obukhov similarity

    Gradient Richardson number

    Mixing schemes and closure problem

Deep water formation

Review of thermodynamics of atmosphere and ocean

Lab 1: Radiative-convective model

Wave phenomena in the atmosphere and ocean

Review: gravity waves, shallow water equations, equatorial waves

Derivation of Wheeler-Kiladis decomposition

Limitations of Matsuno theory and the inclusion of moisture

Meteorological impacts of equatorial waves

Model simulation of equatorial waves

Lab 2: Convectively-coupled equatorial waves

Variability in the ocean and the atmosphere

Diurnal cycle in tropics: ocean versus land

Convection and thermodynamics

Tri-model distribution of tropical convection

MJO: observations and theories

    CISK, WAVE-CISK and WISHE

MJO and ENSO connections

ENSO theories: unified oscillator

Gill atmospheric model

Model simulations of ENSO

QBO

Decadal variability: observations and mechanisms

Tropical cyclones

Observed structure, incidence

Deep convection and “hot towers”

Formation and intensification

Rossby radius of deformation

GPI, MPI

Drag and exchange coefficients at high wind speeds

Interannual and interdecadal variability

Lab 3: Tropical cyclone simulation

Climate change – current topics

Estimates of climate sensitivity

Feedbacks

Detection and attribution

Effect of clouds

Convective parameterisations

Climate change and ENSO

Climate impacts

Critical review of a journal article