

# Pensum GEF1100 2015

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## Lærebok

ATMOSPHERE, OCEAN, AND CLIMATE DYNAMICS: AN INTRODUCTORY TEXT  
JOHN MARSHALL AND R. ALAN PLUMB

### 1. Characteristics of the atmosphere

- 1.1 Geometry
- 1.2 Chemical composition of the atmosphere
- 1.3 Physical properties of air
  - 1.3.1 Dry air
  - 1.3.2 Moist air

### 2. The global energy balance

- 2.1 Planetary emission temperature
- 2.2 The atmospheric absorption spectrum
- 2.3 The greenhouse effect
  - 2.3.1 A simple greenhouse model
  - 2.3.2 A leaky greenhouse
  - 2.3.3 A more opaque greenhouse

### 3. The vertical structure of the atmosphere

- 3.1 Vertical distribution of temperature and greenhouse gases
  - 3.1.1 Typical temperature profile
  - 3.1.2 Atmospheric layers
- 3.2 The relationship between pressure and density: hydrostatic balance
- 3.3 Vertical structure of pressure and density
  - 3.3.1 Isothermal atmosphere
  - 3.3.2 Non-isothermal atmosphere
  - 3.3.3 Density

### 4. Convection

- 4.3.1 The adiabatic lapse rate (in unsaturated air)
- 4.3.2 Potential temperature
- 4.5.2 Saturated adiabatic lapse rate
- 4.5.3 Equivalent potential temperature

### 5. The meridional structure of the atmosphere

- 5.1 Radiative forcing and temperature
  - 5.1.1 Incoming radiation
  - 5.1.2 Outgoing radiation
  - 5.1.3 The energy balance of the atmosphere
  - 5.1.4 Meridional structure of temperature
- 5.2 Pressure and geopotential height
- 5.3 Moisture
- 5.4 Winds
  - 5.4.1 Distribution of winds

### 6. The equations of fluid motion

- 6.1 Differentiation following the motion
- 6.2 Equation of motion for a nonrotating fluid
  - 6.2.1 Forces...

- 6.2.2 Equations of motion
- 6.2.3 Hydrostatic balance
- 6.3 Conservation of mass
  - 6.3.1 Incompressible flow
  - 6.3.2 Compressible flow
- 6.4 Thermodynamic equation
- 6.6 Equation of motion for a rotating fluid
  - 6.6.2 Transformation into rotating coordinates
  - 6.6.3 Rotating equations of motion
  - 6.6.5 Putting things on the sphere

## **7. Balanced flow**

- 7.1 Geostrophic motion
  - 7.1.1 Geostrophic wind
  - 7.1.2 Synoptic charts
  - 7.1.3 Balanced flows (Gradient and cyclostrophic wind)
- 7.2 Thermal wind equation (not from the book)
- 7.3 Subgeostrophic flow: The Ekman layer
  - Surface wind
  - 7.4.2 Ageostrophic flow...
  - 7.4.3 Ageostrophic flow...

## **8. The general circulation of the atmosphere**

- 8.1 Understanding the observed circulation
- 8.2 Mechanistic view of the circulation
  - 8.2.1 The tropical Hadley circulation
  - 8.2.2 The extratropical circulation
- 8.4 Large-scale atmospheric energy and momentum budget
  - 8.4.1 Energy transport
  - 8.4.2 Momentum transport
- 8.5 Latitudinal variations of climate