Pensum GEF1100 midterm Høst 2014

ATMOSPHERE, OCEAN,
AND CLIMATE DYNAMICS:
AN INTRODUCTORY TEXT
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Stoff fra oblig1 – ikke Matlab

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
2.3.4 Climate feedbacks

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 Conversation 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
6.6.2Transformation 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 Taylor-Proudman theorem (only 1 slide, introduced)
7.3 Thermal wind equation (not from the book)
7.4 Subgeostrophic flow: The Ekman layer
- Surface wind
- 7.4.2 Ageostrophic flow…
- 7.4.3 Ageostrophic flow…