Mesoscale Meteorology

Spring 2009

Lecturer

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Assistant (homework grading)

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Text

Mesoscale Dynamics, 2007, Y.-L. Lin, Cambridge University Press, 630 pp.

References

1. Mesoscale Meteorology and Forecasting, 1986, P. S. Ray, Ed., American Meteorological Society, 793 pp.
2. Dynamics in Atmospheric Physics, 1990, R. S. Lindzen, Cambridge University Press, 310 pp. Chapters 8 and 10: Internal Gravity Waves
3. An Introduction to Atmospheric Gravity Waves, 2002, C. J. Nappo, Academic Press, 276 pp.
4. Atmospheric Convection, 1994, K. A. Emanuel, Oxford University Press, 580 pp.
5. Cloud Dynamics, 1993, R. A. Houze, Jr., Academic Press, 573 pp.
6. Advances in Geophysics, 1979, Vol. 21, Academic Press. The Influence of Mountains on the Atmosphere by R. B. Smith.
7. Topographic Effects in Stratified Flows, 1995, P. G. Baines, Cambridge University Press, 482 pp.
8. Hydrodynamic Stability, 1981, P. G. Drazin and W. H. Reid, Cambridge University Press, 527 pp.

Grading

mid-term exam: 25%

final exam: 25%

homework: 25%

term paper: 25%

* Homework part consists of summarizing the homework papers given below and solving problems.

* Term paper part consists of reviewing a mesoscale phenomenon and giving a presentation.

Lecture Contents

Overview

Governing equations and approximations

Some theorems for stratified flows

Atmospheric gravity waves

Orographically forced flows

Thermally forced flows

Precipitating convection

Mesoscale phenomena

Homework Papers

1. Droegemeier, K. K., and R. B. Wilhelmson, 1987: Numerical simulation of thunderstorm outflow dynamics. Part I: Outflow sensitivity experiments and turbulence dynamics. J. Atmos. Sci., 44, 1180-1210. (due day: 16 March)

2. Lin, Y.-L., and T.-A. Wang, 1996: Flow regimes and transient dynamics of two-dimensional stratified flow over an isolated mountain ridge. J. Atmos. Sci., 53, 139-158. (due day: 30 March)

3. Schar, C., and D. R. Durran, 1997: Vortex formation and vortex shedding in continuously stratified flows past isolated topography. J. Atmos. Sci., 54, 534-554. (due day: 13 April)

4. Baik, J.-J., H.-S. Hwang, and H.-Y. Chun, 1999: Transient, linear dynamics of a stably stratified shear flow with thermal forcing and a critical level. J. Atmos. Sci., 56, 483-499. (due day: 27 April)

5. Robinson, F. J., S. C. Sherwood, and Y. Li, 2008: Resonant response of deep convection to surface hot spots. J. Atmos. Sci., 65, 276-286. (due day: 11 May)

6. Fovell, R. G., and Y. Ogura, 1989: Effect of vertical wind shear on numerically simulated multicell storm structure. J. Atmos.Sci., 46, 3144-3176. (due day: 25 May)