ADVANCED SYNOPTIC METEOROLOGY

METR 5413

Spring 2008

Classroom: NWC 5600 Class day and time: Tues., Thurs. 10 – 11:15 AM

Instructor: Prof. Howie "Cb"Bluestein

Instructor contact information: Office: NWC 5351 (far northwest corner on 5th floor)

Office phone: 325-3006

E-mail address: hblue@ou.edu

Office hours: Mon., Wed., 1:30 - 2:30 PM (tentative)

Office hours may be cancelled if there is a severe-thunderstorm outbreak (or a threat of the aforementioned). Other times by appointment please!

Texts: *Synoptic-Dynamic Meteorology in Midlatitudes (Vol. I): Principles of Kinematics and Dynamics and (Vol. II): Observations and Theory of Weather Systems.* H. Bluestein, Oxford Univ. Press, 1992 and 1993, respectively. Corrections to the first two printings may be found on the Web at http://rossby.metr.ou.edu/~hblue/corrections. Some notes based on recent journal articles will be distributed. These notes will eventually be included in later editions of the text.

Prerequisites: METR 4123 (Dynamic Meteorology II: Synoptic-Scale Systems) and METR 4423 (Synoptic Meteorology Lab), or the equivalent. It is highly recommended that you have already taken METR 5113 (Advanced Atmospheric Dynamics I).

Course outline:

I. Geostrophic phenomena

Quasigeostrophic theory revisited: Role of diabatic heating; effective static stability; effects of variations in static stability. O'Brien's adjustment schemes. Alternative formulations of omega equation and height-tendency equation: Trenberth formulation; Q vectors; P vectors; C vectors; quasigeostrophic potential vorticity. A quasigeostrophic analytic model: Application to baroclinic-instability theory; "bombs" and polar lows. Group velocity and Hovmoller diagrams; blocking.

II. Non-quasigeostrophic phenomena

Observations of surface and middle-upper tropospheric fronts. Kinematics of frontogenesis. Dynamics of frontogenesis: quasigeostrophic frontogenesis; vector form of the frontogenesis function; geostrophic-momentum approximation; Sawyer-Eliassen equation; semigeostrophic equations; semigeostrophic frontogenesis; symmetric instability

III. IPV thinking*

Isentropic potential vorticity and the invertibility principle; structure of synoptic-sale systems in terms of IPV; Rossby-wave propagation; barotropic and baroclinic instability.

*This topic used to be taught in Advanced Mesoscale Meteorology (METR 6413).

N. B.: Conditional symmetric instability and the dryline will now be discussed exclusively in METR 6413, not in METR 5413. P and C vectors are summarized quickly. The Sanders quasigeostrophic analytic model is summarized quickly also. Development of the semi-geostrophic equations is accelerated.

Grades: 50% in two non-comprehensive exams; problem sets will be examined, but not graded; will be considered for borderline grades.

Course-related information (e.g., problem sets, solutions, supplementary material) to be disseminated via the internet at the class site http://weather.ou.edu/~hblue/metr5413