Weather Analysis and Prediction

Instructor: Prof. R. Grotjahn
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Course meeting times & location: lecture: 11:00 am-12:20 pm T,Th; rm 124 Hoagland Hall
                          ATM111L (lab): 2:10-5:00 pm T,Th; rm 124 Hoagland Hall

Office hours: TBA
       Please make an appointment. You could try spontaneously dropping by my (R.G.'s) office, but I may not be able to spend much time with you due to other commitments. **Please avoid the hour before lecture!** (I need that time to review my presentation materials.)
       Also: **avoid 9a-noon on M and F, and 11a-5p W**

Text used: <u>Mid-latitude Weather Systems</u> by T.N. Carlson. Also **2 supplements are available in the bookstore**.

Course goals:
       1. to gain deeper understanding of midlatitude weather systems
       2. to learn about forecast models components
       3. to develop some forecasting skill

Grading: ATM 111 has a Letter grade proportioned on this basis:
Quizzes** at various times (approximately every 2 weeks)	20%
Final exam ** 3:30a-5:30p on Thursday, 23 March 2017*	40%
Homework**	40%
ATM 111L is pass/no pass grading;	
oral map discussions - gather & present required products	10%
labwork/COMET modules - achieve 65% correct **on each exercise**	90%

** NOTE: the homework and the lab exercises are all to be done on an INDIVIDUAL basis. The instructor(s) work with you on your map discussions and you are encouraged to coordinate your map discussion with the other student speaking the same day as you. The exam(s) and quizzes are closed book/closed notes.

Misc notes:
* Final based on a lab meeting time to match when lab meets.

A List LECTURE SUBJECTS:

Course admin/intro. general disc. (Reading: review materials)

---------- Forecast situations ----------------------
Map products and their interpretation. (Reading: Fcsting ntbk)
Significant weather patterns of the Sacramento area (Reading: Fcsting ntbk)
Other signif. wea. patterns from around the country (Reading: Fcsting ntbk)

----------- Analysis & Forecast Models ---------
Intro to anal/fcst system: Data, Objective analysis. [Reading: suppl. material; skip initialization.]
How to solve a model: illus. using the simplest EBVE [Reading: suppl. materials.,]
ETA model: governing eqns & processes included, domain, method of solution [Reading: suppl.
        materials]
GFS: eqns used, domain. spectral formulation   [Reading: suppl. materials. on MRF/AVN]
Statistical prediction & MOS [Reading: supl. materials. on regression equation]
Verification/predictability   [Reading: suppl. materials.,]

------------ Synoptic Textbook ---------------
Why vorticity?, advection of solenoids, [Reading: 1-5, 27-28, 40-43]
Vort. eqn scaling (part 1): time tendency, horiz. advection [Reading: 52-56]
Vort. eqn scaling (part 2): bowstring vert. vel. model, vert. advect. term, [Reading:46-48, 56-60]
Vort. eqn scaling (part 3): divergence term, Tilting & friction terms, [Reading: 61-68]
Summary table for review vort. eqn. [course website]
QG forcing of vert motion (start) [Reading: 79-86]
System length scale & vert motion [Reading: 86-92]
Pressure tendency eqn.; simplified form [Reading: 93-96, 97-100]
Upper forcing of cyclone §4.4
*Barotropic motion: BVE model [Reading: 130-131, 135-138 (skip "Apparent deepening...")]
Barotropic development: EBVE model, [Reading: §6.2]
Illustration of 500 mb level steering, [Reading: §6.4]
Baroclinic development: BEBVE model [Reading:, §7.1]
Changes at 500mb during life cycle, example of development [Reading: §7.2, §7.3,]
Review of motion & development eqns, [Reading: review table at course website]
Topography influence on development & motion [Reading: §9.2]
Cyclone tracks, evolution [Reading: §10.1, §10.2]
Cyclone movement & mature stage [Reading: §10.3, §10.4]
Simplified isentropic analysis [Reading: §12.1]
Warm conveyor belt: relative isentropic flow through cyclone [Reading: §12.3]
Cold conveyor belt, [Reading: 316-323 (in §12.4)]
Jet streaks & ageostrophic motions, [Reading: 364-369 (in §14.1)]
Front formation [Reading: 353-357 (in §13.2), §14.3]
Q vectors (interpretation only) [385-393, skim: 378-385 (in §14.4)]
*-- not covered in lecture, reading for homework problem(s).

A TENTATIVE[*] course LABORATORY (& Labwork: "Labwk") outline:
(also listed: homework: "Hwk" for atm111, G: = group work on board)

Jan 10: Map analysis basics Labwk #1 handed out. (Hwk1 assigned) G: find trofs

Jan 12: Internet sources & other procedures, G: find PVA/NVA, CAA/WAA, fronts

Jan 17: Labwk #2 handed out, Labwk #1 due. (Hwk1 due, Hwk2 assigned)) G: Intro to IDV

Jan 19: WinNT & procedures, continue labwork. G: find fcst fronts (Quiz 1)

Jan 24: Labwk #3 (NWP Comet) handed out, labwk #2 due. (Hwk2 due, Hwk3 assigned)

Jan 26: continue labwork.

Jan 31: (Hwk3 due, Hwk4 assigned).

Feb 2: map review: Prof fcst interp: Prof   (Quiz 2)

Feb 7: map review: Prof fcst interp: Rdr (Hwk4 due, Hwk5 assigned)

Feb 9: map review: Rdr fcst interp: Prof

Feb 14: Labwk #4 (meso Comet) handed out, labwk #3 due. map review: Prof fcst interp: Rdr
       (Hwk5 due, Hwk6 assigned)

Feb 16: Student disc: map review: MP fcst interp: RG   (Quiz 3)

Feb 21: Student disc: map review: CF fcst interp: AK (Hwk6 due, Hwk7 assigned)

Feb 23: Student disc: map review: RG fcst interp: MP

Feb 28: Labwk #5 (fog & icing Comet) handed out, labwk #4 due. Student disc: map review: AK fcst
       interp: CF (Hwk7 due, Hwk8 assigned)

Mar 2: Student disc: map review: MP fcst interp: RG   (Quiz 4)

Mar 7: Labwk #6 (sat overlay) handed out, labwk #5 due. Student disc: map review: CF fcst interp:
        AK   (Hwk8 due, Hwk9 assigned)

Mar 9: Student disc: map review: RG fcst interp: MP

Mar 14: Labwk #7 (NWP miscon. Comet) handed out, labwk #6 due. Student disc: map review: AK fcst
       interp: CF   (Hwk9 due)

Mar 16: Labwk #7 due.   (Quiz 5)

Mar 23: final (3:30-5:30) based on the 2:40/3:10 meeting time. Location: 124 HH.

CF: Carley Fredrickson   RG: Ruolan Gong
AK: Alexandra Kuwano   MP: Marielle Pinheiro