ATMS 315
Radar and Satellite Meteorology
Spring, 2007, MWF 9:15 – 10:05, RH 238

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Course Description:

Weather forecasting expertise is developed through the hard work of studying and analyzing case after case of weather scenarios to find underlying patterns in meteorological variables. Since our world is big, remotely sensed imagery from satellites and radars is the primary lens through which we view Earth's atmospheric phenomena.

This course begins with study of the sun, earth and radiation. Weather satellite and radar imagery cannot be correctly interpreted without understanding the sun/earth geometrics and the behavior of electromagnetic radiation in our atmosphere. After developing some understanding of how radiation is emitted, scattered, absorbed, transmitted, reflected, and refracted, the design and utility of various satellite sensors and radar apparatus will make sense.

The main work of the course will be to develop a "forecasting toolbox" using satellite and radar imagery to analyze case studies designed to provide practice in recognizing visual patterns in weather phenomena like mid-latitude cyclones, snow/ice events, MCSs, tornado outbreaks, and tropical storm events.

Course Details:

Reading Assignments:

Three textbooks will be used for the class:

Ron Rinehart's Radar for Meteorologists, (4th Edition) will provide the main course content on radar.

An Introduction to Satellite Image Interpretation by Eric Conway and The Maryland Space Grant Consortium will provide the basis for our discussion on POES and GOES satellite imagery. The material contained in the text is dated and incomplete - the book was published in 1997. Much of the information it contains is available online from various sources. However, the text presents all of the basics of image interpretation readily in one place.

Patrick Santurette and Christo Georgiev have written an intriguing book titled Weather Analysis and Forecasting: Applying Satellite Water Vapor Imagery and Potential Vorticity Analysis. This book contains multitudinous examples using "PV thinking" to monitor and analyze synoptic development. The authors also present a method using water vapor imagery to discover NWP model forecast error, crucial for the prognosis of severe weather events.

8-minute Answers:

Occasionally during the first eight minutes of class, you will be presented with a thought question designed to test your understanding of the course material and to integrate new vocabulary and concepts into your thinking and writing.

Homework:

Homework assignments will range from small problem sets to guided online activities. The weight of each homework assignment will vary according to its intensity. You should expect to have an assignment due at each class session. In this way you will not lag behind in the material. No late homework will be accepted.

Case Studies:

Each case will be broken into three components: 1) details of the weather situation, 2) the pre-event satellite imagery/NWP model analysis, and 3) the radar presentation. Your goal will be to solve a forecasting dilemma and justify your solution using satellite and radar imagery. The data for each case will be accessible through GARP, NMAP2, NTRANS (the GUIs for GEMPAK) and McIDAS. You will be expected to compose brief case study reports including imagery analysis and loops using the tools provided.

Exams:

The course includes four equally weighted examinations. They will include problem solving, short answer and essay questions.

Image of the Day/Weather Briefing:

Students will take turns 1) choosing and explaining an "image of the day" for the course webpage or, 2) presenting a once-a-week weather briefing. The weather briefings will not start until the semester is underway and the basic material has been covered.

Policies:

Points:

8-minute answers	50
Homework	300
Case Studies	360
Exams	240
Images/Briefings	50
	1,000 points total

A	920 – 1,000
A-	900 – 919
B+	880 – 899
B	820 – 879
B-	800 – 819
C+	780 – 799
C	720 – 779
C-	700 – 719
D	600 – 699
F	<600

Attendance is extremely important for your personal success in this class. Examination dates will not change. Make-up examinations will only be given at the discretion of the instructor and may include an oral exam. Late homework will not be accepted. Case studies may be turned in up to two days late, but at a penalty of 25% per day. No make-ups will be given for 8-minute answers, please be in class on time.

Student Affairs Creed:

"The University of North Carolina at Asheville is a community of scholars dedicated to personal and academic excellence and growth. In joining this learning community, We commit to a code of civilized behavior.

- We will practice personal and academic integrity;
- We will respect the dignity of all persons, including ourselves;
- We will respect the rights of others;
- We will not condone bigotry;
- We will strive for the openness to learn from differences in people, ideas, and opinions;
- We will demonstrate concern for others, their feelings, and their need for conditions that support their work and development. Allegiance to these ideals requires us to refrain from behaviors that threaten the freedom and respect every individual deserves."

If you use any form of cheating, you will be subject to procedures outlined in Section 8.3 of the UNCA Faculty Handbook. Possible outcomes include receiving a zero for an assignment, dismissal from the course, and/or submission/dismissal from the university.

To respect the learning experience of others, please turn off all cell phones, pagers, beepers, etc....prior to class.

Please see the course website for a detailed schedule of exams, topics, reading assignments etc.

Day	Date	Topic	Reading
W	1/17	Class Introduction, EM Spectrum	
F	1/19	Sun-Earth Geometry & Orbits	
M	1/22	Earth's orbit: seasons, days, sunrise and twilight	
W	1/24	Flux, Principles of Radiation, EM Propagation	SSI Ch. 1
F	1/26	Emission	
M	1/29	Absorption, Reflection & Transmission	
W	1/31	Surface Radiation Budget	SSI Ch. 5
F	2/2	Earth-atmosphere Global Energy Balance	
M	2/5	**Exam #1**	
W	2/7	Radar Hardware	R Ch. 2 (p. 17 – 49)
F	2/9	Refractivity	R Ch. 3 (p. 51 – 62)
M	2/12	Curvature & Radar	R Ch. 3 (p. 62 – 67)
W	2/14	Radar Equations – Point Targets	R Ch. 4 (p. 69 – 83)
F	2/16	Distributed Targets	R Ch. 5 (p. 85 – 99)
M	2/19	Doppler Velocity Measurement	R Ch. 6 (p. 101 – 110)
W	2/21	The Doppler Dilemma	R Ch. 6 (p. 110 – 128)
F	2/23	Velocity Errors	R Ch. 7 (p. 131 – 137)
M	2/26	**Exam #2**	
W	2/28	GOES	SSI Ch. 2
F	3/2	POES & NPOESS	SSI Ch. 2
M	3/12	Example Case – Midwest Cold Season Synoptic Storm	SII Ch. 10
W	3/14	PVA/NVA	WV Ch. 1 & SII Ch. 9
F	3/16	GARP/Mc IDAS Fun	
M	3/19	Case #1 Assigned – Clouds, Precip & Lake Effect Snow	SII Ch. 6
W	3/21	McIDAS	WV Ch. 2
F	3/23	GARP & Radar	R Ch. 8
M	3/26	Case #2 Assigned – Thunderstorms	SII Ch. 9
W	3/28	satellite	
F	3/30	radar	
M	4/2	Case #3 Assigned –East Coast Explosive Cyclogenesis	SII Ch. 11 (p. 145 – 162)
W	4/4	satellite	
F	4/6	radar	
M	4/9	**Exam #3** & Case #4 Assigned – Tornadoes	SII Ch. 11 (p. 162 – 167)
W	4/11	satellite	
F	4/13	radar	
M	4/16	Case #5 Assigned – Wind & Fire	SII Ch. 11 (p. 167 – 172)
W	4/18	satellite	
F	4/20	radar	
M	4/23	Case # 6 Assigned – Tropical Storms	SII Ch. 12
W	4/25	satellite	
F	4/27	radar	
M	4/30	Wrap-up	
M	5/7	**Exam #4** 8:00 am – 10:30 am	

Note: This schedule and the reading assignments are subject to revision, however the exam dates will not change. Please consult the course webpage for updates.