Geography 5940
Synoptic Meteorology Laboratory
Spring 2022 Derby Hall 140

Instructor: Jeff Rogers, Prof. Emeritus
Instructor: Jacklynn Beck, GTA

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Office: Derby Hall 1049 (jcr) Derby 1070 (Jackie)
Office Hours (jcr): MW 11-noon
Office Hours (Jackie): T,Th 9:00-10:30 a.m.
Class time: M, W 9:35 – 10:55 a.m.

Course website**: http://carmen.osu.edu**

Course Prerequisites: Concurrent Geography 5900 or Atmos. Sci. 2940. Course precedes autumn Geography 5941.

Course Objectives: The objective of the course is to introduce students to the various methods by which meteorological and weather information is gathered, measured, and displayed, for use in weather forecasting applications. Students will become familiar with methods of obtaining information, data, and weather forecasts using the Web, and learn how to perform basic meteorological analyses using web data. This training will facilitate weather map and web usage in more advanced synoptic meteorology courses and serve as a background of applied information for dynamic meteorology classes. Specific aims of the course are to introduce
(1) basic meteorological data collection and data coding methods,
(2) the displaying of that information on surface and upper air synoptic charts,
(3) the interpretation and forecasting applications of these charts,
(4) the methods of gathering and displaying information from weather radar and upper air soundings,
(5) the basics of satellite meteorology and interpretation of satellite-based weather images,
(6) the basics of numerical modeling and model output interpretation, and
(7) the basics of isobaric analysis, frontal analysis and plotting and analysis of thermodynamic diagrams.

Course Structure: The class meets two days per week. These sessions will include lectures, demonstrations of meteorological charts and their interpretation. The course is divided into several topics, each focusing on a synoptic weather chart or series of charts and diagrams that convey information vital for the forecasting of weather. Each topic is covered in approximately one or two class sessions, the outline of which is given on page 2. The course places heavy emphasis on analysis of synoptic charts and diagrams and "hands-on" learning of the analysis procedures and methods as well as on how to find the information using internet sources. Some of the course work (approximately one formal hour per week) is therefore devoted to individual laboratory work, weather map and chart analysis, and to the task of becoming familiarized with the basic features of internet data sources, including how to access and use the stored synoptic information. Assignments will cover key topics in analysis of synoptic charts and diagrams.

Course Requirements.
Students should purchase color pencils and bring them to class by week 3 (yellow, green, red, blue, at a minimum).

Your grade in this course will be determined based on the following:
1. Assignments: 50% of your grade
2. One mid-term examination worth 25%
3. Final Exam on Friday April 29 at 10:00 a.m.: 25%

Homework assignments will include both in-class assignments for which there will be no make-up, and take-home assignments. In-class homework assignments may, for example, may use current weather data analyses. All assignments will be given a grade although some may not be formally corrected - only collected to determine that the assignment work was completed. Take-home assignments will be graded as "zero" if they are not turned in by their due date. Missed assignments due to voluntary departures during the semester will be graded as zero. Missed assignments for medical reasons, with a medical excuse, will be graded. Medical excuses are necessary for missed exams. *Any student that feels he/she may need an accommodation based on the impact of a disability should contact me privately to discuss your specific needs.*

Course Outline

TOPICS

1. Introduction. The National Weather Service; its organizational structure and technology
   ASOS (Automated Surface Observing Systems): how weather data collection is done.

2. METAR/TAF Code and its translation.

3. Surface Synoptic Chart and the Station Model.
   Clouds & cloud types.

4. Isobaric and isothermal analysis on surface synoptic charts.
   Identification of fronts on surface synoptic charts; frontal troughs, and pressure tendency

5. The Norwegian cyclone model and the Shapiro-Keyser cyclone model

6. History of upper air observations. Rawinsonde network and upper air data.
   The upper air station model and plotting station models on constant pressure upper air synoptic charts

7. Using of upper-level constant pressure charts: 850 mb & charts and low level thermal advection
   700 mb constant chart: vertical motions, cold front aloft

8. 500 mb constant pressure chart: divergence, vorticity, and vorticity advection
   300 mb constant pressure chart: jet streams and (wind) isotach analysis, and divergence

9. Interpreting the thermodynamic diagram; mixing and the elevated mixed layer; theta-e.
   Mid-term Examination

Spring Break March 14 - 18

10. Analysis of sounding-based vertical wind shear: Making and using hodographs
    Operational Forecasting Models RAP, NAM, GFS, and medium & long-range forecasts

11. Model Output Statistics (MOS): what they are, how to read MOS output
    Zone forecasts, what they are and how to format and write them

12. NEXRAD: wx radar and meteorological data obtained from it. Characteristics of wx radar & echoes.
    NEXRAD Radar Composite Summary Chart and symbols.

13. Meteorological Satellites: The GOES I-M and POES satellites, history; basic imagery & interpretation.
    GOES Satellite Weather Interpretation: Identifying cloud forms and other earth/atmosphere features.

14. Satellite Jet stream identification from satellites, identification of ridges and troughs
    The Great Plains Cyclone Model

15. (Monday) Numerical weather prediction procedure and processes

Final Exam: Friday April 29, 2022, 10:00 to 11:45 a.m. in Derby 140.