**AT 541**  
Daily Weather Laboratory II  
Spring Semester 2009  
(2 credits)

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**Time:** Tues, Thurs 1:00 – 2:50pm  
**Location:** ATS 101  
**Instructor:** Dan Lindsey, CIRA 021, Phone -8773, lindsey@cira.colostate.edu  
**TA:** David Lerach, ATS 213, Phone-8425, dlerach@atmos.colostate.edu  
**Website:** [http://johnson.atmos.colostate.edu/teaching/](http://johnson.atmos.colostate.edu/teaching/)

**Preferred way to contact me:** E-mail. I check it constantly, and I'll get back to you ASAP. I won't define specific office hours; instead, send me an e-mail and we can set up a time to meet. David's office hours are Wednesday 1pm-2:30pm and Thursday 11am-12:30pm.

The course is scheduled for four hours per week, which will nominally include one hour of lecture and one hour of lab each day of class. AT 541 deals primarily with mesoscale weather phenomena; however, the first part of the course will treat aspects of synoptic-scale meteorology related to cyclogenesis and frontogenesis.


The primary text for this course will be the set of notes that Dr. Johnson has assembled for this course. These notes will be available from the class website at:  
[http://johnson.atmos.colostate.edu/teaching/](http://johnson.atmos.colostate.edu/teaching/)

Additionally, copies of lecture notes (usually powerpoint) will be available on the website. Some other supplemental materials may be distributed throughout the semester (such as relevant papers, material on topics not covered in the notes, etc.)

Course forecast activity: A forecast contest will be conducted, with two separate "tournaments" separated by Spring Break. Your forecasting performance will not affect your grade, but participation is expected.

Weather briefings: In-class discussions will be given by students as part of the class forecasting contest. Each student can expect to lead 2-3 discussions over the course of the semester.
Course Subjects
(order to be determined to some extent by timing of weather events during semester)

1. Definitions of mesoscale, METAR code, mesoanalysis plotting code
2. Potential vorticity (PV), Q-vector, and dynamic tropopause concepts applied to the analysis of extratropical systems
3. Colorado/Fort Collins weather climatology
4. Cyclogenesis (application: Colorado Front Range, Midwest, East Coast snowstorms)
   a. Basic classifications
   b. Synoptic and mesoscale characteristics
   c. Cold-air damming
   d. Case study, when suitable event occurs
5. Fronts and frontogenesis
6. Mesoscale aspects of extratropical cyclones (frontal rainbands, CSI)
7. Upper- and lower-tropospheric jets, coastally trapped disturbances, barrier jets, damming
8. Subsynoptic analysis techniques
   a. Data processing
      - conventional observing systems
      - specialized networks
      - treatment of pressure in mountainous terrain
   b. Mesometeorological analysis
      - streamline, p, theta-e, q, isochrone, isohyet, etc.
      - isallobaric analysis (movement of pressure systems, cross-isobar flow)
9. Mountain, valley circulations
   a. Diurnal circulations
   b. Downslope windstorms
10. Convective processes module.
    a. Small scale (1-10 km)
       - dry and wet thunderstorm microbursts
       - ordinary cell, multicell, and supercell (tornadic) storms
       - flash floods
    b. Mesoscale (>10 km)
       - mesoscale convective systems: MCCs, squall lines, mesoscale convective vortices (MCVs)
       - structure, kinematics, thermodynamics and dynamics; associated mesoscale features (gust fronts, downdraft outflows, etc.)
### Tentative Course Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Topics</th>
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<tbody>
<tr>
<td>1</td>
<td>Jan 20,22</td>
<td>Introduction, definitions</td>
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<tr>
<td>2</td>
<td>Jan 27,29</td>
<td>Vertical motion, omega-equation, Q-vectors</td>
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<tr>
<td>3</td>
<td>Feb 3,5</td>
<td>Potential vorticity concepts</td>
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<td>4</td>
<td>Feb 10,12</td>
<td>Fronts and frontogenesis</td>
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<td>5</td>
<td>Feb 17,19</td>
<td>Jets, coastally trapped disturbances, damming</td>
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<td>6</td>
<td>Feb 24,26</td>
<td>Lee cyclogenesis, Front Range snowstorms</td>
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<td>7</td>
<td>Mar 3,5</td>
<td>Mountain waves, downslope windstorms</td>
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<tr>
<td>8</td>
<td>Mar 10,12</td>
<td>Mesoanalysis techniques</td>
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<tr>
<td>9</td>
<td>Mar 17,19</td>
<td>Spring Break</td>
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<td>10</td>
<td>Mar 24,26</td>
<td>Midterm exam</td>
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<td>11</td>
<td>Mar 31, Apr 2</td>
<td>Mountain, valley circulations</td>
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<tr>
<td>12</td>
<td>Apr 7,9</td>
<td>Convective processes, Part 1</td>
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<td>13</td>
<td>Apr 14,16</td>
<td>Convective processes, Part 2</td>
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<td>Apr 21,23</td>
<td>Convective processes, Part 3</td>
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<td>15</td>
<td>Apr 28,30</td>
<td>Mesoscale convective systems</td>
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<td>16</td>
<td>May 5,7</td>
<td>Flash floods, microbursts</td>
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<tr>
<td>17</td>
<td>Week of May 11-14</td>
<td>Final exam</td>
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Emphasis in class will be on understanding physical/dynamical processes through analysis and interpretation, not on forecasting rules. Post-analysis of specific mesoscale events (e.g., jet streaks, low-level jets, or mesoscale convective systems) may be carried out if good cases occur during the semester, if data coverage is good, and time permits.

**Grading**

- Lab exercises (approximately 5 to 7): 40%
- Mid-semester test: 25%
- Final: 35%