



University of Manitoba
Faculty of Environment, Earth and Resources
Department of Environment and Geography

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COURSE DETAILS

Course Title & Number:	GEOG 4780 Storms – Mesoscale Meteorology
Number of Credit Hours:	3
Class Times & Days of Week:	T/Th 1300 – 1415
Location for Classes:	243 Wallace
Pre-Requisites:	GEOG 3310 (there are several pre-req's for GEOG 3310)

Instructor Contact Information

Instructor(s) Name:	Dr. Ronald Stewart Dr. John Hanesiak
Office Location:	468 Wallace (Hanesiak); 470 Wallace (Stewart) but: will not be on campus much
Office Hours or Availability:	Make an appointment via email during regular daytime hours (8am – 4pm) for a meeting
Office Phone No.	474-7049 (Hanesiak); 480-1052 (Stewart) but best way to communicate is through email
Email:	John.hanesiak@umanitoba.ca Ronald.stewart@umanitoba.ca All emails will be replied to within 48 hrs
Contact:	Feel free to set up an after-class meeting in person in class or via email during regular daytime hours (8am – 4pm)

General Course Information & Goals

This course is important (but not required) for careers in operational meteorology (weather forecasting), atmospheric and climate sciences. It can also serve as a solid foundation for basic atmospheric processes understanding for other physical sciences careers.

This course focuses on a range of storms and mesoscale phenomena in the summer or winter. These include thunderstorms, tornadoes, squall lines, lightning, low level jets, gust fronts, blizzards, freezing rain, orographic storms, and polar lows. The emphasis is on the physical

mechanisms leading to these events and it also examines how they may change in our changing climate.

This course is concerned with storms and mesoscale meteorology. These are critical aspects of atmospheric science and they bridge the temporal/spatial scales between the microscale (< 1 km) and synoptic scales (> 500 km). Mesoscale phenomena can also be embedded within larger scale weather systems. Mesoscale meteorology is particularly important now that atmospheric computer models are able to resolve these scales. Examples of mesoscale atmospheric phenomena include, but are not limited to, severe convective storms of all kinds, hurricanes, polar lows, lake effect storms, land/lake breezes, tornadogenesis, and heavy rainfall/snowfall events. Students will gain an appreciation of the fundamental factors associated with a range of storms and mesoscale phenomena through up-to-date material from textbooks and the current literature.

This course is important (but not required) for careers in operational meteorology (weather forecasting), atmospheric and climate sciences. It can also serve as a solid foundation for basic atmospheric processes understanding for other physical sciences careers.

The assessments for this course are comprised of two assignments (10% each; one assignment in 1st half of the course and one in 2nd half), two reports/presentations (25% each; one in 1st half of course and one in 2nd half), and two tests (15% each; mid-term covering first half of course and final test covering last half of course). **NO final exam**. Assignments are used to gauge student competency using quantitative assessments (calculations necessary) and short answer conceptual questions. The mid-term test in Part 2 is composed mainly of conceptual (short and long answer) questions, with limited quantitative questioning.

Using Copyrighted Material

Please respect copyright. We will use some copyrighted content in this course. I have ensured that the content I use is appropriately acknowledged and is copied in accordance with copyright laws and University guidelines. Copyrighted works, including those created by me, are made available for private study and research and must not be distributed in any format without permission. Do not upload copyrighted works to a learning management system (such as UM Learn), or any website, unless an exception to the *Copyright Act* applies or written permission has been confirmed. For more information, see the University's Copyright Office website at <http://umanitoba.ca/copyright/> or contact um_copyright@umanitoba.ca.

Recording Class Lectures

The instructors (Hanesiak and Stewart) and the University of Manitoba hold copyright over the course materials, presentations and lectures which form part of this course. No audio or video recording of lectures or presentations is allowed in any format, openly or surreptitiously, in whole or in part without permission of the instructors. Course materials (both paper and digital) are for the participant's private study and research.

Textbook, Readings, Materials

Reference textbooks (but not required):

- (1) *Mesoscale Meteorology in Midlatitudes* by P. Markowski and Y. Richardson (2010), Wiley Blackwell, 407 pp.
- (2) *Mesoscale Meteorology and Forecasting* by P. Ray (ed.) (1986), Amer. Meteor. Soc., 793 pp.
- (3) *Mesoscale Meteorological Modeling* by R.A. Pielke (1984), Academic Press, 612 pp.
- (4) *Cloud Dynamics* by R. Houze, Jr. (1993), Academic Press, 573 pp.
- (5) *Atmospheric Convection* by K.A. Emanuel (1994), Oxford Press, 580 pp.
- (6) *Severe Convective Storms*: C.A. Doswell III, ed. (2001), Meteor. Monograph, 28, 50, 1-26.
- (7) *Mountain Weather Research and Forecasting: Recent Progress and Current Challenges* by F.K. Chow, S.F.J. De Wekker and B.J. Snyder (eds.) (2012), Springer, 750 pp.

Tools:

All students should ensure they have non-programmable scientific calculators.

Course Lectures/Materials:

All lecture powerpoints and other digital content will be provided to students via UM Learn System. Be sure to familiarize yourself with the UM Learn System.

Course Technology

It is the general University of Manitoba policy that all technology resources are to be used in a responsible, efficient, ethical and legal manner. The student can use all technology in the classroom setting only for educational purposes approved by the instructor and/or the University of Manitoba Disability Services. Students should not participate in personal direct electronic messaging / posting activities (e-mail, texting, video or voice chat, wikis, blogs, social networking (e.g. Facebook) online and offline “gaming” during scheduled class time. If a student is on call (emergency) the student should switch his/her cell phone on vibrate mode and leave the classroom before using it. (©S Kondrashov. Used with permission)

Class Communication

The University requires all students to activate an official University email account. For full details of the Electronic Communication with Students please visit:

http://umanitoba.ca/admin/governance/media/Electronic_Communication_with_Students_Policy_-_2014_06_05.pdf

Please note that all communication between ourselves and you as a student must comply with the electronic communication with student policy

(http://umanitoba.ca/admin/governance/governing_documents/community/electronic_communic

[ation_with_students_policy.html](#)). You are required to obtain and use your U of M email account for all communication between yourself and the university.

Expectations: Instructors Expect You To

The instructors will be in class for 5-10 minutes prior to and after the class time. We will treat you with respect and would appreciate the same courtesy in return. See [Respectful Work and Learning Environment Policy](#).

Academic Integrity:

Please see the PDF file called “Schedule-A-ROASS.pdf” in the UM Learn course folder that contained Schedule “A” (Policies and Resources) that outlines academic integrity policies and student resources. Students should acquaint themselves with the University’s policy on cheating and examination impersonation (see Section 7.0 of the University of Manitoba General Calendar). **Plagiarism and cheating in general, is a serious academic offence.**

All work/assignments submitted by each student is to be completed independently unless otherwise specified.

Students Accessibility Services

Student Accessibility Services

If you are a student with a disability, please contact SAS for academic accommodation support and services such as note-taking, interpreting, assistive technology and exam accommodations. Students who have, or think they may have, a disability (e.g. mental illness, learning, medical, hearing, injury-related, visual) are invited to contact SAS to arrange a confidential consultation. *Student Accessibility Services* <http://umanitoba.ca/student/saa/accessibility/>

520 University Centre

204 474 7423

Student_accessibility@umanitoba.ca

Expectations: You Can Expect Instructors To

We value each student’s viewpoint and input to each class. Therefore, we encourage students to interact with us in class by asking questions and answering questions posed by instructors and other students in the class. We expect students to respond the best they can, however, we do not expect perfection!

Class Schedule

This schedule is subject to change at the discretion of the instructor and/or based on the learning needs of the students but such changes are subject to Section 2.8 of the – [ROASS-Procedure](#)).

Stewart Schedule

Date(s)	Class Content	Required Readings or Pre-class Preparation	Evaluation
Sept 7	Introduction and fundamentals	Material on UM Learn	
Approx. Sept 12-19	Winter storms and embedded features	Material on UM Learn	
Approx. Sept 21-26	Precipitation transition regions	Material on UM Learn	
Approx. Sept 28	Surface weather conditions	Material on UM Learn	
Sept 28	Assignment #1 due (Part 1 of course) and marks back 1 week later		10% of final grade
Approx. Oct 3 -5	Storms and orography	Material on UM Learn	
Approx. Oct 10	Lightning	Material on UM Learn	
Approx. Oct 12	Lake effect storms	Material on UM Learn	
Oct 12	Student reports/presentations (expect marks back within 1 week)		25% of final grade
Approx. Oct 17	Polar lows and future extremes	Material on UM Learn	
Oct 19	Final Test (Part 1 of course)		15% of final grade

Hanesiak Schedule

Date(s)	Class Content	Required Readings or Pre-class Preparation	Evaluation
Oct 24	Introduction & mesoscale scale analysis	Material on UM Learn	
Approx. Oct. 26 – Nov 21	Supercells and Tornadoes	Material on UM Learn	
Nov 13-17	Fall Break		

Approx. Nov 23 & 28	Planetary Boundary Layer (PBL) and Low Level Jets (LLJs)	Material on UM Learn	
Nov 23	Assignment #2 (Part 2 of course) Due (expect marks back prior to final test)		10% of final grade
Approx. Nov 30 & Dec 5	Non-Mesocyclone Tornadoes (NMTs)	Material on UM Learn	
Dec 5	Student reports/presentations (Part 2 of course)		25% of final grade
Dec 7	Final test (Part 2 of course)		15% of final grade

Course Evaluation Methods

We will be using a combination of assignments, presentations and tests for evaluation purposes.
No final exam is used.

Refer to the Report and Presentation Description on the following page of the syllabus for details of what is expected.

Date:	Assessment Tool	Value of Final Grade
Sept 28	Assignment #1 due (Part 1 of course) and marks back 1 week later	10% of final grade
Oct 12	Student Presentations (Part 1 of course) and expect marks back within 1 week	25% of final grade
Oct 19	Final Test (Part 1 of course)	15% of final grade
Nov 23	Assignment #2 (Part 2 of course) Due (expect marks back prior to the test)	10% of final grade
Dec 5	Student Presentations (Part 2 of course)	25% of final grade
Dec 7	Final Test (Part 2 of course)	15% of final grade

Grading

It will be important to attend the lectures and interact with the instructors and other students. Students will not be permitted to write make-up tests or hand in late assignments except for documented medical or compassionate reasons. A grade of zero will be recorded for missed

assignments, tests and presentations. Late assignments will be penalized 10% per day (including weekends and holidays). Students may have access to their marks prior to the voluntary withdrawal date (November 21, 2023) and are encouraged to talk with instructors before a decision to withdraw is made.

Letter Grade	Percentage out of 100	Grade Point Range	Final Grade Point
A+	90-100	4.25-4.5	4.5
A	80-89	3.75-4.24	4.0
B+	75-79	3.25-3.74	3.5
B	70-74	2.75-3.24	3.0
C+	65-69	2.25-2.74	2.5
C	60-64	2.0-2.24	2.0
D	50-59	Less than 2.0	1.0
F	Less than 50		0

Assignment/Presentation/Test Descriptions

There will be two assignments, two reports/presentations and two tests that students will have to complete for the course (one assignment, one presentation and one test per instructor). No Final Exam will be done. The assignment questions and details will be provided in each assignment but will focus on the topics covered in class. The final tests will cover class material as well as major points within student presentations – questions will involve short-answer type questions. Details of the report and presentation requirements are provided below.

You may select a topic from the list below to be the focus of your report and presentation for Part 1 and Part 2 of the course. The Report should be the same topic as the Presentation. Other topics may be acceptable, however, be sure to verify this with the instructor first.

Written Paper Guidelines:

You will collect and read research papers (e.g., journal articles) on a subject below selected by yourself, and write a review on the subject in as much detail as you can. Guidelines follow below:

- The paper should be between 9-10 pages long with 1.5 spacing. No longer than 10 pages please!
- Figures/Tables should be embedded within the text, close to where they are cited within the text (i.e. on the same page or immediately after the page in which they are discussed/cited in the text).
- All figures/tables should be numbered in sequential order and ***should be explicitly referred to in your paper!***
- You are encouraged to include your own critical views of the subject in your paper/review.

- Original research and topics different from those below are encouraged, however, you must discuss your topic idea with me first.
- The paper should include an introduction (why the topic is important scientifically and to people and society) followed by the main body of the paper (the main body should be well organized and include sub-sections where appropriate).
- All references should be at the end of the report in alphabetical order according to the lead author name.
- You should use RECENT publications for your project! 1-2 older references (prior to 2005) are fine to cite older work, but make sure you use the most up-to-date research articles possible for the primary discussion. Failure to do so will impact your mark.

The paper/review should demonstrate a good understanding on your part of the chosen subject. **The paper will be graded on overall organization, clarity, understanding of the subject, grammar, completeness, neatness and using up-to-date more recent references.**

The following aspects should be considered when writing your paper (We encourage you to have others proofread your report):

- Is the material well organized and is the flow logical?
- Does the introduction clearly state the purpose and/or motivation of the paper/review?
- Is the paper and presentation clear and easily understandable?
- Write and organize it in such a way that other students can learn from your paper.
- Are figures appropriate and effective in supporting the text in the paper?
- Do the figures have adequate captions and are they clearly discussed and referred to in your paper?

Presentation Guidelines:

The following aspects should be considered when preparing/delivering your presentation:

- The talk should not be longer than 10 minutes. Be sure to practice it beforehand!
- Title page should reflect the main focus topic of the presentation.
- 1-2 slides should be used for an Introduction to your topic – this includes “motherhood stuff” such as why the topic is important to society. The Intro should also include relevant background to the topic.
- The introduction should also clearly state the purpose and/or motivation of the paper(s) you used for your talk.
- Organize your talk so the flow is logical.
- Discuss the topic in such a way so that other students can learn from your presentation – i.e. be sure to take more time when discussing more detailed or complex ideas.
- Are figures appropriate and effective in supporting your discussions?
- Figures should have citations - from where it was used.
- Speak clearly and loud enough when delivering your talk.
- Last slide should include all references.

You will be graded according to the points above, as well as, **overall organization, clarity, understanding of the subject, and using up-to-date more recent references.**

Example Topics:

Hail Storms	Tornadogenesis
Drylines	Squall Lines / Derecho's / MCCs
Boundary layer rolls	Downslope windstorms and/or terrain-induced rotors
Land or sea breezes	Hurricanes
Land/vegetation influence on cloud/storm initiation	Polar Lows and Arctic Extreme Weather Rainbands
Valley flows	Orographic precipitation
Mountain waves	Fog
Gravity waves	Non-mesocyclone tornadoes (NMT's)
Density Currents	Convection Initiation processes
micro or macrobursts	Snow/freezing rain storms
Surface icing	Precipitation bands

Some common journals in the library system (online or hardcopy) include:

- American Meteorological Society (many journals)
- Atmosphere-Ocean (Canadian Meteorological and Oceanographic Society)
- Electronic Journal of Severe Storms Meteorology (EJSSM)
- Atmospheric Research
- Quarterly Journal of the Royal Meteorological Society (QJRMS)
- Tellus
- Journal of Geophysical Research - atmospheres
- Earth Interactions
- Boundary Layer Meteorology
- Agricultural and Forest Meteorology
- Arctic

Books (do not use books older than 2005)

Assignment Grading Times

See the Class Schedule Tables.

Assignment Extension and Late Submission Policy

Students will not be permitted to write make-up tests or hand in late assignments except for documented medical or compassionate reasons. A grade of zero will be recorded for missed assignments, tests and quizzes. Late assignments will be penalized 10% per day (including weekends and holidays). Students may have access to their marks prior to the voluntary withdrawal date (November 21, 2023) and are encouraged to talk with instructors before a decision to withdraw is made.

Schedule “A”

Section (a): A list of academic supports available to Students, such as the Academic Learning Centre, Libraries, and other supports as may be appropriate:

Writing and Learning Support

The Academic Learning Centre (ALC) offers services that may be helpful to you throughout your academic program. Through the ALC, you can meet with a learning specialist to discuss concerns such as time management, learning strategies, and test-taking strategies. The ALC also offers peer supported study groups called Supplemental Instruction (SI) for certain courses that students have typically found difficult. In these study groups, students have opportunities to ask questions, compare notes, discuss content, solve practice problems, and develop new study strategies in a group-learning format.

You can also meet one-to-one with a writing tutor who can give you feedback at any stage of the writing process, whether you are just beginning to work on a written assignment or already have a draft. If you are interested in meeting with a writing tutor, reserve your appointment two to three days in advance of the time you would like to meet. Also, plan to meet with a writing tutor a few days before your paper is due so that you have time to work with the tutor’s feedback.

These Academic Learning Centre services are free for U of M students. For more

information, please visit the Academic Learning Centre website at:

<http://umanitoba.ca/student/academiclearning/>

You can also contact the Academic Learning Centre by calling 204-480-1481 or by visiting 201 Tier Building.

University of Manitoba Libraries (UML)

As the primary contact for all research needs, your liaison librarian can play a vital role when completing academic papers and assignments. Liaisons can answer questions about managing citations, or locating appropriate resources, and will address any other concerns you may have, regarding the research process. Liaisons can be contacted by email or phone, and are also available to meet with you in-person. A complete list of liaison librarians can be found by subject: <http://bit.ly/WcEbA1> or name: <http://bit.ly/1tJ0bB4>. In addition, general library assistance is provided in person at 19 University Libraries, located on both the Fort Garry and Bannatyne campuses, as well as in many Winnipeg hospitals. For a listing of all libraries, please consult the following: <http://bit.ly/1sXe6RA>. When working remotely, students can also receive help online, via the Ask-a-Librarian chat found on the Libraries' homepage: www.umanitoba.ca/libraries.

Section (b): A statement regarding mental health that includes referral information:

**For 24/7 mental health support, contact the Mobile Crisis Service at
204-940-1781.**

Student Counselling Centre

Contact SCC if you are concerned about any aspect of your mental health, including anxiety, stress, or depression, or for help with relationships or other life concerns. SCC offers crisis services as well as individual, couple, and group counselling. *Student Counselling Centre:*

<http://umanitoba.ca/student/counselling/index.html>

474 University Centre or S207 Medical Services

(204) 474-8592

Student Support Case Management

Contact the Student Support Case Management team if you are concerned about yourself or another student and don't know where to turn. SSCM helps connect students with on and off campus resources, provides safety planning, and offers

other supports, including consultation, educational workshops, and referral to the STATIS threat assessment team.

Student Support Intake Assistant

<http://umanitoba.ca/student/case-manager/index.html>

520 University Centre

(204) 474-7423

University Health Service

Contact UHS for any medical concerns, including mental health problems. UHS offers a full range of medical services to students, including psychiatric consultation.

University Health Service <http://umanitoba.ca/student/health/>

104 University Centre, Fort Garry Campus

(204) 474-8411 (Business hours or after hours/urgent calls)

Health and Wellness

Contact our Health and Wellness Educator if you are interested in information on a broad range of health topics, including physical and mental health concerns, alcohol and substance use harms, and sexual assault.

Health and Wellness Educator

<http://umanitoba.ca/student/health-wellness/welcome.html>

Katie.Kutryk@umanitoba.ca

469 University Centre

(204) 295-9032

Live Well @ UofM

For comprehensive information about the full range of health and wellness resources available on campus, visit the Live Well @ UofM site:

<http://umanitoba.ca/student/livewell/index.html>

Section (c): A notice with respect to copyright:

All students are required to respect copyright as per Canada's *Copyright Act*. Staff and students play a key role in the University's copyright compliance as we balance user rights for educational purposes with the rights of content creators from around the world. The Copyright Office provides copyright resources and support for all members of the University of Manitoba community.

Visit <http://umanitoba.ca/copyright> for more information.

Section (d): A statement directing the student to University and Unit policies, procedures, and supplemental information available on-line:

Your rights and responsibilities

As a student of the University of Manitoba you have rights and responsibilities. It is important for you to know what you can expect from the University as a student and to understand what the University expects from you. Become familiar with the policies and procedures of the University and the regulations that are specific to your faculty, college or school.

The [Academic Calendar](http://umanitoba.ca/student/records/academiccalendar.html) <http://umanitoba.ca/student/records/academiccalendar.html> is one important source of information. View the sections *University Policies and Procedures* and *General Academic Regulations*.

While all of the information contained in these two sections is important, the following information is highlighted.

- If you have questions about your grades, talk to your instructor. There is a process for term work and final **grade appeals**. Note that you have the right to access your final examination scripts. See the Registrar's Office website for more information including appeal deadline dates and the appeal form <http://umanitoba.ca/registrar/>
- You are expected to view the General Academic Regulation section within the Academic Calendar and specifically read the **Academic Integrity** regulation. Consult the course syllabus or ask your instructor for additional information about demonstrating academic integrity in your academic work. Visit the Academic Integrity Site for tools and support <http://umanitoba.ca/academicintegrity/> View the **Student Academic Misconduct** procedure for more information.

- The University is committed to a respectful work and learning environment. You have the right to be treated with respect and you are expected to conduct yourself in an appropriate respectful manner. Policies governing behavior include the:

Respectful Work and Learning Environment

http://umanitoba.ca/admin/governance/governing_documents/community/230.html

Student Discipline

http://umanitoba.ca/admin/governance/governing_documents/students/student_discipline.html and,

Violent or Threatening Behaviour

http://umanitoba.ca/admin/governance/governing_documents/community/669.html

- If you experience **Sexual Assault** or know a member of the University community who has, it is important to know there is a policy that provides information about the supports available to those who disclose and outlines a process for reporting. The **Sexual Assault** policy may be found at:
http://umanitoba.ca/admin/governance/governing_documents/community/230.html More information and resources can be found by reviewing the Sexual Assault site <http://umanitoba.ca/student/sexual-assault/>
- For information about rights and responsibilities regarding **Intellectual**

Property view the policy

[http://umanitoba.ca/admin/governance/media/Intellectual_Property_Policy - 2013_10_01.pdf](http://umanitoba.ca/admin/governance/media/Intellectual_Property_Policy_-_2013_10_01.pdf)

For information on regulations that are specific to your academic program, read the section in the Academic Calendar and on the respective faculty/college/school web site <http://umanitoba.ca/faculties/>

Contact an **Academic Advisor** within our faculty/college or school for questions about your academic program and regulations <http://umanitoba.ca/academic-advisors/>

Student Advocacy

Contact Student Advocacy if you want to know more about your rights and responsibilities as a student, have questions about policies and procedures, and/or want support in dealing with academic or discipline concerns.

<http://umanitoba.ca/student/advocacy/>

520 University Centre

204 474 7423

student_advocacy@umanitoba.ca