This handout contains important information about how Geog 410 is structured, taught and assessed. A timetable for the seminar programme is provided at the end. In 2013, the course will be taught by Andy Sturman and Marwan Katurji with the assistance of other members of the atmospheric research group.

Course goals and content

The main goal of this course is to provide you with an appreciation of research approaches in atmospheric science. A major focus is on atmospheric processes near the ground or what is referred to as the boundary-layer meteorology, including surface radiational and turbulent energy exchange, and the development and characteristics of the atmospheric boundary layer. Building on this background knowledge, you will be introduced to atmospheric processes over varying surface types as well as complex terrain, which often produce local wind systems and other local climate variations. Applications to such problems as air pollution dispersion, wind energy and agriculture will also be covered. You will be required to examine topics of contemporary interest within the seminar programme. The course will include skills developed through literature research and an introduction to particular research methods used to investigate the atmosphere at this scale. Practical activities include introduction to atmospheric modelling and analytical and measurement techniques based on ongoing research projects within the department.

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Keep this handout with your Geog410 course notes for future reference
Teaching/learning methods

This course is taught through a seminar and reading programme, as well as through practical and field-based classes (see the schedule at the end). In Term 1, the seminars serve to provide background knowledge of important concepts and processes in mesoscale and local atmospheric research. Laboratory classes are integrated into the weekly programme to provide development of practical skills, such as atmospheric modelling and analytical and measurement techniques. Term 1 concludes with more applied sessions covering atmospheric boundary layer processes of importance to such topics as wind energy and air pollution transport and dispersion. Term 2 will provide you with an opportunity to present seminars based on your own literature research topic, as well as to learn about field measurement techniques through sessions in the laboratory and the field. There will also be project work relating atmospheric boundary layer processes to agricultural problems such as frost prediction and mitigation, and the term will conclude with an overview of the course.

The learning outcomes for this course will be both knowledge and skill oriented. By the conclusion of Geog410, you should be able to:
1. Describe and analyse the complexity of atmospheric boundary layer processes and phenomena,
2. Apply knowledge of atmospheric boundary layer processes and phenomena to practical problems involving human use of the environment,
3. Critically assess published research on the atmospheric boundary layer,
4. Design and execute your own atmospheric boundary layer research, involving modelling, analytical and/or measurement techniques.

Assessment

Assessment consists of:
1. A literature review (review paper) worth 50% and due one week after the seminar presentation. More information on this assignment is given below.
2. A research paper worth 50%, due on Friday 11 October and describing an independent practical exercise conducted using either the atmospheric modelling, measurement or analytical skills developed in the course.

Literature review (worth 50% of final mark)

Reviews should not exceed 20 pages (including figures and references), should be written in a style normally required for publication in scientific review journals (e.g. Progress in Physical Geography, Reviews of Geophysics), must be fully referenced and handed in on time. In the process of writing a literature review on a topic of your choice you must give a seminar presentation to the class outlining your progress (10% of the final grade). You are expected to produce a draft of your literature review before your seminar so that others can read about your topic. This is for your benefit, so that you receive constructive feedback during your seminar which can help you to complete your written assignment. The following steps should be followed:

a) Topics relevant to the course will be selected by the end of the second week.
b) Focus on recent literature on the topic (mostly found in peer-reviewed journals), and provide a contemporary review of the current status of research on the topic (do not just regurgitate old well-known textbook material).
c) Send a first draft of your review to the class via Learn and not later than midday on the Friday before your seminar is to be presented. This will allow others to read it before your presentation.
d) Present a seminar on the selected review topic (no more than 40 minutes, including discussion). Put your Powerpoint files in the \canterbury.ac.nz\universal\Scratch directory and
make sure that you let staff know well ahead of time via email that they are ready to be transferred to the laptop, or bring them along on a memory stick.

e) Feedback will be formerly requested from the class and staff on a standard form, and presenters will receive the completed forms after the presentations to help with their final editing. The completed review paper should take on board feedback on the seminar presentations and be no longer than 20 pages (including figures and references). It should be handed in within one week after the seminar presentation.

**Guidance for library research and reading**

Information for your assignments can be gained in a number of ways:

1. Library catalogues (Central, Physical Science, Engineering), which can all be accessed from the Geography Learning Space computers (level 3 in the lab block) or elsewhere on campus.

2. The search facilities in the libraries – check the library web site or talk to the library staff about databases that may be useful. Web of Science is a good start, but you can also look at Scopus or Science Direct. You could also contact Dave Clemens (dave.clemens@canterbury.ac.nz) who looks after the Geography Subject Guide in the Central Library (http://canterbury.libguides.com/geog) - he can be very helpful!

3. The following journals:
   - Agricultural and Forest Meteorology
   - Atmosphere
   - Atmosphere-Ocean
   - Atmospheric Environment
   - Atmospheric Chemistry and Physics
   - Atmospheric Research
   - Australian Meteorological Magazine
   - Boundary-layer Meteorology
   - Bulletin American Meteorological Society (AMS)
   - Bulletin World Meteorological Organisation
   - Clean Air and Environmental Quality
   - Climate Research
   - Climate Dynamics
   - Contributions to Atmospheric Physics
   - Dynamics of Atmospheres and Oceans
   - Environmental Pollution
   - Geophysical Research Letters
   - International Journal of Climatology
   - International Journal of Biometeorology
   - Journal of Applied Meteorology (AMS)
   - Journal of Atmospheric Chemistry
   - Journal of Atmosphere and Ocean Technology
   - Journal of Climate
   - Journal of Geophysical Research
   - Journal of Hydrometeorology
   - Journal of Meteorology
   - Journal of the Air and Waste Management Association
   - Journal of the Atmospheric Sciences
   - Meteorological Applications
   - Meteorological Magazine
   - Meteorological Monographs (AMS)
   - Meteorological Zeitschrift
Research paper (worth 50% of final mark)

Research papers should be about 10-15 pages (single spaced, including figures and references), should be written in a proper scientific style (examples will be provided on learn), and fully referenced and handed in on time. The research paper should be based on skills (atmospheric modelling and/or observational analysis) that you have developed in this course, and should be handed in by the due date of Friday 11 October. Examples of research papers will be provided on Learn. The chosen analytical or field measurement topic should relate to the course content and should be selected with the assistance of the teaching staff. Students are encouraged to choose specific topics that they are interested in and develop their approach with help of teaching and/or technical staff.

Class, field and laboratory work

This course is worth 0.25 EFTS so you should spend about 20 hours a week on coursework of some form or another, averaged over the semester. Although your contribution to class, field and laboratory sessions is often not directly assessed, your full involvement is expected. You are expected to attend all classes, and if you cannot attend you should send your apologies to Andy or Marwan in advance. Late work may be accepted after consultation with course lecturers when external factors (such as illness, injury or bereavement) interfere with normal work. However, application must be made on the forms obtained from the 5th floor of the Geography Staff block (see departmental guidelines). If you have any problems during the course, do not hesitate to contact either of the course coordinators for assistance.
Formal sessions for this course are on:

**Thursday 9am - 12 pm in Kirkwood KG06 (& computer lab, rm 608, Geography Building)**

The timetable of sessions is provided below:

**Term 1 – Background and applications**

11 July  Introduction to the course  
- Housekeeping/introductions  
- The atmosphere near the ground  
- Overview of current research  
- Introduction to atmospheric modelling and measurement  
- Introduction to research topics

18 July  Surface atmospheric processes  
- Surface energy exchange processes  
- Effects of surface characteristics  
- Measurement techniques  
- Atmospheric modelling (practical)  
- Confirmation of research topics

25 July  Atmospheric boundary-layer processes  
- Links between surface fluxes and the overlying atmosphere  
- Characteristic features of the atmospheric boundary layer

1 Aug   High resolution satellite remote sensing of surface characteristics in complex topography: challenges and future directions

8 Aug   Local circulations within an urban boundary layer in complex terrain  
- Effects of complex terrain and urban canopy on atmospheric boundary layer flows  
- Application of modelling techniques to air pollution dispersion

15 Aug   Wind engineering problems  
- The meteorology behind wind energy generation  
- Application of atmospheric modelling to wind energy resource assessment

**Term 2 – Field measurement and analysis techniques**

5 Sept  Field trip to Cass and introduction to field measurements of the on-going research field campaign STABX (www.geog.canterbury.ac.nz/research/stabx/stabx.shtml)

12 Sept  Student seminar presentations (based on literature review papers)

19 Sept  Project work – designing and describing the methodology and field area; selecting and applying appropriate analytical and/or modelling techniques

26 Sept  Project work – writing up the results and conclusions, and drafting the paper

3 Oct   Project work – final presentations

10 Oct  Overview and course round-up
Textbooks

While there is no required text for this course, several books are recommended (see below). You are expected to expand your knowledge by reading research publications on topics of interest, and to read widely, particularly recent journal articles.


Stefan, E. 2011 *Surface-based remote sensing of the atmospheric boundary layer*. Dordrecht : Springer Netherlands.


