

Dendroclimatology GEOS 597I

Interession 2006

3 credits

Instructors: Dr. Malcolm K. Hughes and Dr. Ramzi Touchan

We will adopt an “open-door” policy during normal working hours.

First class meeting 9.30am May 15th Room Shantz 242E.

Dendrochronology, the study of tree-rings, is a broad field in which annual growth layers in trees are used to explore important questions in a variety of disciplines, including archaeology, climatology, ecology, geomorphology, forest science and many others. This intensive 3-week short course, offered by the laboratory where the field was founded, provides an introduction to the climatological applications of dendrochronology.

Dendroclimatology will place tree rings as natural archives of climate fluctuation in the context of interannual to millennial fluctuations in climate, and of other sources of evidence. The development of tree-ring records for use in the development of climate reconstructions, and the testing and use of such reconstructions will be covered by a mixture of lectures, discussions, practical exercises and student presentations.

Dendroclimatology Schedule: May 15 - June 2

All lectures by Malcolm Hughes unless otherwise indicated.

May 14: Arrive Tucson

Week 1: (May 15 - 20):

Lectures 9-10.15 and 10.45-12, except first day when the first lecture will be at 9.30am in Shantz 242E.

Lab sessions: first week: we will split into two groups, one meeting 1pm to 3pm, the other 3.30pm to 5.30pm, both in Tree-Ring West Rm 20.

May 15:

Lect.1: Introductions and organization meeting.

Lect.2: What are tree rings?

Lab.I.: Introduction to materials

May 16:

Lect. 3: Dating – what it is and how it is done

Lect 3a (10am) Introduction to Java applet (Paul Sheppard)

Lect. 4: Xylem and how it is formed

Lab.II.: Dating exercise

May 17:

- Lect. 5: What can we measure? –state of tree ring (TRW, EW/LW, cell sizes, density, isotopes, other chemistry), trauma (scars, anomalous anatomy such as frost rings, light rings, white rings, etc.)
- Lect. 6: Dendroclimatological exploration – where can usable annual rings be found?
- Lab.III. Dating exercise.

May 18:

- Lect. 7 Site chronologies: dating
- Lect. 8 Site and tree selection
- Lab. IV. Dating exercise.

May 19:

- Lect. 9: Introduction to dendroclimatology
- Lect. 10: Introduction to dendroecology (DA Falk)
- Lab.V.: Dating exercise

May 20:

One-day field trip to Santa Catalina Mountains to see site and tree selection, sampling strategies and techniques.

Week 2 (May 22- 26)

Lectures 9-10.15 and 10.45 -12 (some days discussion of assigned reading replaces second lecture) in TRWest 20.

Labs –two 2-hr sessions in Tree-ring West Monday and Tuesday, 3-hr TRW20 Wednesday am, in BSE Thursday and Friday..

May 22:

- Lect. 11: Introduction to standardization and time-series properties
- Lect. 12: Regional Curve Standardization, Age-Band Decomposition etc. and chronology evaluation
- Lab VI.: Dendroclimatology exercise: COFECHA

May 23:

- Lect. 13: Signal identification: Response functions.
- Lect. 14: Common lecture: Reconstructing Fire-Climate relations: Tom Swetnam
- Lab. VI: Dendroclimatology exercise: COFECHA continued

May 24:

- Lab. VII: a) Discussion of Reading 1.
b) Dendroclimatology exercise: COFECHA continued and core preparation.
- Lect. 14 : Signal identification: Process-based modeling.
- Lect. 15: Transfer functions – basic ideas.

May 25:

- Lect.16: Case studies: Small regional studies.
Lect. 17: Guest lecture: Synoptic dendroclimatology – Katie Hirschboeck
Lab. VIII: Dendroclimatology exercise: ARSTAN.

May 26:

- Lect. 18: Case study: Interannual to millennial climate fluctuations recorded in old western trees.
Discussion of assigned reading 2.
Lab. IX.: Dendroclimatology exercise: ARSTAN continued.

Week 3 (May 29 – June 2):**May 29:**

**All day Monday – room 104 W. Stadium; Tuesday, Wednesday Thursday mornings
W. Stadium 104, afternoons in BSE except where indicated**

All common lectures in Shantz 242E

- Lect. 19: Use of tree rings in reconstruction of hemispheric and global temperature patterns
Discussion of assigned reading 3
Lab. X: Dendroclimatology exercise: Introduction of a process-based model, Kevin Anchukaitis

May 30:

- Lect. 20: 9-10 Common lecture – Isotopes in dendrochronology – Leavitt
10-11 Common lecture – Tropical isotope dendroclimatology - Anchukaitis
11-12 Discussion of assigned reading 4
Lab. XI: Dendroclimatology exercise: Response functions

May 31:

- Lect. 21: Common lecture: Reconstructing regional patterns of streamflow – Dave Meko
Lect. 22: Guest lecture: Dendroclimatology in the Mediterranean region, Ramzi Touchan
Lab. XII: Group microprojects

June 1:

- Lect.23 Guest lecture – Tree rings and ice cores in Western China -Paul Sheppard
Lecture 22: Overview lecture on dendroclimatology
Lab. XIII: Group microprojects and preparation of student presentations

June 2:**8.30 Tour of Tree-Ring Lab – West Stadium**

9.30 Preparation of Student presentations

12.30 Student presentation, course evaluation and wind-up
3.30 End of course

Full participation in all scheduled and assigned activities is essential to satisfactory completion of this intensive course. Graduate students will be assessed on contributions to group activities (70%), and their reporting on analysis and synthesis of results (30%). There is no single required text, but required readings will be made available. Students will participate in a one-day weekend field trip the first weekend of the course. It will be students' responsibility to bring appropriate clothing and footwear.