



Advances in Climate Sciences, F8513S

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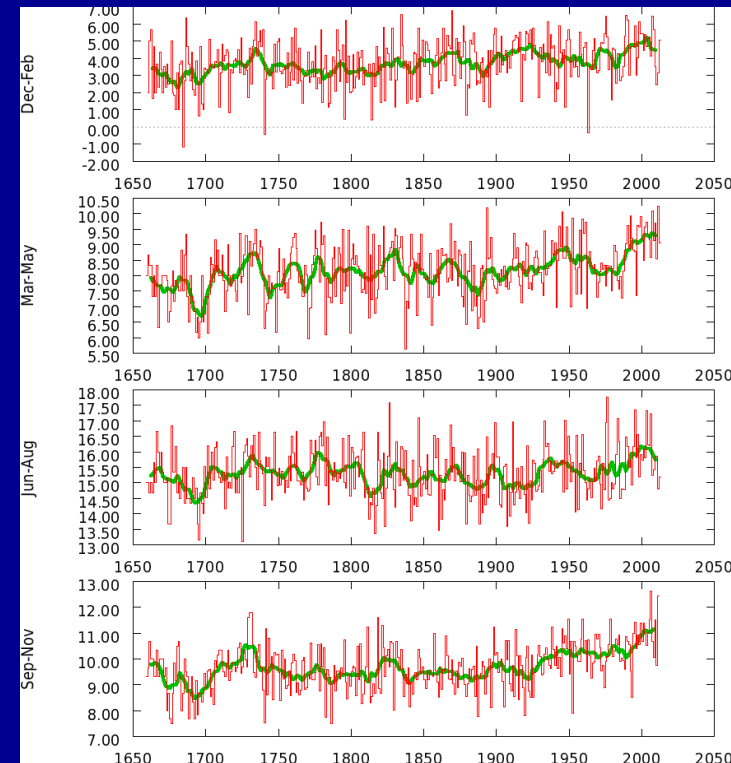
Two Aspects of The Module

1. Climate variability at a wide range of timescales
 - ENSO, Pacific Decadal Oscillation (PDO), North Atlantic Oscillation (NAO), Madden-Julian Oscillation (MJO).....
 - Major uncertainties in climate sciences, such as climate models, global carbon cycles.....

Two Aspects of The Module

2. Quantitative climate analyses

- Climate data formats (e.g., ascii or binary)
- KNMI Climate Explorer
- Statistics in climate sciences



Module Programme: Lectures

- Lecture 1: Introduction to climate sciences
- Lecture 2: ENSO climate variability One
- Lecture 3: ENSO climate variability Two
- Lecture 4: ENSO climate variability Three
- Lecture 5: Climate variability at longer timescales
- Lecture 6: Climate statistics review and research topics
- Lecture 7: Climate variability at shorter timescales

Module Programme: Lectures

- Lecture 8: Earth system and climate models
- Lecture 9: IPCC climate projections
- Lecture 10: End-of-term summary and report writing
- Lecture 11: No lecture (I will be in China field class.).

Module Programme: Labs

- Lab 1: Introduction to lab sessions
- Lab 2: Introduction to KNMI Climate Explorer
- Lab 3: KNMI analysis one
- Lab 4: KNMI analysis two
- Lab 5: Introduction to IPCC models
- Lab 6: Assessment Oral Presentation
- Lab 7: Assessment Oral Presentation

Module Programme: Labs

- Lab 8: Research project one
- Lab 9: Research project two
- Lab 10: Research project three
- Lab 11: No lab (I will be in China field class.)

Two Assessments

- 1. An outline of research project: 10-minute presentation at our lab session.**
- 2. Climate analysis report (4000-word) due during the mid-year assessment period (AB2) to Canvas (e-submission).**

Module Outline

- Teaching staff: Dr. Yi Wang (convenor)
- One lecture per week (1H).
- One lab session per week (2H).
- I may offer additional lab sessions in the term.
- Attendance is compulsory for both lecture and lab sessions.

Two Main Research Topics

1. ENSO and Climate Changes:

- a. ENSO and its correlations with rainfall (Asian, Australian, or African monsoons).
- b. ENSO and its correlations with temperature changes (in South Africa).
- c. ENSO and its correlations with Arctic sea ice
- d. ENSO and its correlations with NAO or AMO index

2. IPCC Climate Projections:

- a. What is projected rainfall change over the Sahel/Sahara boundary?
- b. What is projected change of snow season over Canada?

Module Recommended Textbooks

- IPCC AR5 Working Group I Report (downloaded free online @ IPCC website)
- IPCC AR6 Working Group I Report (also free@IPCC website)
- Climate Change and Climate Modelling, David Neelin, Cambridge University Press (2011)
- The Global Climate System, edited by Howard Bridgman and John Oliver, Cambridge University Press (2006)
- Climate Change: A Multidisciplinary Approach, William Burroughs, Cambridge University Press (2010)

Module Learning Outcomes

- Demonstrate some fundamental knowledge on the climate system and its variability (e.g., ENSO).
- Understand the cause of climate change and variability (e.g., NAO).
- Understand the key elements of climate models and their predictions.

Module Learning Outcomes

- Summarise key debates and uncertainties in the climate change (e.g., ENSO)
- Identify research topics and help you develop independent research questions on the climate sciences under two main streams.
- Understand the fundamental approaches used in climate analyses and evaluations (e.g., statistics).