ES7013 Climate and Climate Change (3AUs)

This course is designed to provide you a comprehensive and interdisciplinary introduction to climate science. It covers the scientific concepts and physical principles of climate science, the history of Earth's climate, evidence for climate change, the interactions between the climate system and human society, the mitigation and adaptation of climate change, and the ethical and political dimensions of climate change. Through this course, you are expected to become familiar with analytical and mathematical tools to study the climatic state, and finally, to be able to link theories to the observation data in the real world.

We will cover a wide range of topics in climate science. You will learn how the climate system works, what caused climate change in the past, how climate will change in the future, and to what extend such changes was or will be caused by human activity. While climate has been consistently changing, this course mostly contains the following topics.

1. Earth's climate system, atmospheric structure and composition
2. Earth's radiation budget
3. Dynamics: hydrostatic balance
4. Thermodynamics: tropical weather, humidity and precipitation
5. Numerical climate modelling: global climate models and climate feedback
6. Global warming and consequences: IPCC and recent climate change, climate projections
7. Climate change in Singapore and how Singapore is addressing climate change
8. Deep time Earth's climate
9. Earth's carbon cycle
10. Ice ages, greenhouse to icehouse, abrupt climate change
11. Climate and human evolution
12. Anthropocene and climate engineering