UNIVERSITÀ DEGLI STUDI FIRENZE | DST Dipartimento di Scienze della Terra

UNIVERSITÀ DEGLI STUDI FIRENZE | SISTEMA MUSEALE DI ATENEO

Max Planck Institute for Biogeochemistry

SHORT COURSE

Thermodynamics and Optimality of the Earth system

September 19-21, 2022

Sala Strozzi (Paleontology Museum), DST UNIFI

Via Giorgio La Pira 4, Firenze

Virtual room

Visiting Professor

Prof. Axel Kleidon

Max Planck Institute for Biogeochemistry, Jena (D)
BGC – Group of Biospheric Theory and Modelling

axel.kleidon@bgc-jena.mpg.de

For details see CV: https://www.bgc-jena.mpg.de/index.php/BTM/AxelKleidon

ABSTRACT

Water flows downhill, mountains erode, and wood burns into ashes. If nothing else happened, sooner or later, water would collect in the world's oceans, mountains would be eroded down to the seafloor, and wood would decompose to its raw ingredients. The outcome would constitute a "dead" state of the Earth system, without atmospheric dynamics, hydrologic and biogeochemical cycling, and it would be unable to sustain life. The present Earth is nowhere near such a "dead" state, and thermodynamics provides the key answer to understand why the Earth is not in such a "dead" state and how processes perform work to keep the Earth in an active state.

For information please contact: Prof.ssa Antonella Buccianti - antonella.buccianti@unifi.it

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PROGRAM (12h of frontal lessons):

Monday 19 - Day 1

- 10:00-12:00 - Introduction and Basics
- 13:00–14:30 Short Course Lunch
- 15:00-17:00 - Climate

Tuesday 20 - Day 2

- 10:00-12:00 - Climate Change
- 15:00-17:00 - Hydrologic Cycling

Wednesday 21 - Day 3

- 10:00-12:00 – Life and Habitability
- 15:00-17:00 - Humans, Sustainability, and Renewable Energy

Further information:

- Prerequisite: Master's degree in scientific disciplines
- Lessons available both in presence and online
- Discussion is welcome!
- Suggested reading: research articles provided by the teacher
- Certificate of attendance

COURSE

- This short course provides the basics to understand how dynamics are maintained in Earth systems from a thermodynamic perspective.
- It provides the basics for a comparatively non-technical description of the thermodynamic foundations, illustrates quantitatively how these apply to the various processes of the Earth system, describes how thermodynamics links with organization of flows in space and time (such as turbulent structures and fractal networks), and how these shape the interactions with other processes and their boundary conditions within the system.
- These descriptions are illustrated with examples that apply these concepts to climate and global warming, hydrology, and limits of renewable energy. The course consists of a mix of lectures, exercises, and discussions.

Course registration via Moodle platform

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