Oceanographic Data Processing

Dr. Julia Köhler

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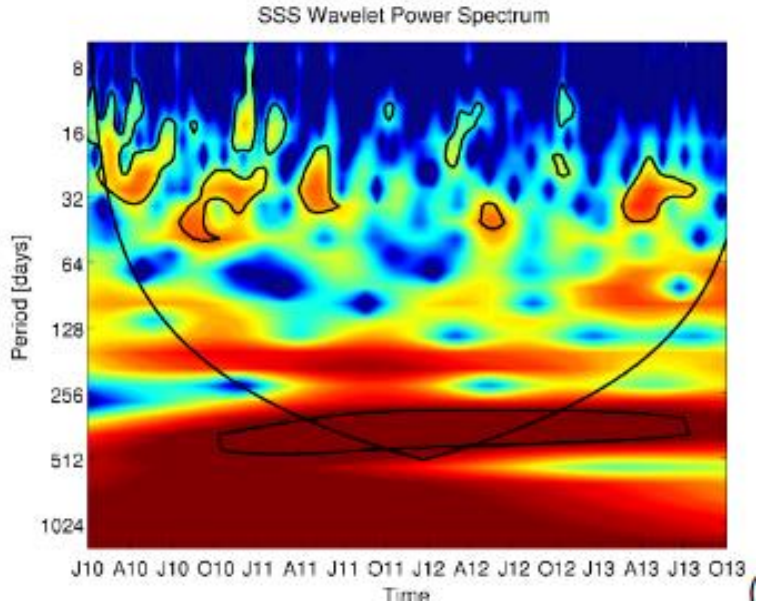
In Search of Patterns

- Physical Oceanographer
- **Research Focus:** Developing a satellite-based Sea Surface Salinity (SSS) product for climate research and investigated the complex interplay between oceanic processes and atmospheric conditions to better understand climate dynamics
- **Current Role:** Speaker of Climate Topics/Data Scientist for a non-profit organization
- **Coding Experiences:**
  - Fortran
  - Matlab
  - Python



Course Objectives, Rules & Guidelines

Key Learning Outcomes

Environment Setup: Set up and manage Python environments using VS Code and scientific libraries.

Data Handling: Load, explore, and process large datasets (e.g., NetCDF) with xarray and numpy.

Python Programming: Apply core Python concepts like loops, functions, classes, and error handling.

Data Analysis: Perform statistical analysis (means, trends) and manipulate multidimensional arrays.

Visualization:Visualize data with hvplot, matplotlib and overlay geographical features using geopandas.

Scientific Algorithms: Use Fourier transforms, wavelet analysis, and EOF to explore frequency patterns.

OOP: Automate tasks with reusable Python classes for time series analysis.

Your Time Commitment

- We have 10.5 hours of face-to-face sessions, but you also have homework and self-practice time (approximately 65 hours).
- It is important to spend time at home completing what we don’t finish in class and doing the assigned homework.
- If you have any questions, feel free to reach out to me.
- My priority is that you understand the material and enjoy learning it.

Course Schedule Overview

- **Dates:**
  - November 2: Session 1 & 2
  - November 30: Session 3 & 4
  - January 11: Session 5 & 6

- **Timing:**
  - Each Session is 1 hour 45 Minutes, followed by a 30-minutes beak
  - We start promptly at **10:00** am each day
  - The course ends at 2:00 pm each day

Course Rules & Guidelines

Attendance Requirement: Regular attendance is mandatory. If you miss more than 20% of the course, you will not be eligible to take the final exam.

Absences: If you know in advance that you cannot attend a session or might be late, please notify me before the course begins by emailing *julia.koehler@hcu-hamburg.de*. Together, we will find a solution.

Punctuality: We start promptly at 10:00. (Too) late arrivals will be marked as absent.

Today’s Objectives

Session 1 & 2

Set Up the Workspace:

- (Install) and configure Python and VS Code.
- Create and manage a virtual environment for scientific programming.

Data Handling: Load and explore wind and sea surface temperature (SST) datasets using Python.

Data Analysis:

- Calculate SST anomalies and the long-term trend.
- Analyze the ENSO (El Niño-Southern Oscillation) phenomenon in the Pacific.