Course Fees

Students*	300 €
University Employees	400 €
Others	500 €

*including doctoral students. Employees and students of the University of Potsdam are exempted from the course fee.

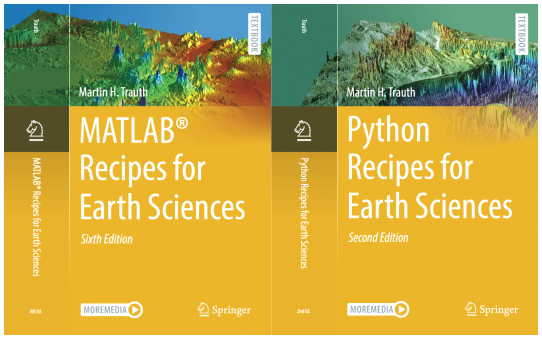
The book

The course fees includes an electronic copy of the textbooks

Trauth, M.H. (2025) MATLAB Recipes for Earth Sciences – Sixth Edition. Springer International Publishing, 567 p, https://doi.org/10.1007/978-3-031-57949-3.

Trauth, M.H. (2024) Python Recipes for Earth Sciences – Second Edition. Springer International Publishing, 491 p., https://doi.org/10.1007/978-3-031-56906-7.

including all course materials, example data, as well as all MATLAB and Python recipes.



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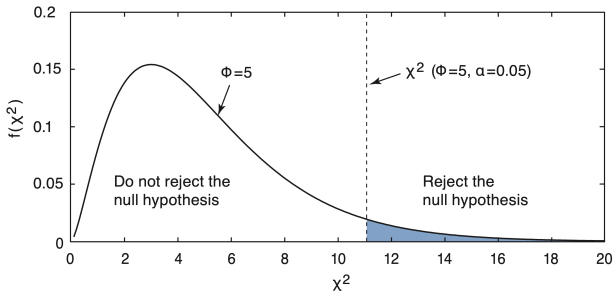
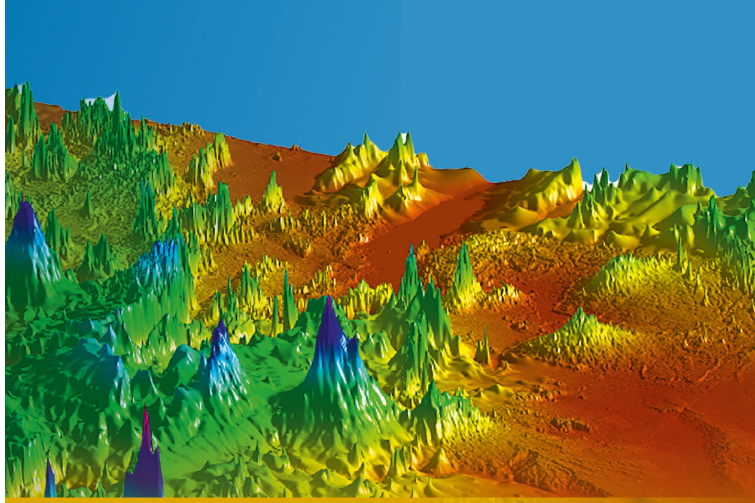
URL http://www.martinhtrauth.de
URL https://mres.uni-potsdam.de



Principles of a χ2-test. The null hypothesis that the two distributions are identical cannot be rejected if the measured χ2 is lower than the critical χ2.



60th Shortcourse on

MATLAB and Python Recipes for Earth Sciences

15–19 September 2025
Interactive online seminar

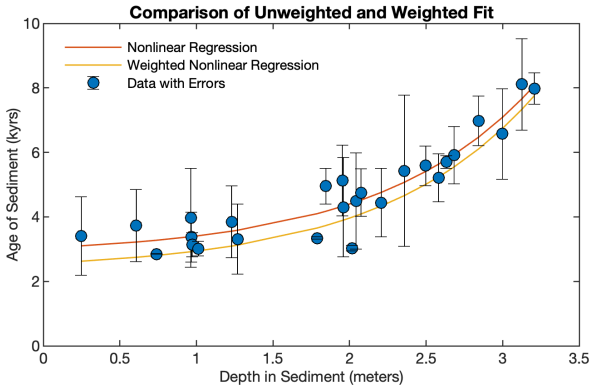
Prof. Dr. Martin H. Trauth
University of Potsdam, Germany

Content

The course introduces methods of data analysis in earth and environmental sciences using the MATLAB and Python software, the leading software packages for the data analysis. The content of the course includes basic statistics for univariate, bivariate and multivariate datasets, time-series analysis and signal processing, processing and displaying digital elevation models, gridding and contouring, and image processing and analysis.

References

The course was taught since more than 20 years at the BAM Berlin, U Aberystwyth, U Addis Ababa, U Bremen, U Bratislava, U Fribourg, U Ghent, UA Barcelona, BGR Hannover, U Kiel, UC London, LMU München, BGI Bayreuth, U Nairobi, U Köln, U Stockholm, U Amsterdam, NHM Vienna, GNS Science Wellington, Brown U Providence, U Arizona Tucson, U Fribourg and U Potsdam.



Comparison of unweighted (dashed line) and weighted (solid line) regression results from synthetic data. The plot shows the original data points (circles), the error bars for all data points, and the regression line for an exponential model function.

Course Program

Monday

Data analysis in earth and environmental sciences, types of data, overview of methods. Introduction to the MATLAB and Python programming environment. MATLAB and Python syntax, import and export of data, types of data, scripts and functions, basic visualization techniques.

Tuesday

Univariate statistics, theoretical distributions, hypothesis testing, distribution fitting, error analysis. Bivariate statistics, regression, bootstrap and jackknife, reduced major axis regression, nonlinear weighted regression.

Wednesday

Time-series analysis, Fourier Transform, Schuster's periodogram, Blackman-Tukey and Welch's method, spectrogram, Thomson's multitaper method, Lomb-Scargle method, Wavelet power spectrum. Signal processing, convolution and filtering, filter design, adaptive filters.

Thursday

Analysis of spatial data, digital terrain models, spatial interpolation, visualization of spatial data. Multivariate statistics, principal component analysis, cluster analysis, discriminant analysis, Aitchison's log-ratio transformation.

Friday

Image processing and analysis, processing and georeferencing satellite images, image analysis of microscope images, quantification of objects in images, Hough transformation, digitization. Optional short presentation of the participants' projects, followed by a discussion on how to apply the methods learnt in the course.

Course Concept

The course is being taught as an interactive online seminar with lectures, demonstrations and exercises on selected examples from the earth and environmental sciences.

We use a modern web conferencing system for the lectures, demonstrations and exercises, in connection with a course management system for the course materials including recorded lectures, coding sessions and exercises.

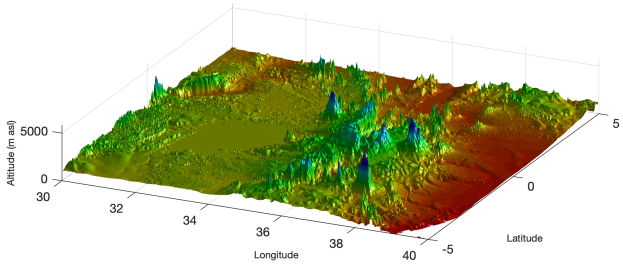
The participants are expected to use their personal computers running Windows, Linux, or macOS. A temporary license of MATLAB will be provided by the organizers. We will use the free Anaconda distribution with Spyder and Python.

Registration

Register online at 60th Shortcourse Registration

60th Course – English 15–19 September 2025

Deadline: 1 August 2025



Surface plot of the GTOPO30 elevation data using light. The plot uses phong as the lighting type, which is very popular in 3D computer graphics and creates a combined diffuse and specular reflection on surfaces (data from the U.S. Geological Survey).