

Lecture Abstract:

Time Series Analysis

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Climate is a paradigm of a complex system. Analysing climate data is an exciting challenge, which is increased by non-normal distributional shape, serial dependence, uneven spacing and timescale uncertainties. My book (Mudelsee, 2010) presents bootstrap resampling as a computing-intensive method able to meet the challenge. It shows the bootstrap to perform reliably in the most important statistical estimation techniques: regression, spectral analysis, extreme values and correlation.

This course illustrates the basic statistical concepts (cf. book chapters 1 to 3) and focuses on two application types: regression (chapter 4) and correlation (chapter 7).

Audience, background: A basic understanding of mathematics and statistics is assumed.

Audience, reading: Participants would benefit mostly if they have available (and had a cursory reading before) of the book (Mudelsee, 2010).

Audience, book recommendation: Mudelsee M (2010) Climate Time Series Analysis: Classical Statistical and Bootstrap Methods. Springer, Dordrecht Heidelberg London New York. [ISBN-13: 978-90-481-9481-0, ISBN-10: 90-481-9481-4, e-ISBN: 978-90-481-9482-7, DOI: 10.1007/978-90-481-9482-7; xxxiv + 474 pp; Atmospheric and Oceanographic Sciences Library, Vol. 42]

Audience, link to book: <http://www.manfredmudelsee.com/book>

Audience, software: Participants should bring their own laptop (Windows, Mac, possibly also Linux) with their computing environment of choice (preferably Fortran, C, R or Matlab). Pre-installed version of Gnuplot graphics viewer would be good. Software shall be provided in the computer tutorial.

Audience, links to software: <http://gcc.gnu.org/wiki/GFortranBinaries> (Fortran compiler),
<http://cran.r-project.org/bin/windows/base/> (R package),
<http://www.gnuplot.info/download.html> (Gnuplot)

¹ Climate Risk Analysis, <http://www.climate-risk-analysis.com/>

Audience, data: Participants are very welcome to bring their own data time series to the course. We try to give individual feedback on statistical/climatological estimation challenges.

Mudelsee, general: received his diploma in Physics from the University of Heidelberg and his doctoral degree in Geology from the University of Kiel. He was then postdoc in Statistics at the University of Kent at Canterbury, research scientist in Meteorology at the University of Leipzig and visiting scholar in Earth Sciences at Boston University; currently he does climate research at the Alfred Wegener Institute for Polar and Marine Research, Bremerhaven. His science focuses on climate extremes, time series analysis and mathematical simulation methods. He has authored over 60 peer-reviewed articles. In his 2003 paper, Mudelsee introduced the bootstrap method to flood risk analysis. In 2005, he founded the company Climate Risk Analysis.

Mudelsee, links: <http://www.manfredmudelsee.com/> (academic URL), <http://www.climate-risk-analysis.com/> (company URL)