Global warming assessment using MATLAB

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Title: Extreme events analysis using MATLAB.

Summary: In this activity, we learn where to get climate data (monthly temperature maxima and monthly precipitation maxima) from the National Oceanic and Atmospheric Administration (NOAA). We learn how to fit a GEV distribution for extreme events analysis and how to calculate the confidence intervals of the analysis. We learn how to be critical about the results calculated, how to ensure the quality of the calculations performed and to put the results calculated with model in perspective to the empirical results.

Learning Goals: Students learn how to find and analyze climate data and how to be critical regarding the quality of the data they have and about the interpretation of their results. They will learn trend analysis and extreme values analysis using probabilistic distributions, how to perform some quality control routine on their data (K-S test for fitting, sensitivity analysis using half and full dataset).

Context for use: This activity is designed for the public who wants to learn how to be critical with climate data analysis and for the students who are working on data analysis, at any academic level (undergraduate or graduate). Students with limited coding experiences will be able to successfully complete this activity since it involves more thinking than coding. However basic experience in Matlab syntax is preferred. Basic knowledge of data analysis is also preferred but not required.

Assessment

At the end of the activity, the student should have decided if the climate got warmer in its selected area within the past decades and what's his confidence interval. The student should also have calculated the return level of an 80-years event.

References and Resources

AghaKouchak A., Easterling D., Hsu K., Schubert S., Sorooshian S. (eds.), 2012, Extremes in a Changing Climate, Springer, ISBN 978-94-007-4478-3

AghaKouchak A., Sellars S., Sorooshian S., Methods of Tail Dependence Estimation, in Extremes in a Changing Climate (eds. AghaKouchak A., Easterling D., Hsu K., Schubert S. and Sorooshian S.), Springer, ISBN 978-94-007-4478-3.