I'm not a bot

1 The Nordic-Baltic co-operation on the EMEP AssessmentParticipants: Jan Schaug, Kjetil Tørseth, Norway Niels Heidam, Denmark Gun Lövblad, Karin Sjöberg, Sweden Pia Anttila, Tuija Ruoho-Airola, Finland Katrin Pajuste, Toivo Truuts, Estonia Marina Frolova, Iraida Luylko, Latvia Dalia Sopauskiene, Lithuania we all should prepare a national study on the sources and trends of acidifying substances we agreed on a grass-roots approach were all countries work with their own data we should use common tools in order to get directly comparable results the developed software must be accessible to all of us 2 Tools Makesens (MS-Excel-spreadsheet) for calculation of the trend statistics (Mann-Kendall test and Sen’s slope estimates) INPUT: annual values of atmospheric and precipitation concentrations and deposition OUTPUT: -time series graphs to analyze if the series qualifies the initial conditions of the stat. methods -trend statistics values 3 Tools the sector template, which calculates the annual average concentrations for each wind sector arriving at each measurement site INPUT: -daily measurement values of atmospheric concentrations -the daily sector value classification for each site ( ) offered at the EMEP homepages OUTPUT: seasonal sectoral concentration values 4 Contents of each national contributionResults Contents of each national contribution Description of sites, methods and data quality Emissions of acidifying components Trends and sources of air and precipitation concentrations Comparison between measurements and modelling Discussion of trends in relation to emissions, meteorology and data quality And finally we will try to make a Nordic-Baltic summary of the findings Mann-Kendall trend test is a nonparametric test used to identify a trend in a series, even if there is a seasonal component in the series.Mann-Kendall test historyThis test is the result of the development of the nonparametric trend test first proposed by Mann (1945). This test was further studied by Kendall (1975) and improved by Hirsch et al (1982, 1984) who allowed to take into account a seasonality.Mann-Kendall trend test hypothesesThe null hypothesis H0 for these tests is that there is no trend in the series.The three alternative hypotheses are that there is a negative, non-null, or positive trend.The Mann-Kendall tests are based on the calculation of Kendall's tau measure of association between two samples, which is itself based on the ranks with the samples. The computations assume that the observations are independent.XLSTAT allows taking into account and removing the effect of autocorrelations. Sen's slope is computed if you request to take into account the autocorrelation(s)Mann-Kendall trend testIn the particular case of the trend test, the first series is an increasing time indicator generated automatically for which ranks are obvious, which simplifies the calculations.To calculate the p-value of this test, XLSTAT can calculate, as in the case of the Kendall tau test, an exact p-value if there are no ties in the series and if the sample size is less than 50. If an exact calculation is not possible, a normal approximation is used, for which a correction for continuity is optional but recommended.Seasonal Mann-Kendall testIn the case of seasonal Mann-Kendall test, we take into account the seasonality of the series. This means that for monthly data with seasonality of 12 months, one will not try to find out if there is a trend in the overall series, but if from one month of January to another, and from one month February and another, and so on, there is a trend.For this test, we first calculate all Kendall's tau for each season, then calculate an average Kendall’s tau. The variance of the statistic can be calculated assuming that the series are independent (eg values of January and February are independent) or dependent, which requires the calculation of a covariance. XLSTAT allows both (serial dependence or not).To calculate the p-value of this test, XLSTAT uses a normal approximation to the distribution of the average Kendall tau. A continuity correction can be used. A Mann-Kendall Trend Test is used to determine whether or not a trend exists in time series data. It is a non-parametric test, meaning there is no underlying assumption made about the normality of the data. The hypotheses for the test are as follows: H0 (null hypothesis): There is no trend present in the data. HA (alternative hypothesis): A trend is present in the data. (This could be a positive or negative trend) If the p-value of the test is lower than some significance level (common choices are 0.10, 0.05, and 0.01), then there is statistically significant evidence that a trend is present in the time series data. This tutorial explains how to perform a Mann-Kendall Trend Test in R. Example: Mann-Kendall Trend Test in R To perform a Mann-Kendall Trend Test in R, we will use the MannKendall() function from the Kendall library, which uses the following syntax: MannKendall(x) where: x = a vector of data, often a time series To illustrate how to perform the test, we will use the built-in PrecipGL dataset from the Kendall library, which contains information about the annual precipitation for all of the Great Lakes from the years 1900 to 1986: #load Kendall library and PrecipGL dataset library(Kendall) data(PrecipGL) #view dataset PrecipGL Time Series: Start = 1900 End = 1986 Frequency = 1 [1] 31.69 29.77 31.70 33.06 31.31 32.72 31.18 29.90 29.17 31.48 28.11 32.61 [13] 31.31 30.96 28.40 30.68 33.67 28.65 30.62 30.21 28.79 30.92 30.92 28.13 [25] 30.51 27.63 34.80 32.10 33.86 32.33 25.69 30.60 32.85 30.31 27.71 30.34 [37] 29.14 33.41 33.51 29.90 32.69 32.34 35.01 33.05 31.15 36.36 29.83 33.70 [49] 29.81 32.41 35.90 37.45 30.39 31.15 35.75 31.14 30.06 32.40 28.44 36.38 [61] 31.73 31.27 28.51 26.01 31.27 35.57 30.85 33.35 35.82 31.78 34.25 31.43 [73] 35.97 33.87 28.94 34.62 31.06 38.84 32.25 35.86 32.93 32.69 34.39 33.97 [85] 32.15 40.16 36.32 attr(,"title") [1] Annual precipitation, 1900-1986, Entire Great Lakes To see if there is a trend in the data, we can perform the Mann-Kendall Trend Test: #Perform the Mann-Kendall Trend Test MannKendall(PrecipGL) tau = 0.265, 2-sided pvalue =0.00029206 The test statistic is 0.265 and the corresponding two-sided p-value is 0.00029206. Because this p-value is less than 0.05, we will reject the null hypothesis of the test and conclude that a trend is present in the data. To visualize the trend, we can create a time series plot of the annual precipitation by year and add a smooth line to depict the trend: #Plot the time series data plot(PrecipGL) #Add a smooth line to visualize the trend lines(lowess(time(PrecipGL),PrecipGL), col='blue') Note that we can also perform a seasonally-adjusted Mann-Kendall Trend Test to account for any seasonality in the data by using the SeasonalMannKendall(x) command: #Perform a seasonally-adjusted Mann-Kendall Trend Test SeasonalMannKendall(PrecipGL) tau = 0.265, 2-sided pvalue =0.00028797 The test statistic is 0.265 and the corresponding two-sided p-value is 0.00028797. Once again this p-value is less than 0.05, so we will reject the null hypothesis of the test and conclude that a trend is present in the data. We're fetching your file...Please wait a moment while we retrieve your file from its home on the internet We're fetching your file...Please wait a moment while we retrieve your file from its home on the internet 0 ratings0% found this document useful (0 votes)70 views8 pagesThe document provides an overview of the Mann-Kendall Test, a statistical method used to identify trends in time series data. It includes data sets, calculations for MK-stat, z-stat, p-value...SaveSave Mann Kendall Test For Later0%0% found this document useful, undefined0 ratings0% found this document useful (0 votes)70 views8 pagesThe document provides an overview of the Mann-Kendall Test, a statistical method used to identify trends in time series data. It includes data sets, calculations for MK-stat, z-stat, p-value, and a time series plot. The document appears to be part of a larger tool or guide related to statistical analysis using Excel.0 ratings0% found this document useful (0 votes)70 views8 pagesThe document provides an overview of the Mann-Kendall Test, a statistical method used to identify trends in time series data. It includes data sets, calculations for MK-stat, z-stat, p-value… TREND ANALYSES OF AIR QUALITY MONITORING DATA USING MANN-KENDALL TESTSGeneva, 20 March 2002 Timo SalmiFinnish Meteorological Institute Air Quality Research timo.salmi@fmi.fiContent • Introduction • Methods and limitations • Excel template • ExamplesINTRODUCTION • Nordic-Baltic EMEP assessment project • Methods selected for trend analysis of annual values: • existence: Mann-Kendall test • magnitude: Sen’s Slope estimator • Excel template for statistical calculations • Template and user manual will be available also for other countriesREFERENCES Gilbert, R.O. 1987. Statistical methods for environmental pollution monitoring. Van Nostrand Reinhold, New York. Alain Siros, 1998. A Brief and Biased Overview of Time- Series Analysis or How to Find that Evasive trend. In WMO report No. 133: WMO/EMEP Workshop on Advanced Statistical Methods and their Application to Air Quality DataMANN-KENDALL TEST • Ho: The values are randomly ordered in time • H1: There is a monotonic trend in time => for annual air quality values only • Nonparametric: test parameter Z depends only on ranking of values • Z normally distributed when n10 • Template calculates two-tailed tests for significance levels 0.001 (***99.9%) , 0.01 (**99%), 0.5 (*95%) and 0.1 (+90%) • Missing values allowedSEN’S SLOPE ESTIMATOR • Linear model for trend f(t)=Q t + C • Nonparametric - no assumption about distribution of residuals but variance of residuals should be constant in time • Template calculates Sen’s estimator for Q and it’s 99% and 95% confidence intervals • Valid when N>10 and not many ties • Missing values allowedVirolahti E17, SO4 in precsignificance ***Virolahti E17, NH4 in precsignificance *Virolahti E17, NO3 in precsignificance *Virolahti E17, Ca in precsignificance ***Virolahti E17, NH3+NH4 in airsignificance >0.1Virolahti E17, SO2 is airsignificance **SUMMARY • An easy to use Excel template has been created for calculation trend statistics of annual air quality values • Methods used are Mann-Kendall test for trend significance and Sen’s slope estimates • The template will be used in the joint Nordic-Baltic EMEP Assessment project • The template can be made available for other countries working with EMEP Assessment, possibly by the EMEP web-site • The users manual will be published and made available too • Limitations of the methods must be taken into considerationThank You

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