Efficiency tests for automatic homogenization methods of monthly temperature and precipitation series "MULTITEST"

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Aims of MULTITEST

- Testing of monthly homogenization softwares with larg test datasets of varied climatic and inhomogeneity properties and identifying the best performing methods;

- Clarifying the relations between efficiencies and test dataset characteristics;

- Finding the minimum conditions for automatic methods in terms of the number of comparable time series, their length and their spatial correlations;

- Providing a large size benchmark dataset for the climatological community characterizing the observed climate of various geographical regions;

Scope of MULTITEST

- Efficiency tests for the homogenization of monthly temperature and monthly precipitation datasets;

- Only automatic methods or semiautomatic methods with default parameterization will be tested;

- Wide range of test dataset properties:
  - climate,
  - network density,
  - inhomogeneity properties,
  - length of time series,
  - missing data fields.

Important and timely (?)

- Variability of monthly and annual means is still an important issue;

- Methodology is better developed for monthly and annual scale data and the potential improvement of data quality is the clearest with the homogenization of annual and monthly data;

- The HOME benchmark with its 15 networks was too small and could not include the examination of the impact of various dataset properties;

- There are new softwares, which should be tested;

- Most inhomogeneities cannot be quantified with parallel measurements.

Evaluation of efficiency

- Centred RMSE of monthly values;

- Centred RMSE of annual values;

- RMSE of trend bias;

- RMSE of network mean trend bias.

Principles of methodology

- Parent networks of at least 100, spatially well correlating time series are built, then subsets of pre-set size are randomly selected;

- Both real data based and synthetic test datasets are used;

- Forms of inhomogeneities: shift, trend, platform;

- True frequency of inhomogeneities is usually higher than that of the detected frequency;

- Inhomogeneity properties are widely varied.

Homogeneous benchmark

- Regional differences of climate is more important for precipitation than for temperature;

- Real data based section of benchmark:
  – advantage: it characterizes best the spatial –
    temporal structures of observed data;
  – drawback: presence of residual inhomogeneities;

- Synthetic section:
  – advantage: fully homogeneous;
  – drawback: imperfect spatial-temporal structures

Homogeneous benchmark

- Temperature, real data based section
  - USA data, Rachel Warren's dataset
  - Spanish data (AEMET)

- Temperature, synthetic section
  - Spatially correlated white noise, 3 versions of predominating spatial correlations

Homogeneous benchmark

- Precipitation, real data based section
  - Mediterranean climate: Mallorca (AEMET)
  - oceanic climate: Ireland (Met Éireann)
  - continental climate: CARPATCLIM gridded observational data (www.carpatclim-eu.org)
- Precipitation, synthetic section
  - Climate of northern Spain, two versions of predominant spatial correlations
  - Monsoon climate, modelling climate of India, two versions of predominant spatial correlations

Parameterization

- Length of time series: 30yr, 60yr, 120yr
- Number of time series in network: 4, **5**, 7, **10**, **25**, 40
- Missing data: **0%**, 10%, 30%; 25 series & 70% missing data
- Form of inhomogeneities: shift, trend, platform
- Three kinds of standard dev. of inhomogeneities (low, medium, high)

	Temperature	Precipitation
Frequency in 100yr		
Frequency of shift	3 **5** 7	1 **3**
Frequency of trend	1	1
Frequency of platform	1 3 10	1 3
Seasonality of biases:	- semi-sinusoid	- no seasonality
	- other	- winter biases differ

Interactive contact and transparency

- New softwares are accepted for testing until the end of 2016

- Parent benchmark will be published at the beginning of 2017

- Datasets of selected experiments will be published

Thank you for your attention!