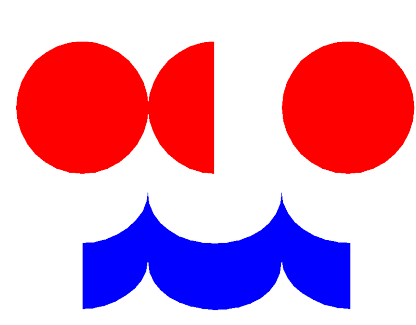# SOFTWARE FOR QUALITY CONTROL AND HOMOGENIZATION OF CLIMATOLOGICAL TIME SERIES   (AnClim and ProClimDB)

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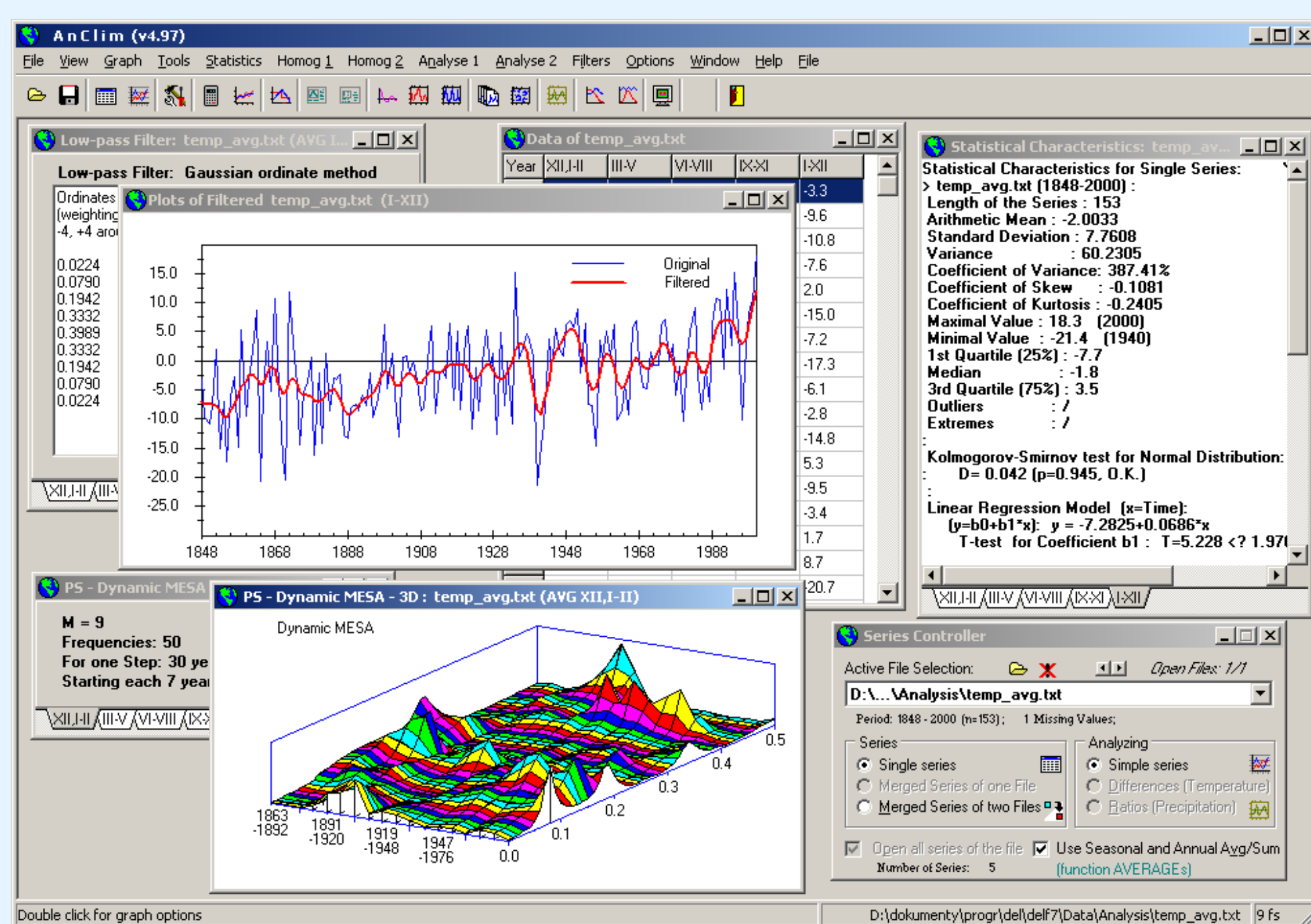[2] Department of Geography, University of Zaragoza, 50009, Spain

ABSTRACT:

*During the last decade, a software package consisting of AnClim, ProClimDB and LoadData for processing climatological data was created. This software offers a complex solution for processing climatological time series, starting from loading data from a central database (e.g. Oracle, software **LoadData**), through data duality control and homogenization to time series analysis, extreme value evaluations and model output verifications (**ProClimDB** and **AnClim** software). In recent years, tools for correction of inhomogeneities in daily data was introduced.*

*Further methods, if available under **R**, can be easily linked with the software and then the whole processing will benefit from a user-friendly environment in which all the most commonly used functions for data handling and climatological processing are available.*
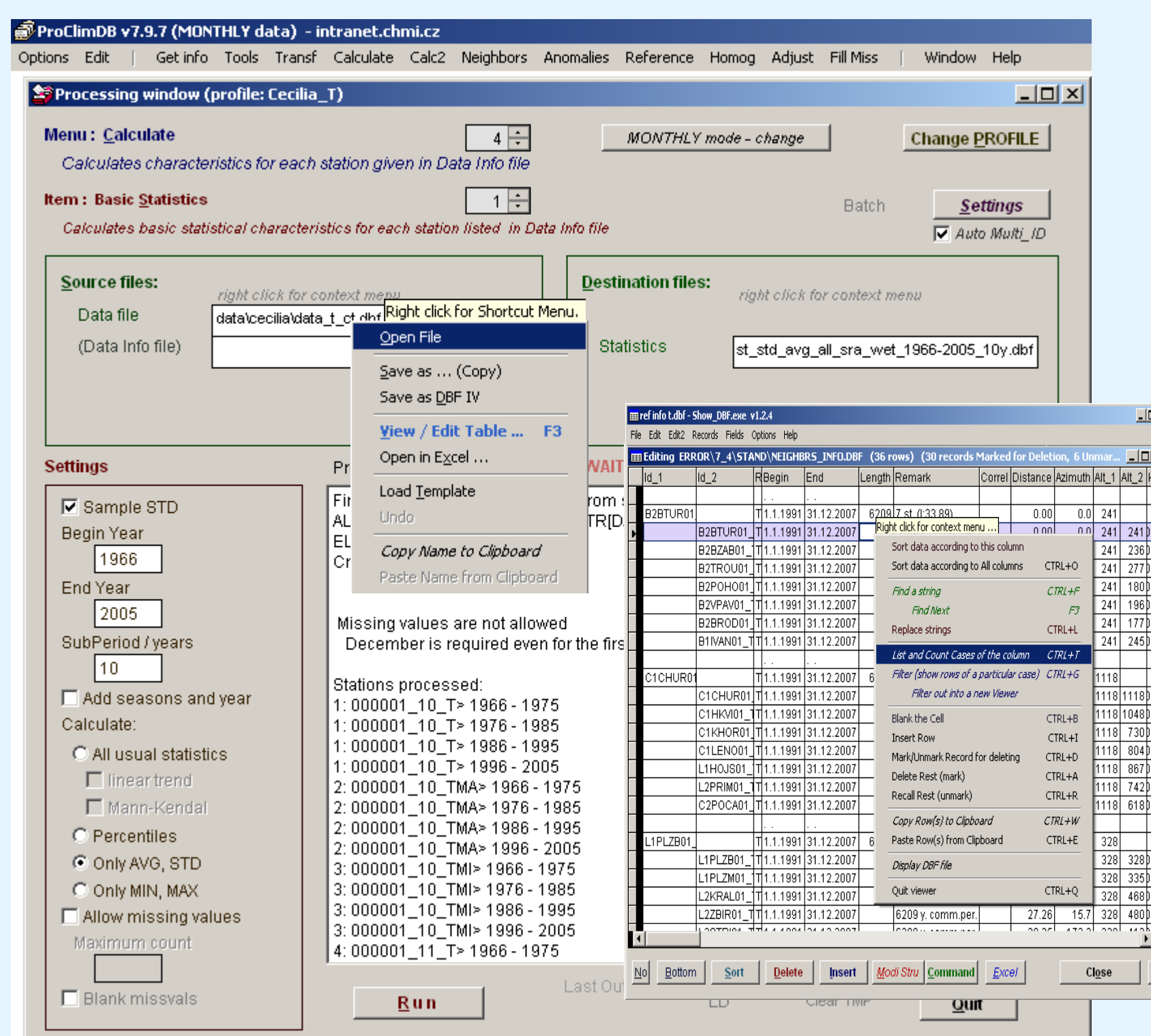
Processing and homogenization of large (climatological) datasets

For the purpose of data quality control, homogenization and analysis of climatological time series (originally for air temperature, precipitation and relative humidity measurements), the software package (AnClim + ProClimDB + LoadData) was created, which is capable of processing all the needed computations for the whole dataset automatically and very smartly. The tasks solved include: • quality control • selection of neighbors according to various criteria • calculation of reference series • running statistical tests for homogeneity • evaluation of the test results • correction of breaks • filling missing values. Users have full control over each step of the processing and can intervene with their own inputs (e.g. values for the correction, neighbor selection, etc.) Versions of the software for processing of **monthly** as well as **daily** data exist. Generally, it is possible to process any time step (even minute data). For details please visit: **www.climahom.eu**.

Scheme of usual data processing during data quality control and homogenization (preparing data for time series analysis)
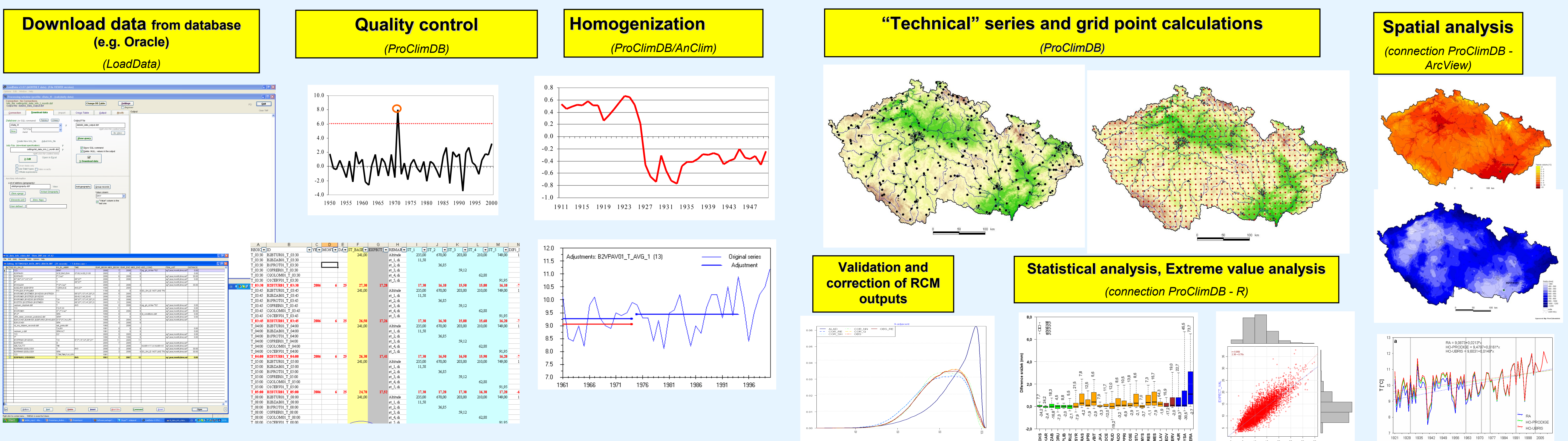
AnClim software

ProClimDB software

Daily data processing

In recent years, tools for correction of inhomogeneities in daily data have been introduced. Some of the methods were already programmed under R (e.g. by Christine Gruber, ZAMG), like HOM of Paul Della-Marta and the SPLIDHOM method of Olivier Mestre. Additionally, our own correction method (DAP) was implemented, an adaptation of a method for the correction of regional climate model outputs by Déqué (2007), itself based on assumptions similar to those implicit in methods described by Trewin and Trevitt (1996) and Della-Marta (2006), which apply variable correction according to individual percentiles (or deciles). Some of the methods are able to apply a multi-element approach (using e.g. weather types)

Examples of the software package outputs

Download data from database (e.g. Oracle)
(LoadData)

Quality control
(ProClimDB)

Homogenization
(ProClimDB/AnClim)

"Technical" series and grid point calculations
(ProClimDB)

Spatial analysis
(connection ProClimDB - ArcView)

Validation and correction of RCM outputs

Statistical analysis, Extreme value analysis
(connection ProClimDB - R)

Conclusions

The presented software package is *freeware* (in cases when it is used for non-commercial activities). It has been developed into its current state (containing the most frequently used tools in climatology) thanks to feedback of its users throughout the world. While **AnClim** software is intended mainly for **teaching purposes** (with a tutorial series for homogenization and a time series analysis, producing many graphical outputs), **ProClimDB** can serve for real **scientific work**, processing thousands of time series (whole databases) with an enormous number of automatic outputs which help the scientist to better understand the data. For more information please visit **www.climahom.eu** .

Available methods of homogenization can be easily compared and evaluated in the software (for both inhomogeneity detection or correction in this case). A comparison of the available correction methods is also the current task of the ongoing COST action ESO601 (www.homogenisation.org).

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