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Comparison of drought events detected by SPI calculated from different historical precipitation data sets – case study from Southern Alps

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During recent years substantial efforts were directed toward the reconstruction of past meteorological data sets of precipitation, air temperature, air pressure and sunshine. In Alpine space of Europe long tradition of meteorological data monitoring exist starting with the first modern measurements in late 18th century. However, older data were obtained under very different conditions, standards and quality. Consequently direct comparison between data sets of different observation points is not possible. Several methods defined as data homogenisation procedures were developed intended to enable comparison of data from different observation points and sources. In spite of the fact that homogenisation procedures are scientifically agreed final result represented as homogenised data series depends on the ability and approach of the interpreters.

Well know data set from the Greater Alpine region based on the common homogenisation procedure is HISTALP data series. However, HISTALP data set is not the only available homogenised data set in the region. Local agencies responsible for meteorological observations (e.g. in Slovenia Environmental Agency of Slovenia - ARSO) perform their own homogenisation procedures. Because more detailed information about measuring procedures and locations for the particular stations is available for them one can expect differences between homogenised data sets.

Longer meteorological data sets can be used to detect past drought events of various magnitudes. They can help to discern past droughts and their characteristics. A very frequently used meteorological drought index is standardized precipitation index – SPI. The nature of SPI is designed to detect events of low frequency. With the help of this index periods of extremely low precipitation can be defined. It is usually based on monthly amount of precipitation where cumulative precipitation amount for the particular time period is calculated. During the calculation of SPI with a time series of monthly precipitation data for a location can calculate the SPI for any month in the record for the previous i months where i=1,2,3, . . . , 12, . . . , 24, ... 48, . . . depending upon the time scale of the interest. A 3 month SPI index is usually used for a short-term or seasonal drought index, a 12 month SPI is used for an intermediate term drought index, and a 48 month SPI is used for a long term drought index.

In the paper results of SPI calculations are presented for the precipitation stations in the region of the Southern Alps for the last 200 years. Compared are results of differently homogenised data sets for the same observation points. We have performed comparison of homogenised data sets between HISTALP and ARSO data base. For the period after World War II when reliable precipitation measurements are available comparison was performed also between raw data series and homogenised data series.

Differences between calculated form short term SPI (from 1 to 6 months) are small and don't influence the interpretation of short term drought appearance. With the prolonged length of SPI differences between calculated values rise and influence the detection of longer term drought appearance. It can be also illustrated that differences among parameters of model distribution (gamma distribution) are larger for longer SPI than for shorter SPI.

It can be empirically concluded that homogenisation procedure of precipitation data sets can importantly influence the SPI values and has impact on conclusions about long term drought appearance.