Using R for time series analysis and spatial-temporal distribution of global burnt surface multi-year product

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Fires are one of the most significant components in the workings of the global ecosystem. There is no doubt that the global fires regime has a major influence on climate, carbon cycle, pollution, etc. Modeling those phenomena has been complicated because of the lack of exhaustive databases concerning past fires distribution. For this reason, JRC is working on the concatenation of two existing independent global multi-year burnt area products: GBS (1982-1999) and L3JRC (2000-2007). Since both time series are produced using different satellite data with different spatial and temporal resolution and algorithms, the main objective is to develop a statistically coherent database. Combining GBS and L3JRC products requires dissecting both of them - analyzing their variations in time and space.

In this paper, we present a few R applications which were applied in our research. `RNetCDF` package was implemented to handle the big amount of spatial data. Afterwards, we applied different predefined methods for time series analysis, using those from `stats` package, as well as from the `zoo`, `tseries` or `lmtest` packages. We introduce several decomposition theorems, tests, stochastic models as well as some graphics dedicated to time series objects.

The principal components analysis allows us the description of the differences in fires regimes derived from GBS and L3JRC algorithms. Based on this, we propose a visualization technique to evaluate the spatial temporal coherence of the 26 years of these global burnt area products. `Rgl` package was used to present the data in principal components space.

We also carried out some new methods to present spatial-temporal distribution of the data. We used variogram analysis and kriging method based on `spatial` package.