MeteoIO: A Meteorological Data Pre-Processing Library for Numerical Models

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While using numerical models, which require large meteorological data sets, the majority of the problems encountered by the operators can be traced back to the Input/Output functionality. Complex models are usually developed by the environmental sciences community with a focus on the core modeling issues. As a consequence, the I/O routines are often primitive, unreliable, error-prone, lacking flexibility and robustness. With the (operational) use of the physical models, this situation ceases to be simply uncomfortable and becomes a major issue. In parallel, the added requirements (in term of robustness and flexibility) increase tremendously the cost of dealing with the I/O. In order to address these needs and contain the costs of new adaptations, a specific I/O library has been designed for the specific needs of numerical models consuming meteorological data. The whole task of data pre-processing has been delegated to this library, namely retrieving, filtering and re-sampling the data if necessary as well as providing spatial interpolations. The focus has been to design an Application Programming Interface (API) that would provide a uniform interface to meteorological data in the models; hide the complexity of the processing taking place; guarantee a robust behavior dealing with formats or transmissions errors, erroneous or missing data. This library is currently used by the Alpine3D alpine surface processes model, the SNOWPACK snow column model, the GeoTop hydrological model and some web applications.

A new design of the API and of the core infrastructure that has been envisioned in order to better deal with filtering performance issues as well as provide more flexibility for spatial interpolations will be presented alongside new challenges introduced by some new applications. New challenges brought by the integration of kriging will also be exposed.

The "MeteoIO" library is released under an Open Source license and is available at http://slfsmm.indefero.net/p/meteoio .