MeteoIO: A Pre-Processing Library for Numerical Models

Bavay, M; Egger, T; Fierz, C; Lehning, M
WSL Institute for Snow and Avalanche Research, SLF Davos, Flelastr. 11, Davos, 7260, Switzerland

Using numerical models, which require large meteorological data sets, is sometimes difficult and problems can often 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 error-prone, lacking flexibility and robustness. With the increasing use of such models in operational applications, 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...

The MeteoIO library has been designed for the specific needs of numerical models that require meteorological data, either as time series or spatially interpolated. 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 (i) provides a uniform interface to meteorological data in the models; (ii) hides the complexity of the processing taking place; (iii) guarantees a robust behavior in case of format or transmission errors, erroneous or missing data. Moreover, in an operational context, this error handling should avoid unnecessary interruptions in the simulation process. A strong emphasis has been put on simplicity and modularity in order to make it extremely easy to support new data formats or protocols and to allow contributors with diverse backgrounds to participate. This library can also be used in the context of High Performance Computing in a parallel environment. Finally, it is released  under an Open Source license and is available at https://slfsmm.indefero.net/p/meteoio .