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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 new 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. Moreover, for an operational context, this error handling should avoid interrupting the simulation as much as possible. 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 not familiar with the environmental sciences and/or a particular model to painlessly participate. This library can also be used in the context of High Performance Computing in a parallel environment. Finally, the “MeteoIO” library is released under an Open Source license and is available at http://slfsmm.indefero.net/p/meteoio .