Title: How high-level abstractions can help bridge the gap between productivity and performance,**Oliver Fuhrer (Federal Institute of Meteorology and Climatology MeteoSwiss)**

Talk Abstract:
The weather and climate community has set ambitious goals to reach global km-scale modeling capability on future exascale high-performance computing (HPC) systems. But currently, state-of-the-art models are executed using much coarser grid spacing and only few of the productive weather and climate models are capable of fully exploiting modern HPC architectures with hybrid node designs.
Alongside rapidly evolving HPC hardware, new associated programming models are being introduced and no de-facto standard has been adopted by the community. As a consequence, some groups are opting for compiler directives, some groups are shifting from Fortran to other programming languages and - finally - some groups are actively developing and using higher-level abstractions such as domain-specific languages and compilers.

In this talk we present our experience from an investment into the COSMO model using a templated C++ library (GridTools) and discuss the pros and cons of this approach for achieving high performance, portability onto multiple hardware architectures and developer productivity. We then move on to discuss the role high-level abstraction can play and why they may be required to achieve high performance while maintaining productivity. We finish by outlining a project which develops and applies a domain-specific language to the FV3GFS weather and climate model and show some early results.