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A web service based tool to plan atmospheric research flights

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We present a web service based tool for the planning of atmospheric research flights. The tool, which we call the "Mission Support System" (MSS), provides online access to horizontal maps and vertical cross-sections of numerical weather prediction data and in particular allows the interactive design of a flight route in direct relation to the predictions. It thereby fills a crucial gap in the set of currently available tools for using data from numerical atmospheric models for research flight planning. A distinct feature of the tool is its lightweight, web service based architecture, requiring only commodity hardware and a basic Internet connection for deployment. Access to visualisations of prediction data is achieved by using an extended version of the Open Geospatial Consortium Web Map Service (WMS) standard. With the WMS approach, we avoid the transfer of large forecast model output datasets while enabling on-demand generated visualisations of the predictions at campaign sites with limited Internet bandwidth. Usage of the Web Map Service standard also enables access to third-party sources of georeferenced data. The MSS is focused on the primary needs of mission scientists responsible for planning a research flight, addressing in particular the following requirements: (1) interactive exploration of available atmospheric forecasts, (2) interactive flight planning in relation to these forecasts, (3) computation of expected flight performance to assess the technical feasibility (in terms of total distance and vertical profile) of a flight, (4) no transfer of large forecast data files to the campaign site to allow deployment at remote locations and (5) low demand on hardware resources. We have implemented the software using the open-source programming language Python.