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Challenges and opportunities of cloud computing for atmospheric sciences

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Cloud computing is an emerging technological solution widely used in many fields. Initially developed as a flexible way of managing peak demand it has began to make its way in scientific research.

One of the greatest advantages of cloud computing for scientific research is independence of having access to a large cyberinfrastructure to fund or perform a research project. Cloud computing can avoid maintenance expenses for large supercomputers and has the potential to 'democratize' the access to high-performance computing, giving flexibility to funding bodies for allocating budgets for the computational costs associated with a project.

Two of the most challenging problems in atmospheric sciences are computational cost and uncertainty in meteorological forecasting and climate projections. Both problems are closely related. Usually uncertainty can be reduced with the availability of computational resources to better reproduce a phenomenon or to perform a larger number of experiments. Here we expose results of the application of cloud computing resources for climate modeling using cloud computing infrastructures of three major vendors and two climate models. We show how the cloud infrastructure compares in performance to traditional supercomputers and how it provides the capability to complete experiments in shorter periods of time. The monetary cost associated is also analyzed. Finally we discuss the future potential of this technology for meteorological and climatological applications, both from the point of view of operational use and research.