# CLIMATE PREDICTION: A MULTIDISCIPLINARY COMPUTATIONAL FLUID DYNAMICS PROBLEM

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## ABSTRACT

In this presentation it will be shown that climate prediction is in its essence a complex computational fluid dynamics problem. Climate prediction models are still quite inaccurate in representing a variety of fluid dynamics processes such as clouds, turbulence, convection and the interaction between the ocean and the atmosphere. The problem is that these processes can occur in a variety of scales, from the planetary scale to very small scales that cannot be represented explicitly in any atmospheric model. A major challenge in climate prediction is in how to improve the representation of these sub-grid scale physical processes: the parameterization problem – also known as the closure problem in the turbulence modeling community.

This talk will focus on a major issue in particular: how to represent sub-grid scale convection associated with clouds. Different types of models and theories that address the interactions between the small-scale turbulence and cloud physics, and large-scale climate processes are reviewed. The main problems associated with moist convection are described in detail and some fundamental parameterization/closure approaches are presented. New unified parameterizations/closures for turbulence and convection involving optimal combinations of Eddy-Diffusivity and Mass-Flux methods will be discussed in detail