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Modelling the turbulence of a freezing Martian ocean

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We modified the General Ocean Turbulence Model (GOTM) to fit simulations investigating the hypotheses of early oceans or seas on planet Mars. Observed morphologies like paleoshorelines (Parker et al. 1987, Carr et al. 2003) and buried craters (Boyce et al. 2005, Head et al. 2002) indicate possible processes which could have been caused by large standing open bodies of water in the northern hemisphere of Mars. These structures, as well as altitude measurements of delta networks (diAchille et al. 2010) proclaim various sizes of oceans and or seas. Evidence for their existence whether one or more at different times in the early history of the planet, or the evolution and fate of an ocean are still elusive. The smoothness of the northern plains is debated, to be the result of volcanic effluents followed by the deposition of the sedimental load called the Vastias Borealis Formation (VBF). Detailed observations of crater depths (d/D ratios) in the northern hemisphere have shown further arguments for a northern ocean. The prevailing opinion is a short life of a liquid ocean, and a rather fast freezing period leading to sublimation under a thin atmosphere. McKay et al. (1990) have shown that liquid habitats could be maintained under an ice sheet for up to several hundred million years, if melt/freshwater and or volcanic activity was supported. Using the atmospheric data of the GCM (Forget et al. 1999) as input parameters for temperature and wind velocities, we simulate an ocean exposed from mild to freezing temperatures of water at different atmospheric pressures. We are investigating the detailed effects of turbulence on the ocean or sea floors, as well as the effects of salinity and freshwater inflow on the Martian soil. Apart from the driving forces like fed of outflow channels and or rivers and wind, the duration of liquid water is a key question on the redistribution of sediments and the formation of coastal structures.