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Effects of the Large-Scale Circulation on Temperature and Water Vapor Distributions in the Michigan Tech Π-Chamber[1] JESSE ANDERSON, GREGORY KINNEY, PRASANTH PRABHAKARAN, SUBIN THOMAS, RAYMOND SHAW, WILL CANTRELL, Michigan Technological University — In Rayleigh-Bénard convection, it is well known that within the turbulent motion a mean flow forms, commonly referred to as the large-scale circulation. We report experimental results on the nature of this circulation and its impact on the temperature and water vapor fields in Michigan Tech's Π-chamber (Aspect ratio=2 and $Pr = 0.7$) under dry, moist (no injection of aerosols) and cloudy conditions. The Π-chamber is designed to study aerosol-cloud interactions in a turbulent environment. These interactions are strongly influenced by the temperature and water vapor fields because they control the growth rates of each cloud droplet. The differential growth rates between droplets could result in a broadening of the cloud droplet distribution which is important for the onset of precipitation in clouds. We report various features of the circulation - an azimuthal oscillation, a sloshing mode, and a possible compression along the axis of the of the main roll. In addition, the temperature and water vapor concentration were measured and analyzed with respect to the orientation to the large-scale circulation. The distributions were found to be positively skewed along the updraft and negatively skewed along the downdraft.

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