学 位 論 文 内 容 の 要 旨

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学 位 論 文 題 名

Influence of the Gulf Stream on ascending airstreams in extratropical cyclones
（メキシコ湾流による温帯低気圧の上昇気流への影響 ）

The Gulf Stream plays an important role in the development of atmospheric phenomena over the North Atlantic. This study investigates the effects of the Gulf Stream on the air-parcel trajectories of ascending air streams in extratropical cyclones (ETCs). These trajectories are referred to as ETC's ascending air-parcel trajectories (EAA trajectories). The EAA trajectories are analyzed by using two numerical experiments of an atmospheric general circulation model (AGCM) for 20-year winter from December 1981 to February 2001: one with daily observational sea surface temperature (SST) data called CNTL and the other with smoothed SST data over the Gulf Stream SST front called SMTHG. The EAA trajectories are identified as trajectories that ascend across the 900 hPa surface, which roughly corresponds to the top of the boundary layer, near ETCs. EAA trajectories occur more frequently at 900 hPa level along the Gulf Stream current axis in CNTL than in SMTHG, and the EAA trajectories crossing the 900 hPa height in this region are referred to as frontal EAA trajectories. In the CNTL experiment, frontal EAA trajectories located in the Gulf Stream region before leaving the boundary layer reach higher altitudes, accompanied by longer horizontal travel distances than those in SMTHG. The 68% of the larger ascent of frontal EAA trajectories in CNTL than in SMTHG is explained by diabatic heating. During the ascent phase, the diabatic heating of EAA trajectories in CNTL is 18.3% stronger than that of SMTHG. Before ascending in the free troposphere, the frontal EAA trajectories are more strongly warmed through the sensible heat flux and moistened via the latent heat flux by the Gulf Stream in CNTL than in SMTHG. The excess moisture given in CNTL than in SMTHG is used as the latent heat release during the ascent in the free troposphere. These results highlight that the Gulf Stream plays an important role in ascending air streams in ETCs over the North Atlantic.