2009 Fall Meeting
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AN: **A21E-0285** ***Poster***
TI: Mechanism of upper tropospheric warming over the Tibetan Plateau at the onset phase of the Asian summer monsoon
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AB: The seasonal migration of the Asian summer monsoon (ASM) is closely related to the upper tropospheric warming over the Tibetan Plateau (TP) and to the reversal of the meridional temperature gradient between the TP and adjacent ocean. The surface sensible heating has been considered to induce the rapid temperature increase over the TP around the onset phase of the ASM. However, previous observation and model based studies have indicated that the surface heating of the TP cannot explain the rapid upper tropospheric warming, such as above 250 hPa. Here, we investigated the mechanism of the upper troposhperic warming over the TP, conducting the heat budget analysis with the 3D visualization tool. The results indicate that diabatic heating warms the troposphere upward from the surface of the TP, while adiabatic subsidence warms the upper troposphere downward from the tropopause, during the onset phase of the ASM. In other words, the troposphere over the TP has the "dual heating mechanism"; the surface sensible heating and the adiabatic subsidence. Significant adiabatic subsidence to the southwest of the TP is closely associated with the divergent flow from the tropical and monsoon convection. Anomalous meridional divergent flow as to break radiative-convective thermal equilibrium of the Hadley circulation is shown to converge and induce adiabatic warming that dominates radiative cooling in the upper troposphere. We have verified this by numerical simulations which show the latent heat flux over the eastern Indian Ocean, that forms the deep convection and the Matsuno-Gill type atmospheric response, contributes significantly to the upper tropospheric warming over the TP at the onset phase of the ASM.
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