**Institute of Atmospheric Physics, National Central University**

Date：2019/06/14

Site：S1-713

Speaker：Qiao-Jun Lin

Advisors : Prof. Jia-Yuh Yu

**A More Stable Atmosphere under Global Warming Accelerates the Hydrological Cycle of MJO**

***Abstract***

Changes in the Madden-Julian Oscillation (MJO) under global warming are analyzed using the Historical and future Rcp8.5 simulations from coupled global climate models (GCMs) in Coupled Model Intercomparison Project phase 5 (CMIP5). The spectrum of precipitation variability associated with MJO is mainly enhanced at higher frequency (period of 20-30 days) and low wavenumbers (1-2) domain across all models with warming.

Over the 10°N/S tropical belt, time-longitude diagrams of 850 hPa filtered average velocity potential (VP850) are used to estimate the MJO phase speed change, which on average increases by about 1.36 m/s in selected CMIP5 models compared to about 1.48 m/s in linear theory related to the internal variability of gross moist stability () and thermal inertia () linked to temperature () and moist () perturbations. Among the three effects contributing to the phase speed change, we found that the positive anomaly (i.e., the atmosphere becomes more stable) is the dominant effect.

Three factors may affect , including changes in convection intensity, cloud top height and MSE stratification. Stronger convection and deeper cloud top tend to increase *M*, and the latter’s contribution is especially important in area dominated by shallow convection such as the eastern Pacific ITCZ. By contrast, change in tends to decrease *M*. Our result shows that the competition between dynamic and thermal dynamic results in increased 𝑀 (i.e., a more stable atmosphere) which in turn generates a faster hydrological cycle and a shorter MJO period under global warming.

**Keyword:** Madden-Julian Oscillation