

1 **Evaluating the Diurnal Cycle of Precipitation Representation in**
2 **West African Monsoon Region with Different Convection**
3 **Schemes and Model Resolutions**

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ABSTRACT

12 As a basic form of climate patterns, the diurnal cycle of precipitation (DCP) can provide
13 a key test bed for model reliability and development. In this study, DCP over North and
14 West Africa was simulated by the National Centers for Environmental Prediction (NCEP)
15 Regional Spectral Model (RSM) during the monsoon season (April to September) of 2005.
16 Three types of convective parameterization schemes (CPSs) - single layer Simplified Arakawa-
17 Schubert (SAS), multi-layer Relaxed Arakawa-Schubert (RAS) and new Kain-Fritsch (KF2)
18 - were evaluated, as well as two different horizontal resolutions (20 km and 10 km) which
19 covered one mesoscale site for further investigation of resolution effects. Harmonic analy-
20 sis was conducted to characterize the phase and amplitude of diurnal variation. Compared
21 to satellite observations, the overall spatial distribution of amplitude and phase was well
22 captured in regional scale. The RSM properly simulated diurnal variation of precipitation
23 amount, indicating a late afternoon peak over land and an early morning peak over ocean.
24 Sensitivity experiments of CPSs showed similar spatial patterns among the schemes, but
25 CPSs mainly affected the amplitude of diurnal cycle, while the phase was not significantly
26 shifted. Additional sensitivity experiments at mesoscale further indicated that model pre-
27 cipitation partitioning between convective and large-scale was significantly modulated by
28 resolution with an overall increased large-scale precipitation from high resolution, which
29 therefore changed the degree of sensitivity of DCP to CPSs and resolution.