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Parameterization of Moist Convection in the Korean Integrated Model (KIM)

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This presentation will provide an introduction to the new version of the simplified Arakawa-Schubert (SAS) cumulus parameterization scheme (CPS) that has been developed by the Korea Institute of Atmospheric Prediction Systems (KIAPS), named the KSAS. The KSAS CPS is a mass-flux scheme based on the SAS CPS, but several modifications have been made which lead to substantially improved forecast skill of a newly developed global numerical weather prediction model of the KIAPS, the Korean Integrated Model (KIM). The modifications include that: (1) the threshold for a trigger condition is represented in proportional to the environmental relative humidity (RH) averaged over the subcloud layer to suppress the trigger of convection in dry low-level environments; (2) the entrainment rate is modified to increase the sensitivity to environmental humidity so that enhanced entrainment at lower RH conditions leads to more decrease in the strength of convection that develops in drier environments; (3) the parameter that determines the fraction of condensate converted to convective precipitation is modified to include a temperature dependency (Han et al. 2016); (4) the closure is modified to take rapidly varying boundary layer forcing into account; (5) the effect of the convection-induced pressure gradient force in the parameterization of convective momentum transport is enhanced in the upper part of the convective updraft; and (6) scale awareness that enables a mass-flux CPS to work seamlessly at various grid sizes across gray-zone resolutions is addressed (Kwon and Hong 2017; Han and Hong 2018). Details of each modification and their impacts on the forecast skill in precipitation and large-scale fields will be presented.