

# Preliminary Study of Superparameterization with GRAPES model and numerical experiments<sup>1</sup>

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## ABSTRACT

Superparameterization (SP) aims to explicitly represent deep convection within a coarse resolution global model by embedding a cloud resolving model (CRM) in each column of the mother model. For the first time, we implemented the SP in a mesoscale regional weather model, the Global/Regional Assimilation and PrEdiction System (GRAPES). The constructed SP-GRAPES uses a two-dimensional (2D) CRM in each grid column. A control and two SP simulations are conducted for the Beijing 7.21 flooding case to evaluate improvements in GRAPES using SP. The SP-run-I is a basic SP run delivering microphysics feedback only, whereas the SP-run-II delivers both microphysical and cloud fraction feedback. A comparison of the runs indicates that the SP-run-I has a slightly more positive impact on the precipitation forecast than the control run. However, the inclusion of cloud fraction feedback leads to an evident overall improvement, particularly in terms of cloud fraction and 24-h cumulative precipitation amounts. Although this is only a preliminary study using SP-GRAPES, we believe that it will provide considerable guidance for follow-up studies using SP in China.

**Key words:** superparameterization, GRAPES, simulation, precipitation, positive impact

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