



## **Sensitivity of local Rainfall to Vegetation Designing schemes using Meso-scale Model (MM5)**

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**Abstract** Vegetation plays an important role in land-air interaction. Physically based modeling is an important tool for studying the feedback processes of vegetation to atmosphere. However, it is hard for us to study the effect of different land use on local environments using general climate models (GCMs) and regional climate models (RegCMs) owing to their low resolutions. Meso-scale models have advantages of high resolution, so, coupled with the land surface model, they can be employed to simulate the effect of real vegetation scheme to local weather. In this paper, we attempt to use MM5V3 to investigate the sensitivity of local rainfall to two different vegetation development schemes in northern Shaanxi province. One domain is determined for simulation and it is located at (104.02~113.58°E, 33.93 ~41.48°N), centering at (37.8°N, 108.8°E), with 9 km horizontal resolution. The vertical atmosphere is divided to 23 levels. Time step is 30s. We adopt the reanalysis data from National Centers for Environmental Prediction (NCEP) as the larger scale background weather field. Results indicate that improving the vegetation of northern Shaanxi may shift the local rainbelt northward, increase local precipitation, and prolong the rainfall process, which would be good for alleviating the local drought and for enlarging the life-form's living space. The reasons of these results have been showed as following: By vegetation improving, the thermal and moist conditions of lower layer air would be strengthened, which extend and intensify the atmospheric instability to northward, then more stronger rising flow occurs when the instability energy is discharged; On the other hand, the upper layer's cyclonic wind would be intensified, which is favorable to the vapor's convergence. So, as a result, the rainfall is increased, the rain belt is migrated

northward. It is indicated that different vegetation schemes may lead to almost uniform variation for local rain belt except for some difference in quantities and center's location. In a word, the larger the vegetation variation scale is, the more notable influences on the local rainfall are.

**Keywords:** vegetation, ecological development scheme, Loess Plateau of northern Shaanxi, summer rainfall, numerical simulation