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The climate effects of the city expansion in the arid area of China

Peng Cai (2,3), Rafiq Hamdi (1), Geping Luo (2), and Philippe De Maeyer (3)

(2) Xinjiang Institute of Ecology and Geography,CAS, Urumqi, China, (3) Gent University,Gent, Belgium, (1) Royal Meteorological Institute, Research, Belgium (rafiq.hamdi@meteo.be)

Although the oasis covers less than 5% of the total area of arid regions in northwest China, it supports more than 95% of the population in the arid regions. The population of the oases are concentrated in the cities. For example, Urumqi, the capital of Xinjiang province, has a population of 3.5 million while the total population of Xinjiang province is 21.8 million. Since 1950s, however the rapid growth of population and the development of industry, the cities experienced a significant expansion. But the mechanism how the city expansion effects the local climate in arid area remains unknown.

To explore the effects, we adopt the climate model ALARO coupling the land surface model SURFEX to simulate how the city expansion influence the regional climate and the “heat island” effect. Firstly, taking the ERA-Interim dataset as driving data, we run the ALARO model in central Asia. Then we validated the ALARO coupling with ISBA and TEB schemes respectively. But the simulation results kept almost the same with previous simulation both in station and spatial scale. We found that the land cover data in ECOCLIMAP failed to present distribution of oases and cities. So we improved the land cover data and run the coupled model with the same parameters. We found that the temperature spatial difference can present the cold-island effect of oases and heat-island effect of cities, which proves that ALARO coupled with SURFEX can be used in arid area.

Now we will run the SURFEX offline to simulate the city “heat island” effects at 1km resolution with the land cover data in different periods to study the dynamic of the “heat island” effects and the regional climate effects of the city expansion.