

Land use changes of eastern Egyptian desert for sustainable Urban development

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The abstract

Egypt is one of the hot spot areas affected negatively by climate change. As it has a limited cultivated land, and water availability can perform sustainable development. The present work employ regional climate model (RegCM4) to test the effete of greening part of eastern desert on the local circulation of the wind and consequently the precipitation pattern over this area. The preliminary results after some validation over this area provided a high sensitivity to this changes by forecasts. The paper present change in surface energy fluxes before and after the experiment.

Key words: Land use, RegCM4, Eastern Egyptian desert.

Introduction:

Climate Models can simulate the interaction between the atmosphere, and the ocean and land surface beneath it. The land properties which include land elevation, and the albedo of the land which determines how much of the incident and reflected solar radiation which depends on the nature of the ground cover. The moisture content of the soil has a strong effect on the hydrological cycle. The roughness of the land surface affects the flow of air, which can become very turbulent near the surface. Also rapid urbanization, deforestation, and changes in land cover all have significant effects on the other component of the model, and also directly impact the atmosphere and its surrounding cities.

Regional climate model (RCMs) have been widely used as dynamical downscaling tools to study regional climate processes (Gao, et al. 2007) regional climate change (e.g. Giorgi et al 2004b) and seasonal climate variability (e.g. Rausher et al. 2006; Seth et al. 2006).

RegCM4 is a grid-point limited area model with a hydrostatic dynamical core (similar to the NCAR/PSU MM5; Grell et al. 1994). RegCM4 is thus a hydrostatic, compressible, sigma-p vertical coordinate model run on an Arakawa B-grid in which wind and thermo-dynamical variables are horizontally staggered. A time-splitting explicit integration scheme is used in which the 2 fastest gravity modes are first separated from the model solution and then integrated with smaller time steps. This allows the use of a longer time step for the rest of the model.

Land use experiment:

RegCM4 model used to study the impact of land use change on regional climate of Egypt (Eastern Desert). Three simulation experiments done by RegCM4 model, the first is control and the second is land use change (forest) and the last is also land use change (tall grass). All of these experiments explain the positive and negative impact of land use change on local climate of Eastern Desert.

Configuration of the experiments:

1	Domain name	Egypt
2	Iy	130 (points in north-south direction)
3	Jx	140 (points in west- east direction)
4	Kz	23 (number of vertical levels)
5	Iproj	'NORMER'
6	Ds	10 km
7	Land scheme	BATS
8	Sstyp	'OI_WK'
9	Dattyp	'FNEST'
10	gdate1	1994010106
11	gdate2	1994123006
12	icup_lnd	Grell
13	icup_ocn	MIT
14	Igcc	Fritch-Chapell
15	scenario	'AIB'

Some results of the experiments:

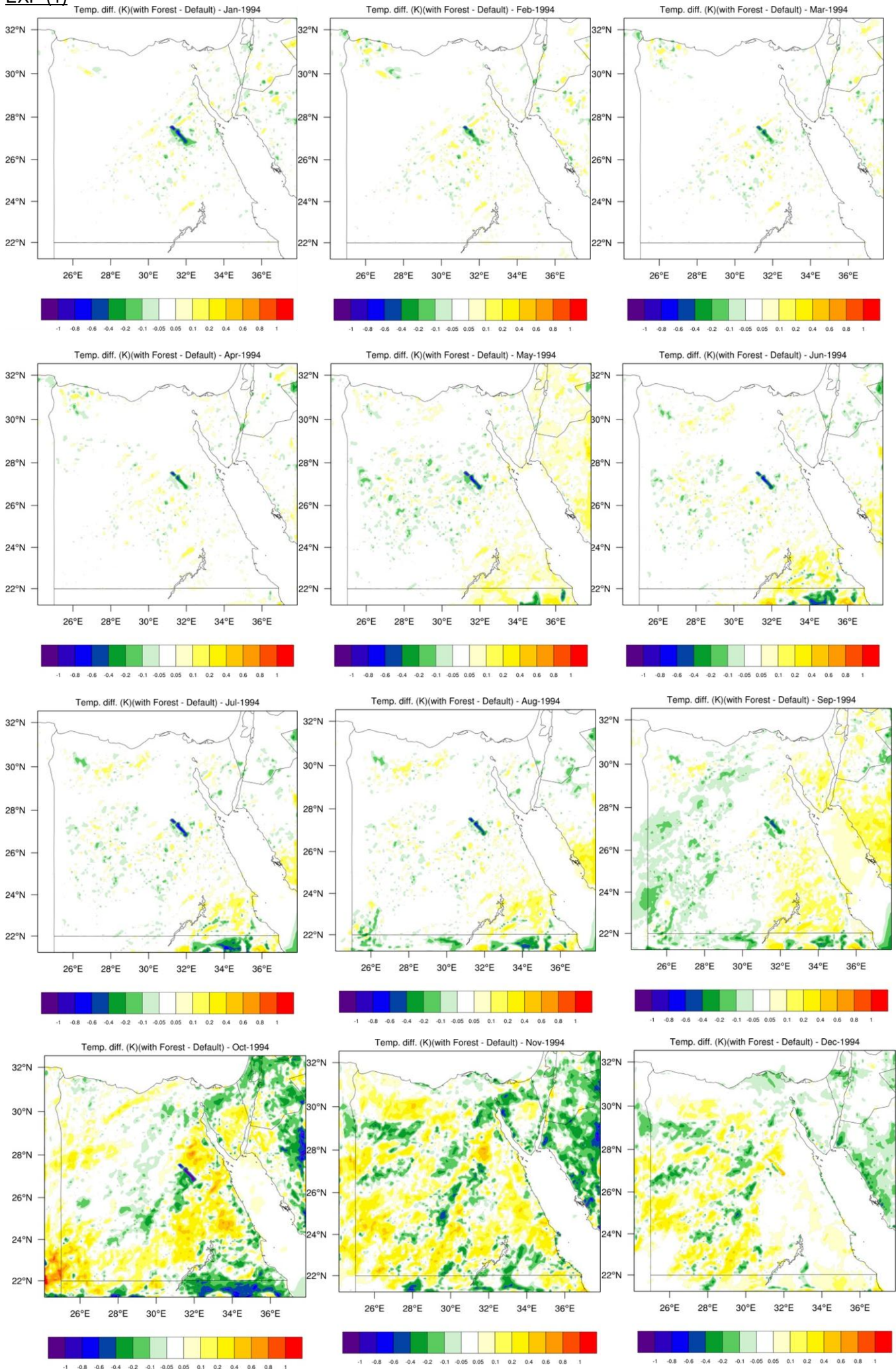
Experiment (1):

A narrow belt near by the Nile River replaced by forest and the results for temperature before and after as shown in monthly difference in EXP (1).

Experiment (2):

The same focused area replaced by tall grass and the results shown in EXP (2) for temperature at 2m.

EXP (1)



EXP (2)

