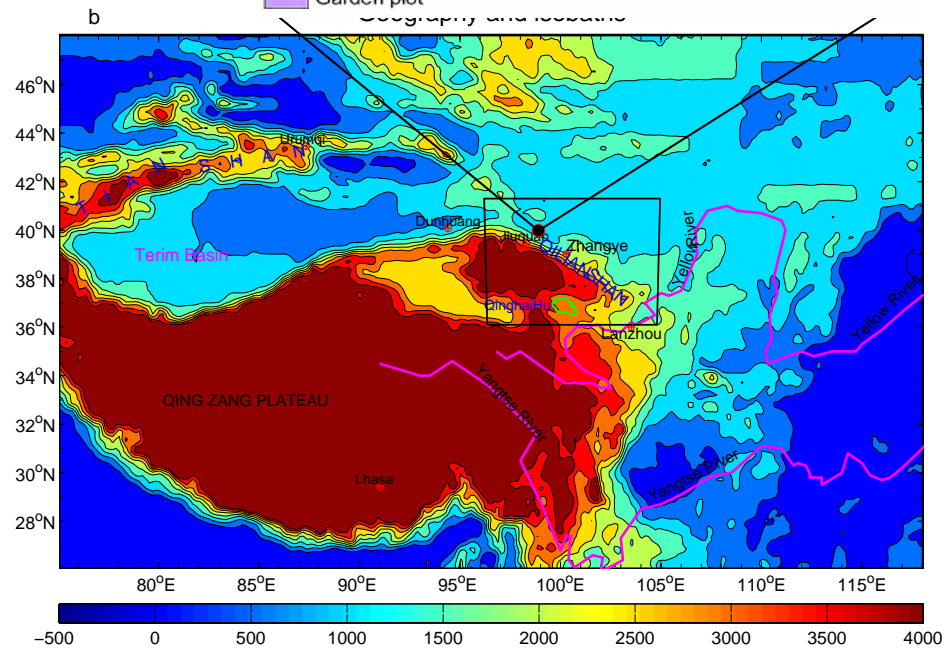
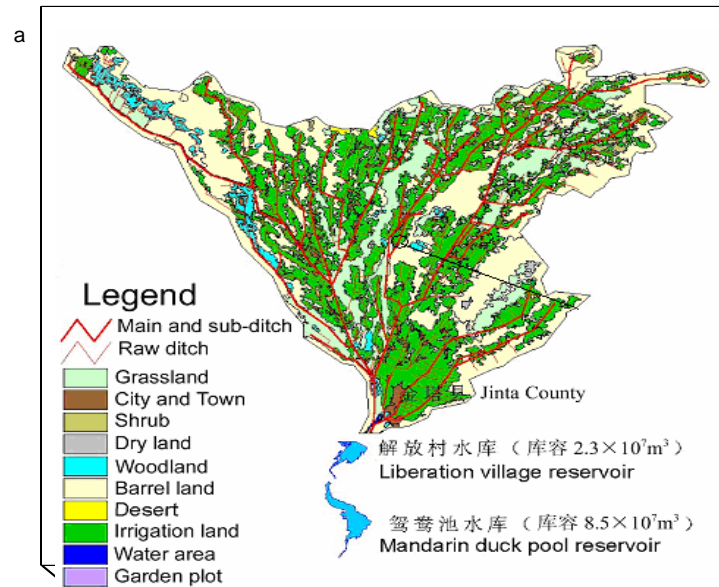


Desert Self Supporting Mechanism

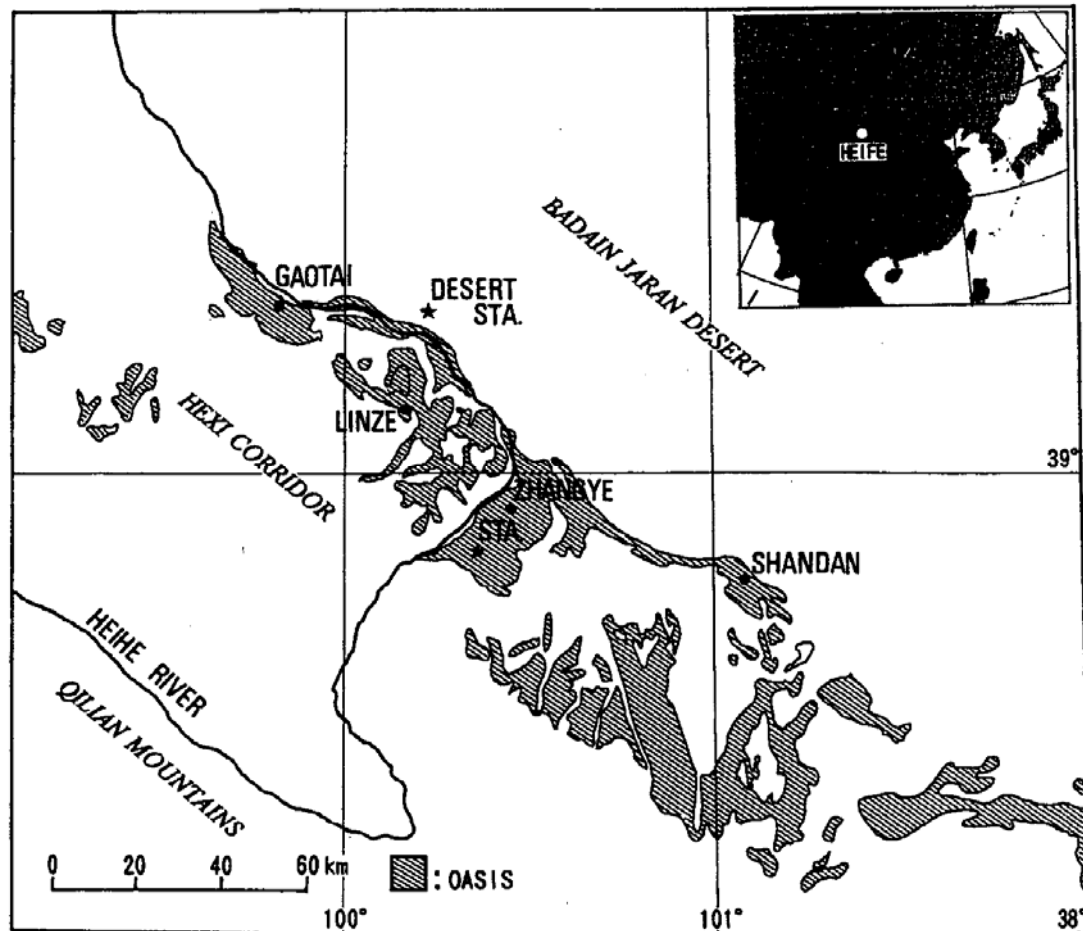
Peter C Chu, S.H. Lu, and Y.C. Chen
Naval Ocean-Atmospheric Prediction
Laboratory, Naval Postgraduate School,
Monterey, CA 93943, Email: pcchu@nps.edu
Website: www.oc.nps.navy.mil/~chu

References

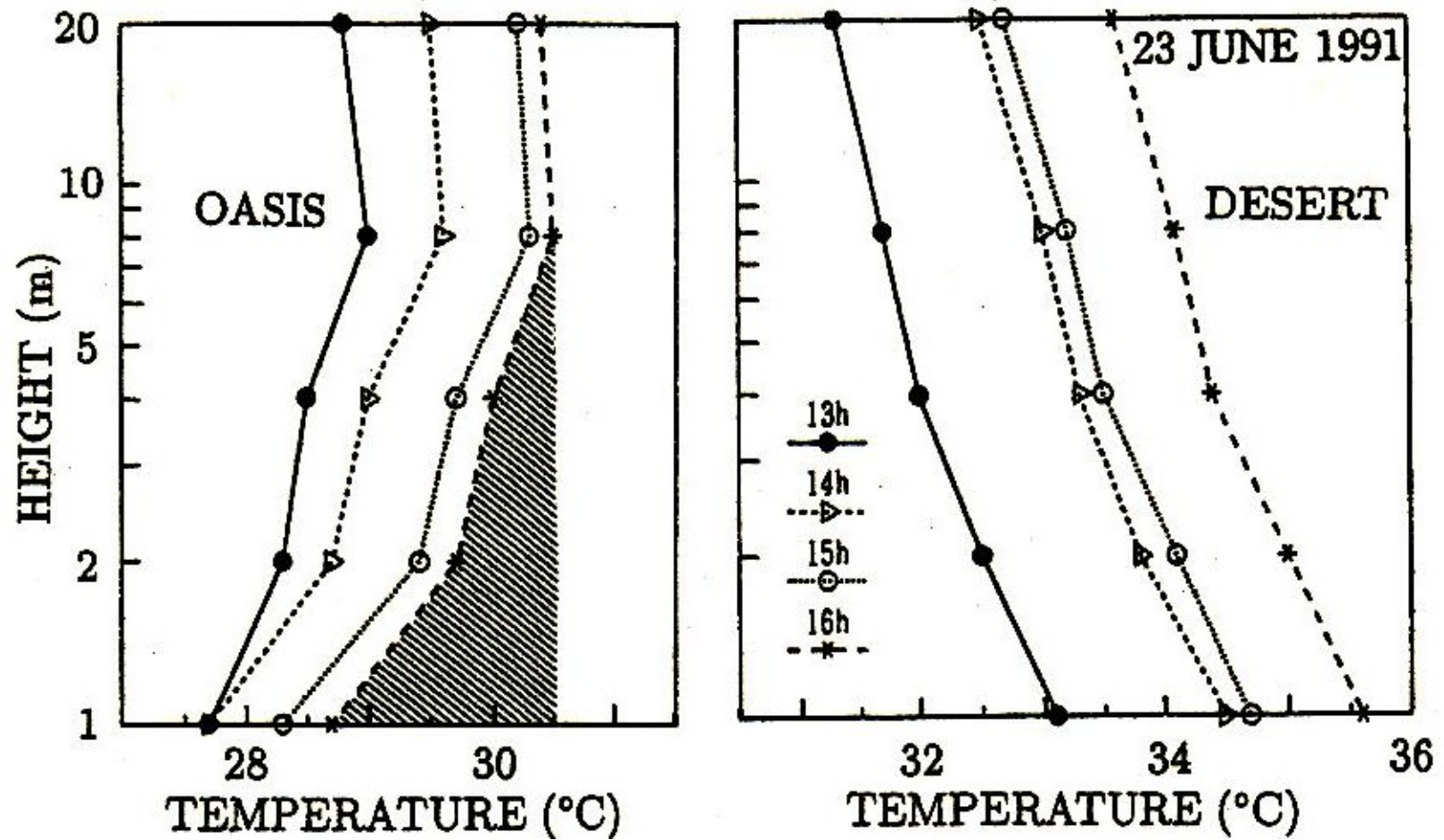
- Chu, P.C., S.H. Lu, and Y.C. Chen: A numerical model for desert oasis self supporting mechanism. *Journal of Hydrology*, accepted.



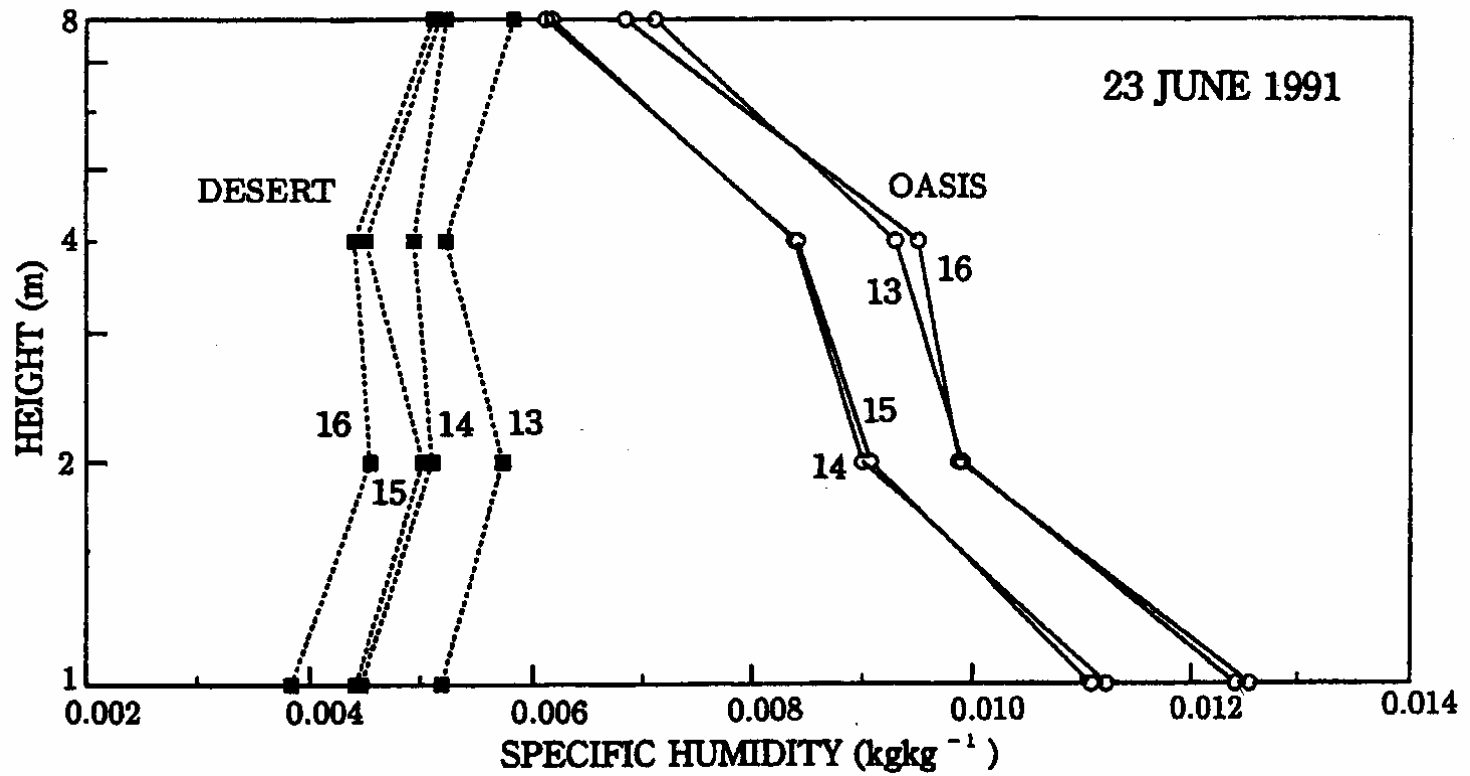
Chinese-Japan Joint Heihe River Field Experiment (HEIFE) 1988-1993



Temperature



Humidity

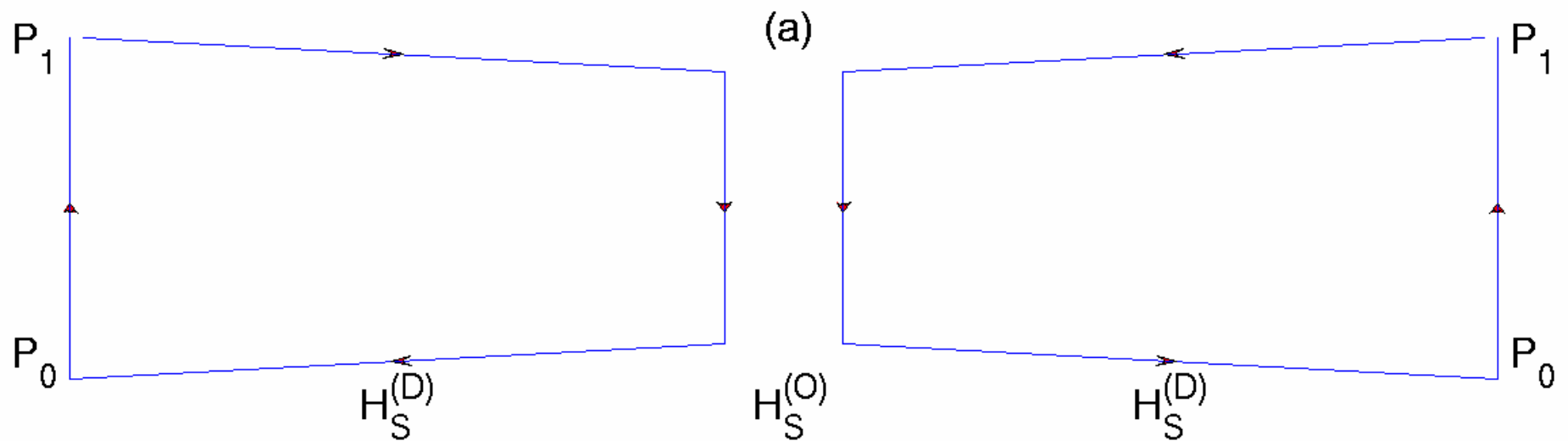


Heterogeneous Sensible Heat Flux (H_s) in HEIFE Region

- H_s (Desert) – H_s (Oasis) $\sim 400 \text{ W m}^{-2}$

Non-Classical Mesoscale Circulation Oasis (cold-wet island)

Oasis Breeze Circulation (OBC)



MM5-LSM

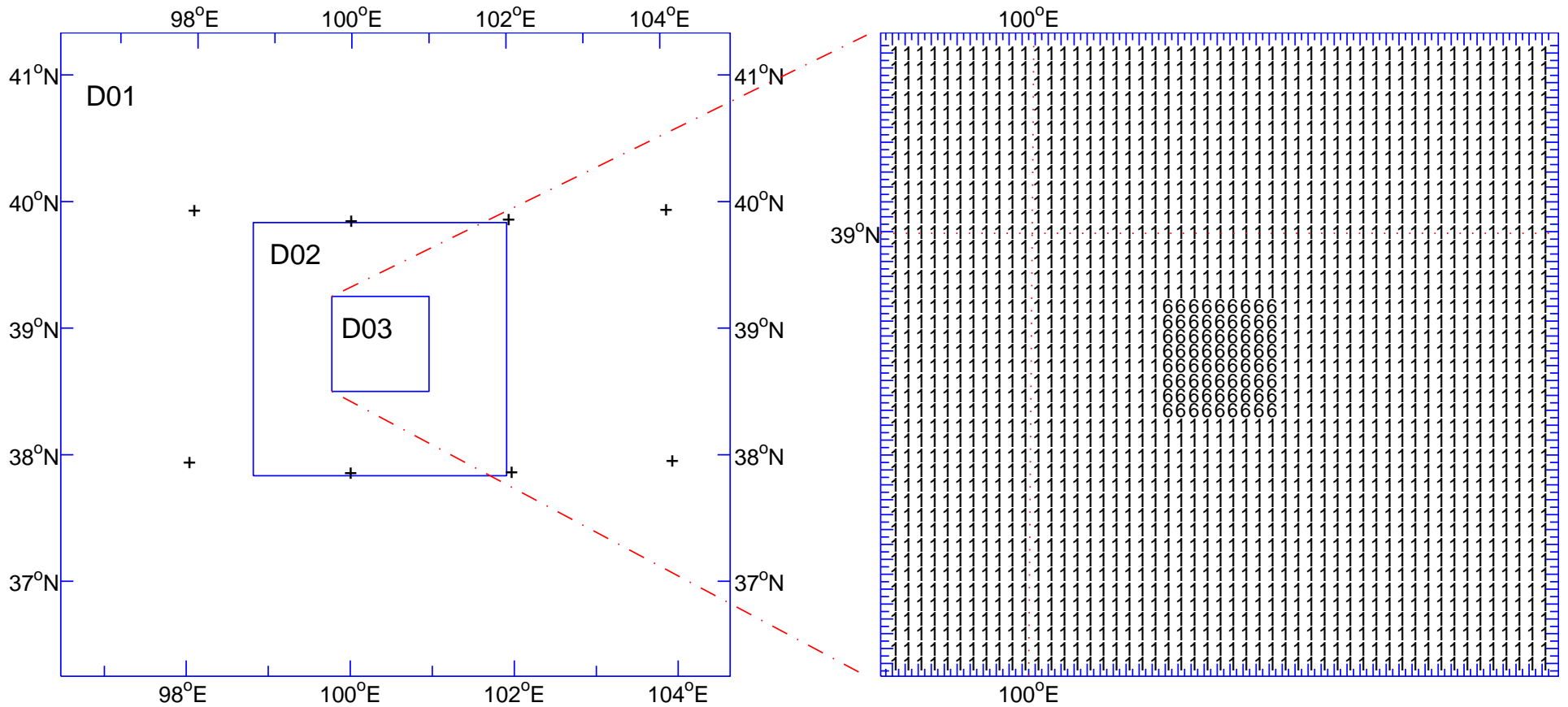
(1) Triple Nesting grids

(2) USGS vegetation types:

Desert (soil type 1)

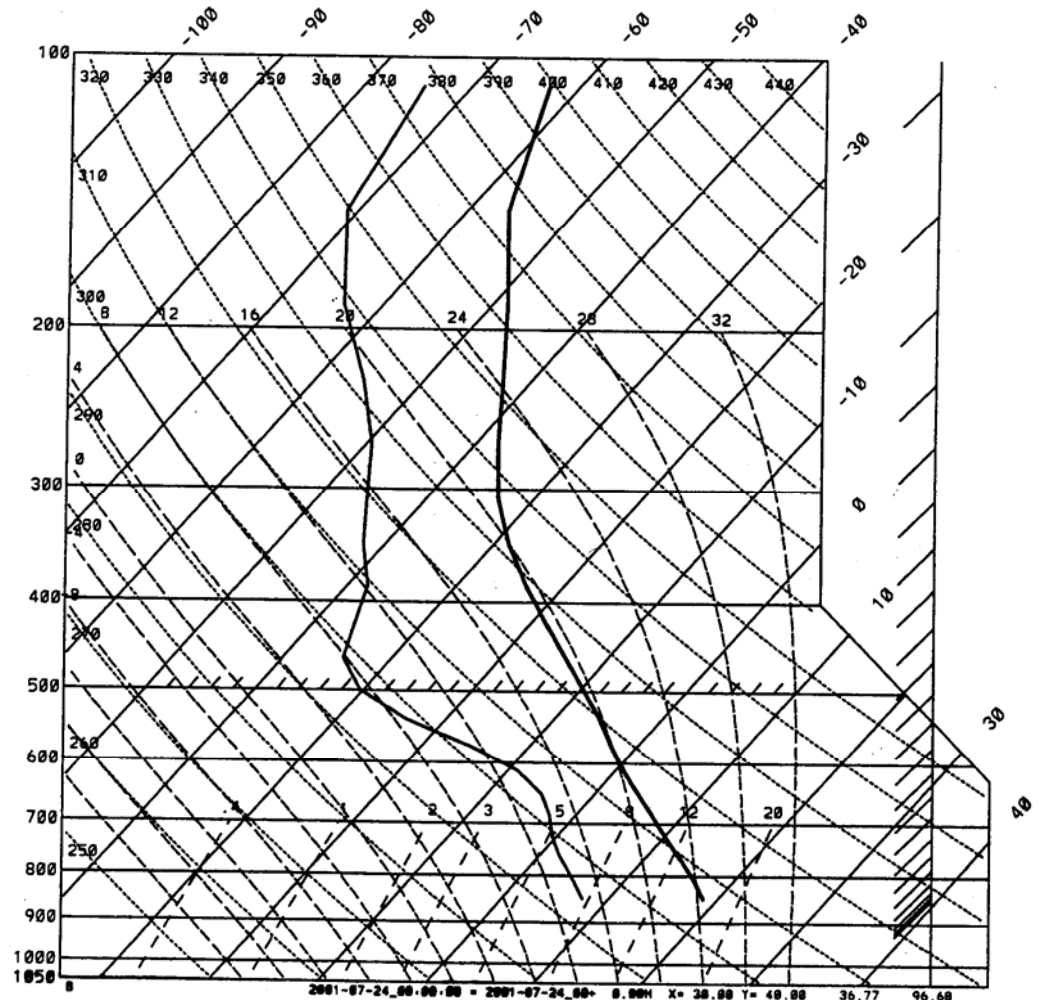
Oasis (Soil Type 6) mixed loam, shrubland,
grassland

Numerical Experiment



Initial Conditions (Atmospheric Part)

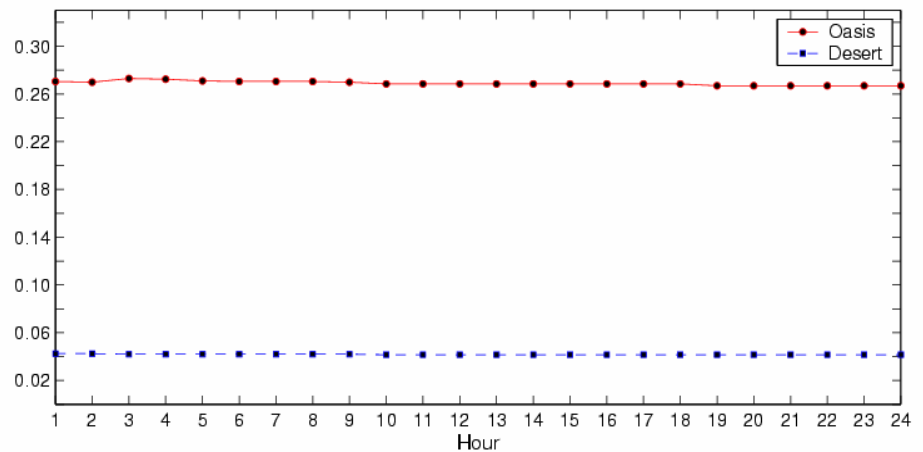
- $V = 0$
- Horizontally uniform temperature and specific humidity soundings, at Zhangye at 00GMT (0700 LT) on July 24, 2000



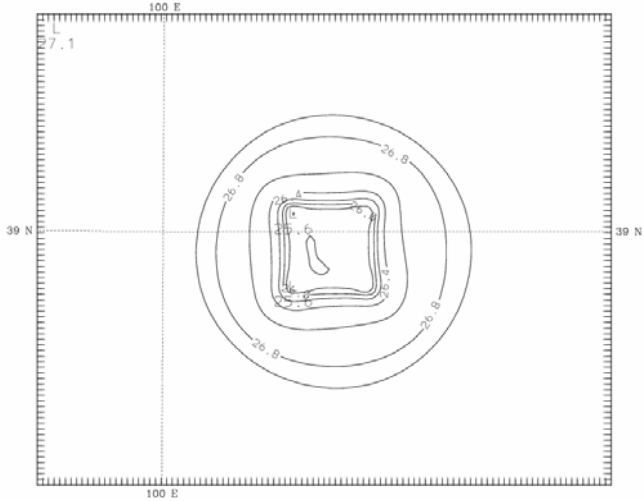
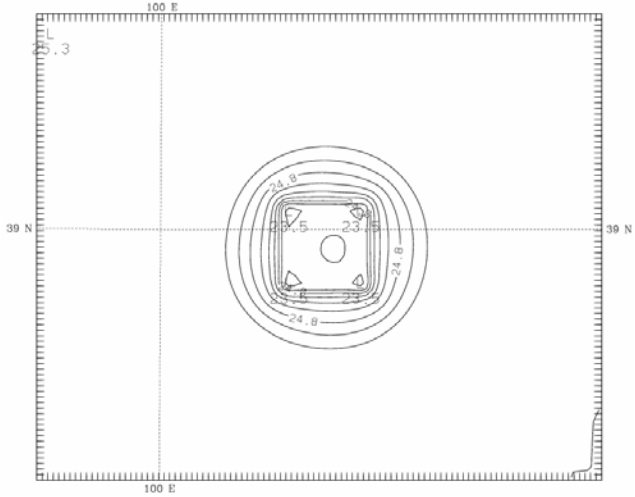
Initial Conditions (Soil Moisture)

Layer	Thickness (m)	Soil Moisture	
		Oasis	Desert
1	0.1	0.34	0.06
2	0.3	0.33	0.05
3	0.6	0.28	0.04
4	1.0	0.24	0.04

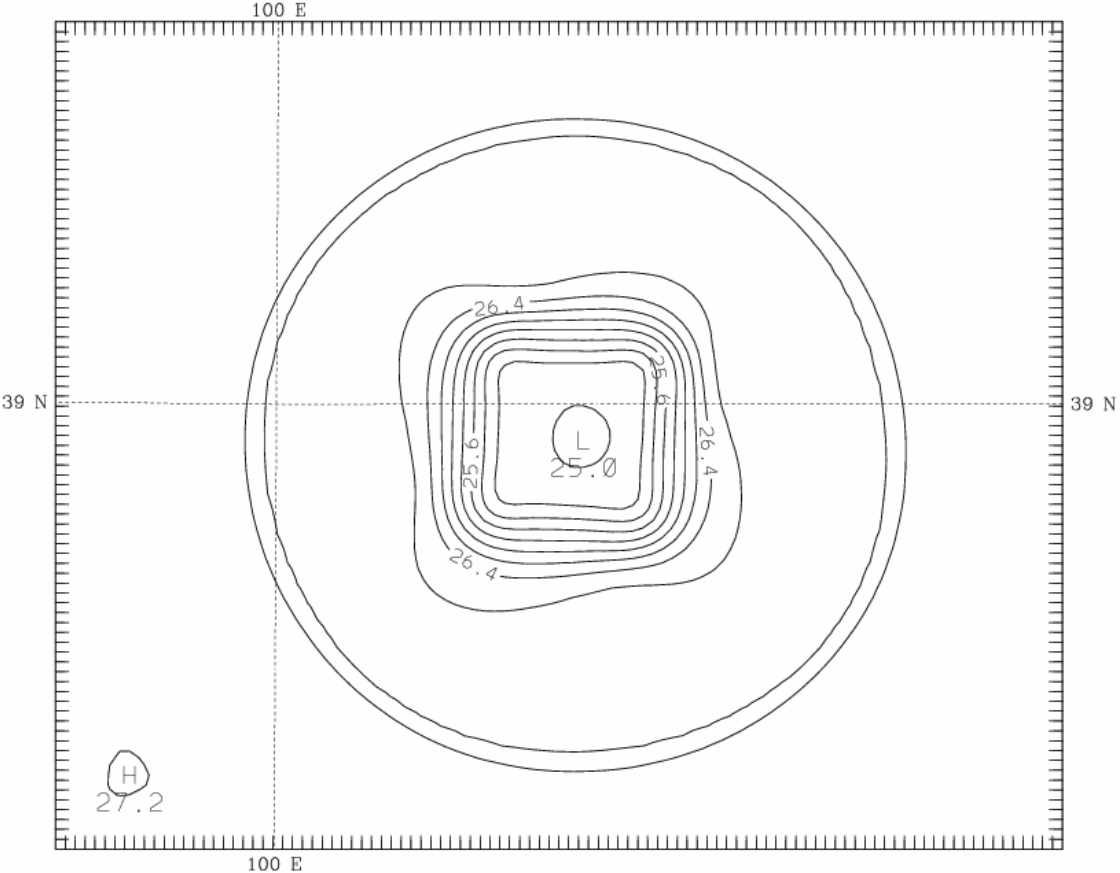
- Simulated temporal variation of total soil moisture (0 - 2 m) for oasis and desert, showing a stable soil-hydrologic environment.



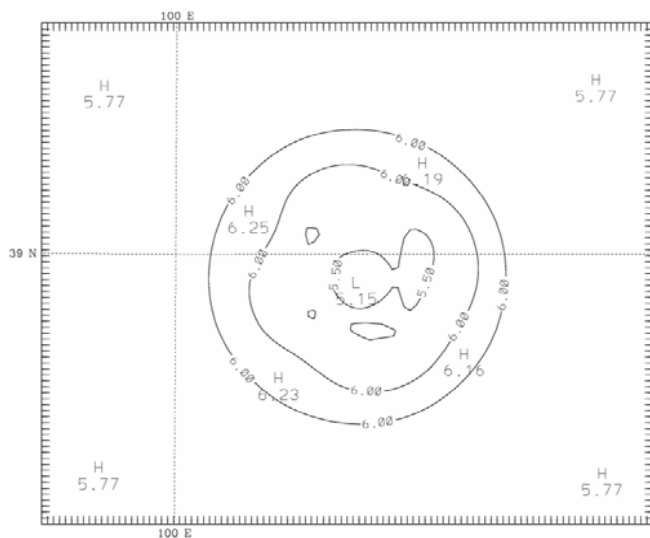
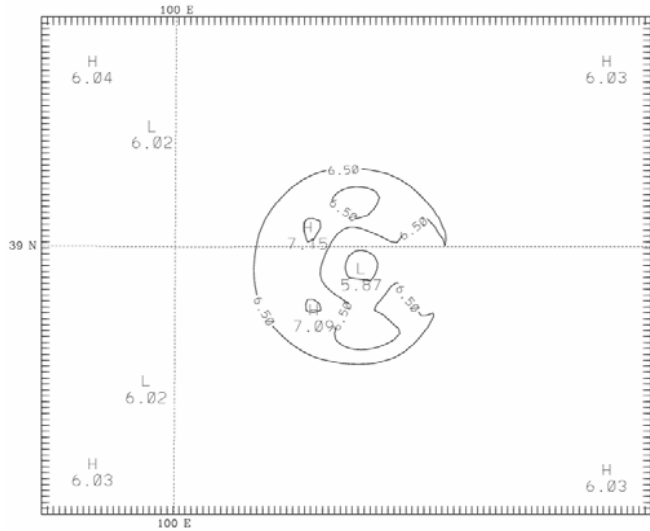
T (850hPa): (a) 0600 GMT (1300 LT), (b) 0900 GMT (1600 LT),
and (c) 1200 GMT (1900 LT) **Cold Island**



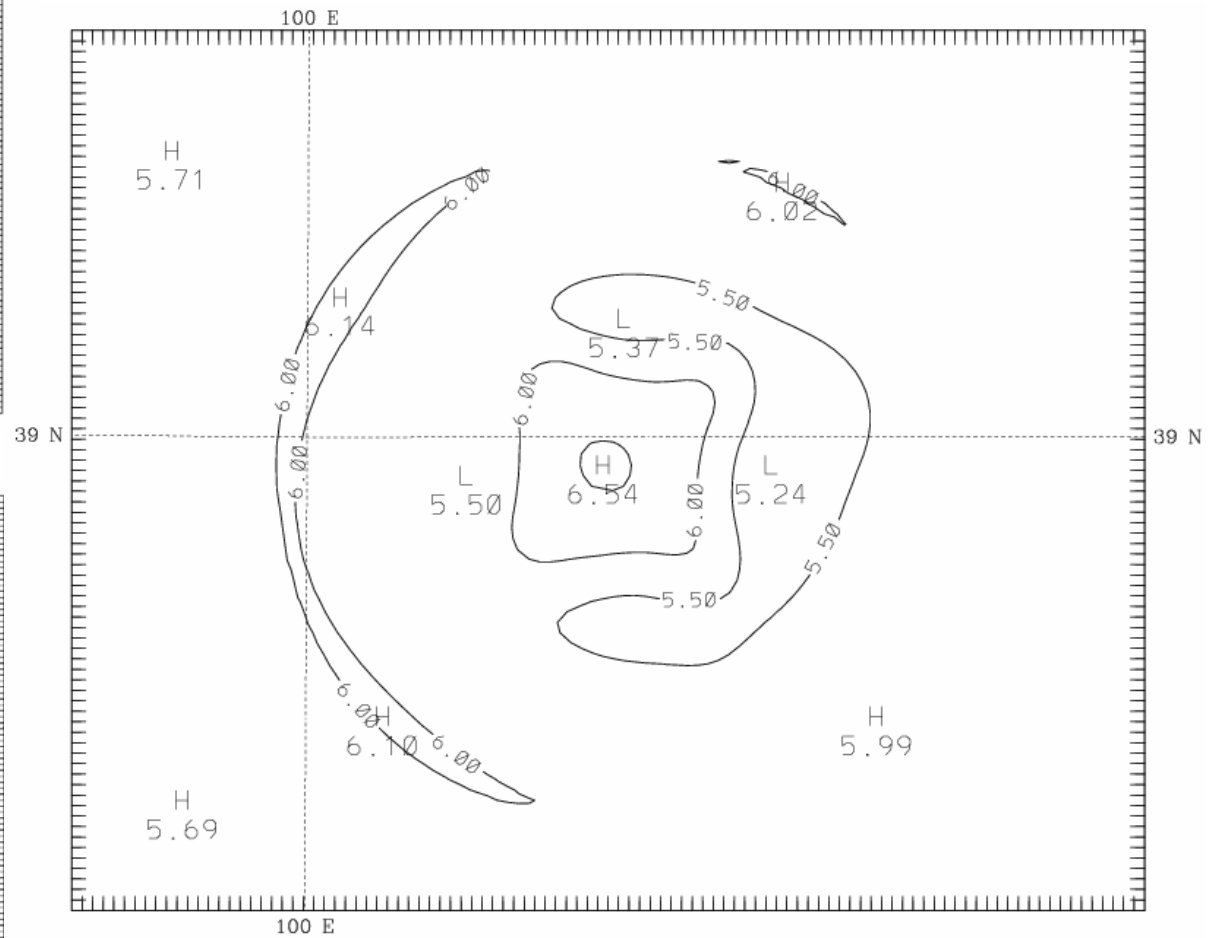
(c)



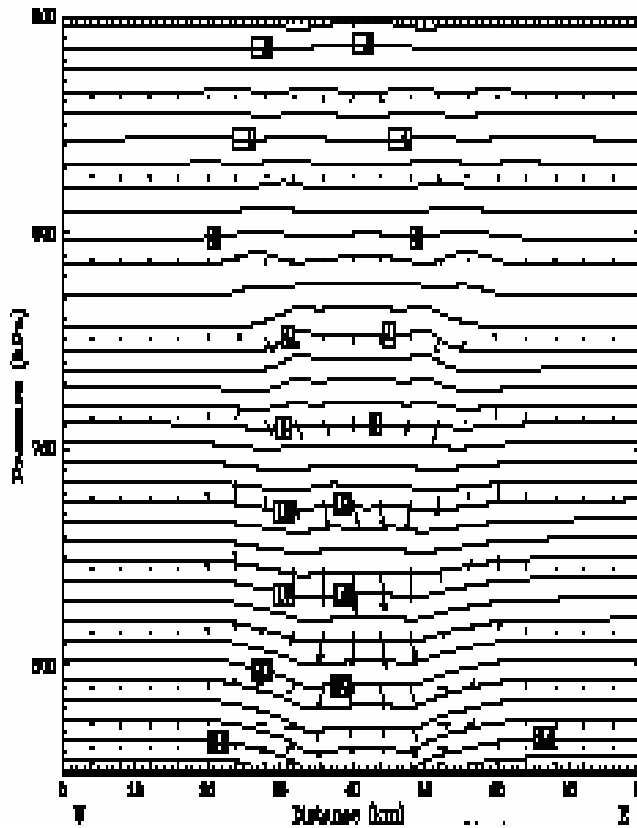
q (850hPa): (a) 0600 GMT (1300 LT), (b) 0900 GMT (1600 LT),
 and (c) 1200 GMT (1900 LT) **Wet Island**



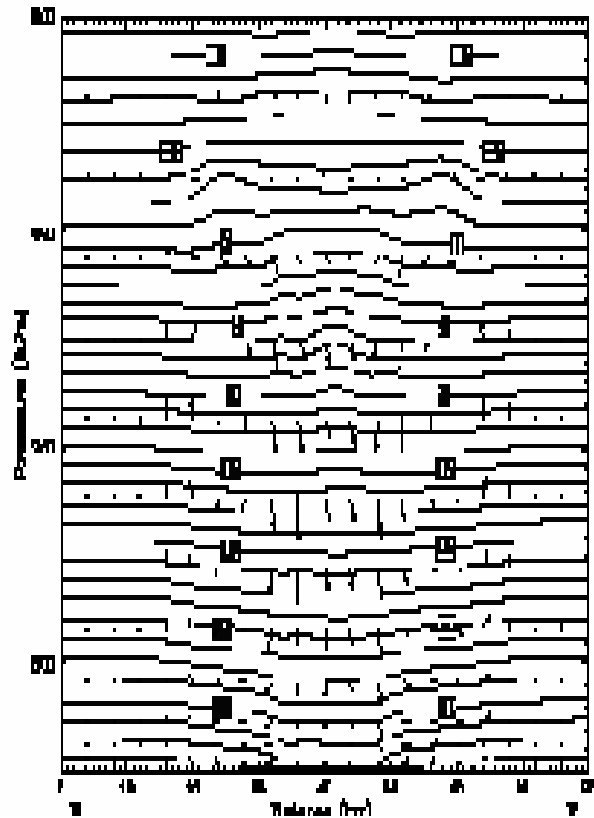
(c)



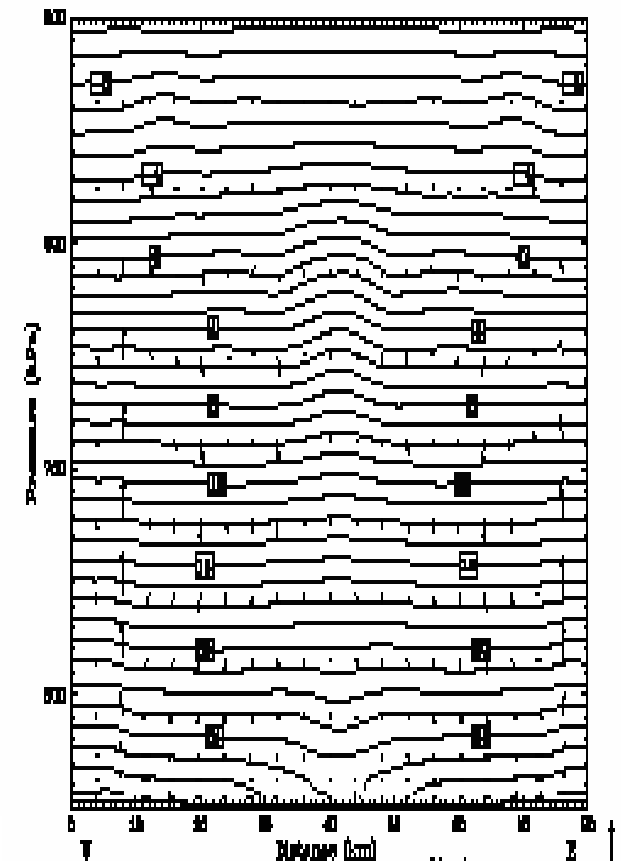
Simulated Zonal Cross Section (39°N) Temperature and Circulation



1300 LT

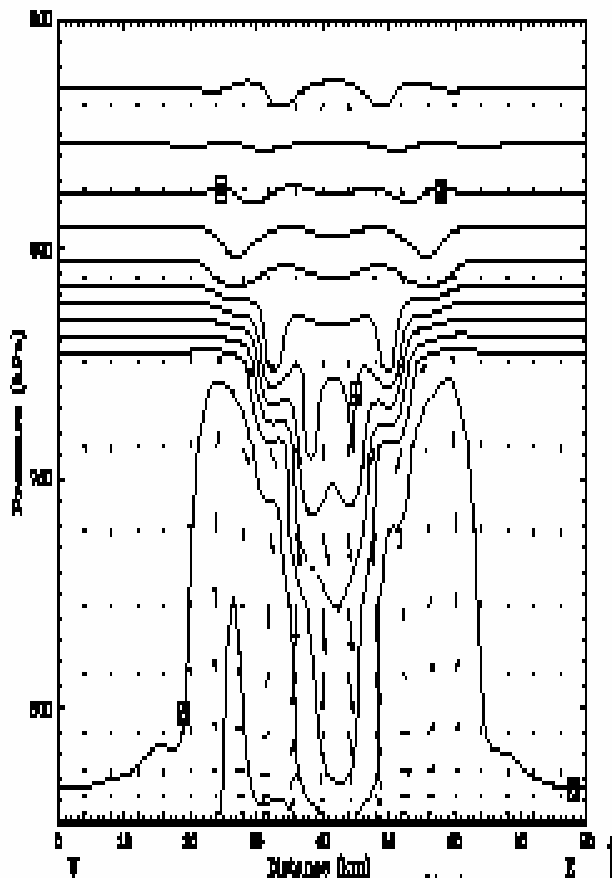


1600LT

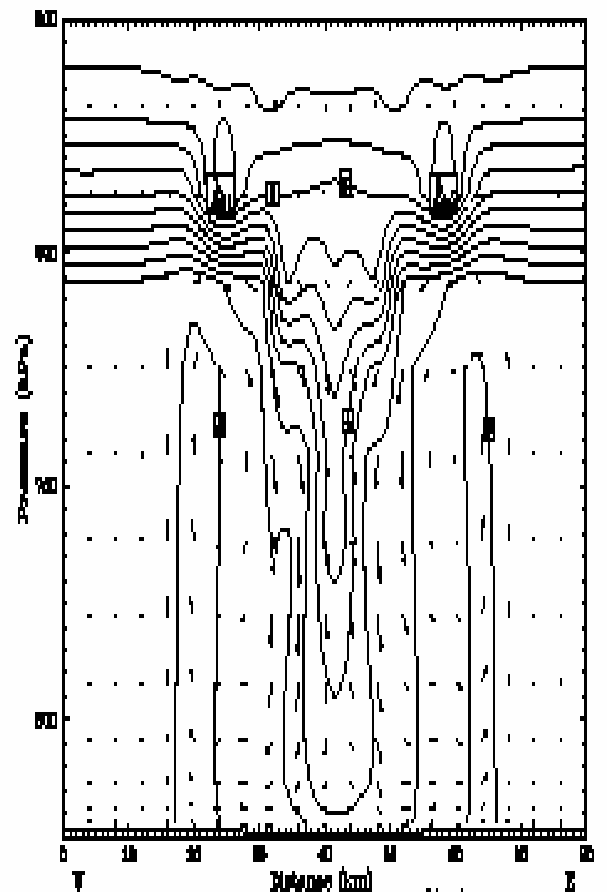


1900 LT

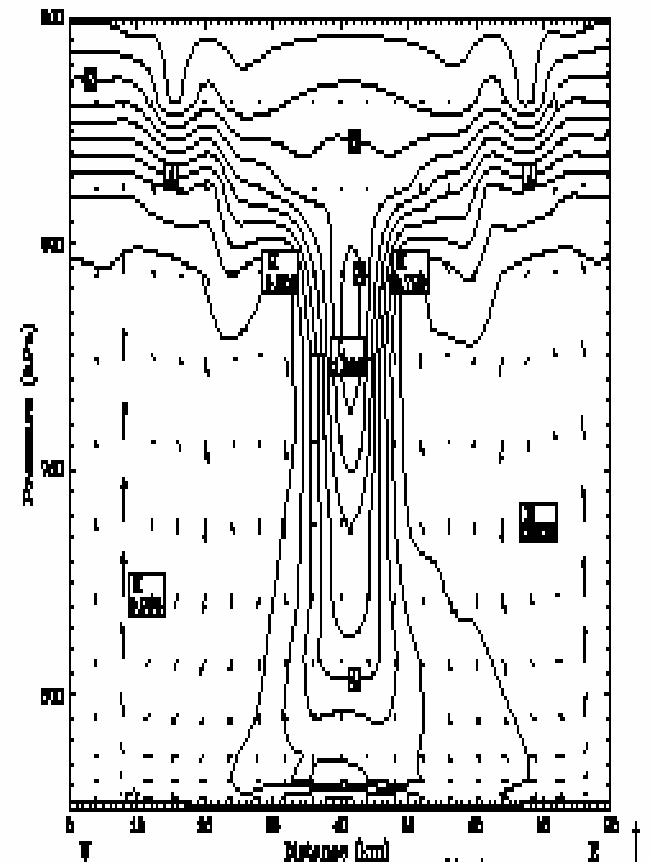
Simulated Zonal Cross Section (39°N) Humidity and Circulation



1300 LT



1600LT



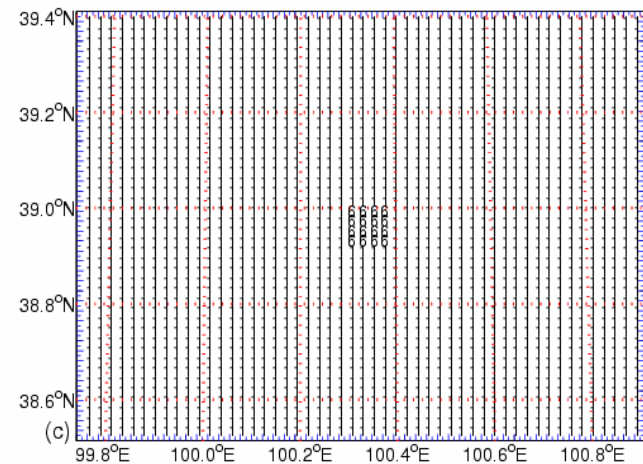
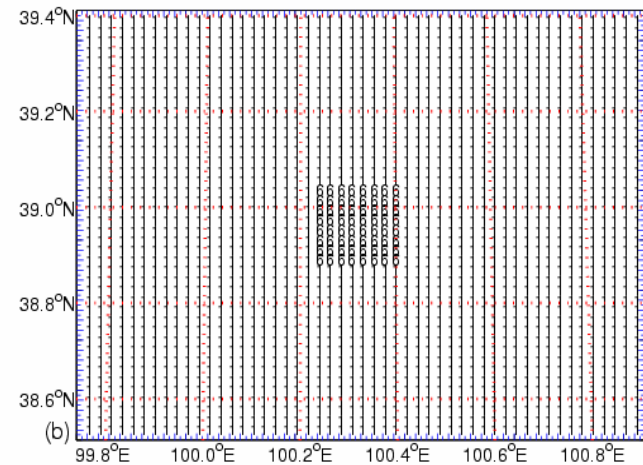
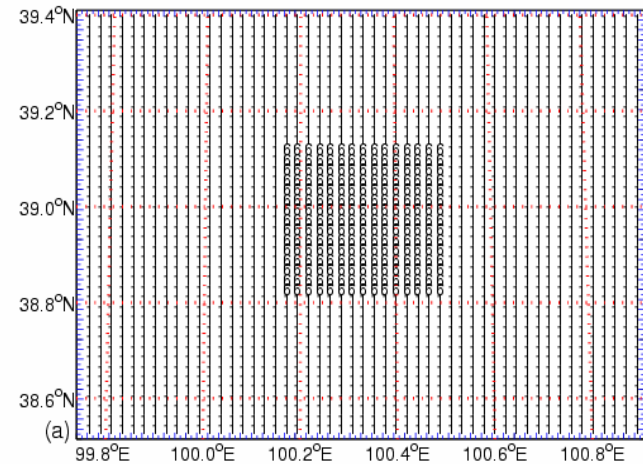
1900 LT

Oasis Scale Effect

- Large Oasis
(30 km X 30 km)

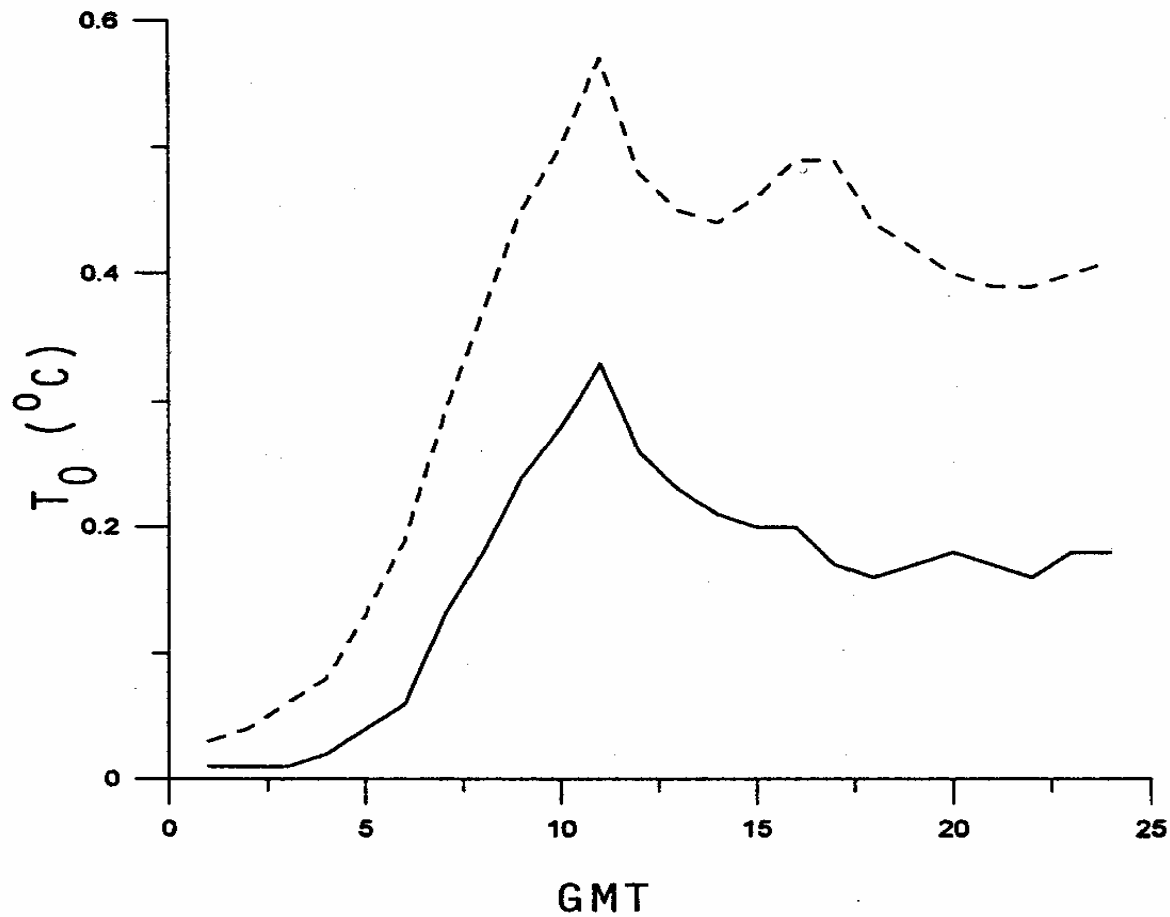
- Medium Oasis
(15kmX15 km)

- Small Oasis
(7.5 kmX7.5 km)



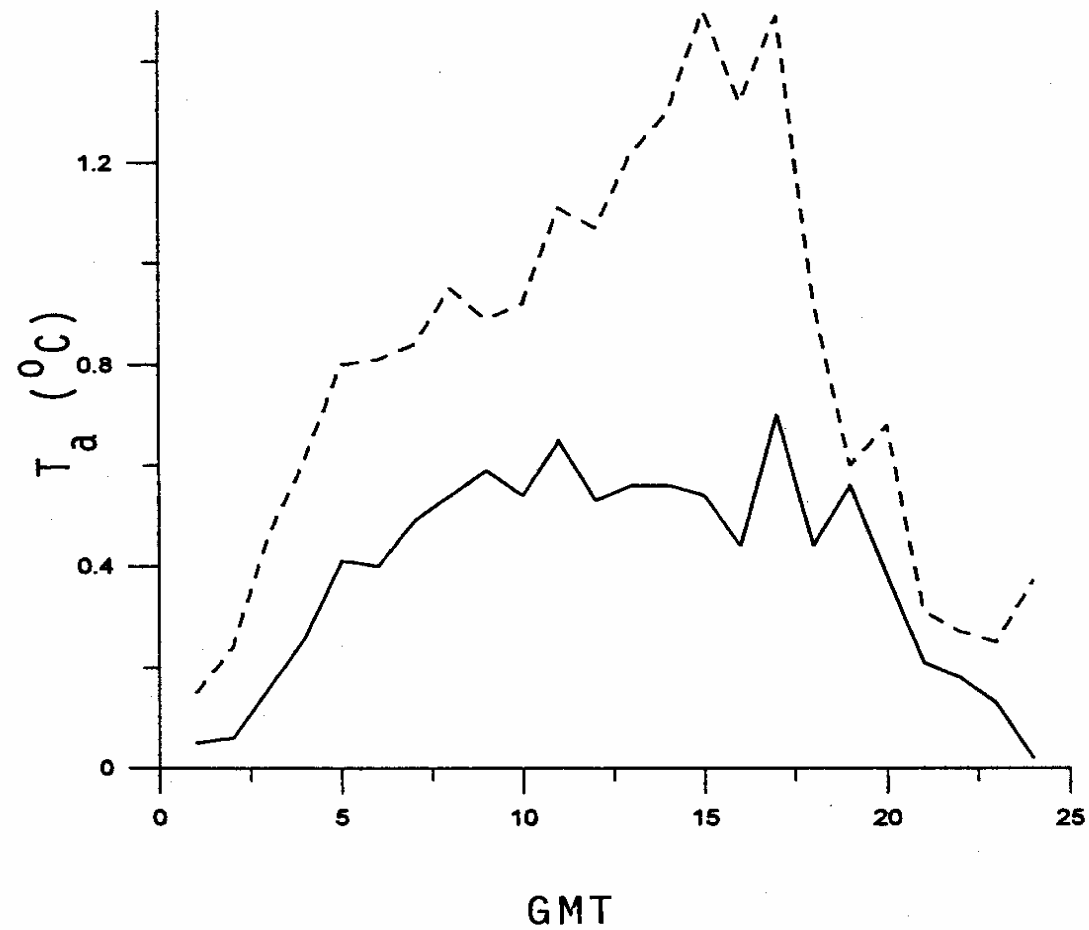
Oasis Land Surface Temperature

Solid: Medium-Large
Dashed: Small-Large



Oasis Surface Air Temperature

Solid: Medium-Large
Dashed: Small-Large



Conclusions

- Cooling at the oasis surface and warming at the desert surface drive OBC.
- The OBC provides a self-supporting mechanism.
- The oasis scale effect: the larger the scale, the larger the self supporting effect is.