CORRESPONDENCE

Comments on "The Effect of Variable Surface Albedo on the Atmospheric Circulation in Desert Regions"[1]

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21 March 1977 and 8 August 1977

Berkofsky (1976) used a numerical circulation model to investigate the implications of changes in surface albedo for desertification tendencies. He was careful to state that his results only applied to conditions resulting from an albedo change with "all other things being equal," but he concluded that his results "are in agreement with those of Charney (1975), and confirm the speculations of Otterman (1974)."

The desertification mechanisms envisioned by these researchers, however, have to do with albedo changes induced by variations in the amount of vegetative ground cover. In particular, they deal with the removal of vegetation by overgrazing. When such is the case, all other things are *not* equal; and conclusions reached by consideration of only variable albedo effects must not be counted as substantiating these other theories.

In a recent study on how to include a vegetation layer in an atmospheric prediction model that simulates ground surface temperature and moisture, Deardorff (1977) concluded that introduction of a foliage layer which may have variable density and an albedo different from that of the ground seemed mandatory for testing a climate theory like that of Charney *et al.* (1975). Indeed, a proper evaluation of the theories of Charney and Otterman can only be made when all comparable effects of variable ground cover on the surface energy balance are considered, and not just albedo variations only. In view of the fact that recent data imply that results may be very different when treated in this manner (Idso, 1977), we would hope that studies such as the one of Berkofsky's here under discussion be not extrapolated too vigorously to situations where all things other than albedo are not the same.

A minor point involves Berkofsky's statement that a realistic profile for the vertical heat flux is one in which it varies parabolically with height. That particular profile was utilized by Deardorff (1972) in a fixed-lid model which did not permit entrainment and boundary-layer growth. A more realistic profile within the daytime boundary layer over land is a linearly decreasing turbulent heat flux, reaching a negative value of magnitude about 0.1–0.2 of the surface heat flux at a height just below the top of the boundary layer, and turning back to zero just above this height. This structure is consistent with a boundary layer which grows from a height of order 100 m shortly after sunrise to a height of anywhere between about 300 m and 3 km by late afternoon. This correction does not affect Berkofsky's Eq. (19), however, since his model employed a boundary layer of fixed height.

[1] Contribution from the Agricultural Research Service, U. S. Department of Agriculture, and the University Corporation for Atmospheric Research under sponsorship of the National Science Foundation.

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0021-8952/78/0560-0560$05.00