depth of 5 km or less. Growth rates are less sensitive to the inclusion of Newtonian cooling, but photochemical enhancement of thermal relaxation rates is likely to be larger in the summer hemisphere. For a rate of 1/(1.5 days), the fastest estimated by Blake and Lindzen, the growth of baroclinic disturbances appears possible only for the largest observed values of the westerly shear.

Convincing observational evidence of the existence of baroclinic waves in the summer mesosphere is likely to be difficult to obtain. The vertical scale of the temperature perturbation appears to be too small to be resolved by current measurements from satellites. Predicted periods relative to the ground are of the order of one day, so use of rocket observations from a single station would require careful analysis to avoid confusion with the diurnal tide. A sequence of observations presented by Hirota (1975) does indeed exhibit considerable variability in the upper stratosphere and mesosphere, but the resolution in time is insufficient to determine whether part of this variability may be a result of baroclinic instability.

REFERENCES


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Comment on the paper ‘Effects of aerosol on the local heat budget of the lower atmosphere’ by J. Glazier, J. L. Monteith and M. H. Unsworth (Q.J., 1976, 95–102)

By K. J. WESTON and H. CATTLE

In their recent paper Glazier, Monteith and Unsworth (1976) suggest that the values of average sensible heat flux at the ground which we calculated from observations over southern England (Cattle and Weston 1975) may be too large by as much as 50%. We stated in our paper that the
omission of direct shortwave heating of the boundary layer leads to an uncertainty in our derived values of heat flux, but we do not consider an error of as high as 50% to be likely, nor do we accept that the findings of Glazier et al. indicate this possibility.

Our observations were made over a period of 3 or 4 hours around midday whereas those of Glazier et al. were made over periods of about 12 hours. Much of the heating of the boundary layer due to sensible heat input at the ground is likely to take place during the middle part of the day whereas the heating due to aerosol is rather less dependent on the elevation of the sun (path length increases with increasing solar zenith angle). This means that in the observations of Glazier et al. the aerosol heating will form a larger fraction of the total heating of the boundary layer than in our observations. The net heat during our observation period on 24 March was at a rate equivalent to 32 degC day$^{-1}$, compared with an average of 8.3 degC day$^{-1}$ found by Glazier et al., so that aerosol heating is relatively of much less importance.

A second point concerns the presence of cloud. Glazier et al. say that due to the presence of scattered cloud on 16 June they adjusted the value of $H_A$, the convergence of radiative flux due to aerosol for the whole atmosphere, given in their Table 1; yet they make no mention of a similar adjustment on their other observation days despite the report of cloud by neighbouring Meteorological Office stations, as shown in the following table of total amount, in eighths, at 12 h. The three stations form a triangle around Sutton Bonington, the observation site.

<table>
<thead>
<tr>
<th>Date</th>
<th>Watnall</th>
<th>Wittering</th>
<th>Elndon</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 June 1973</td>
<td>4</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7 June 1973</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>15 June 1973</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>16 June 1973</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>1 Aug. 1973</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Although such an adjustment would not directly affect the calculated values of aerosol heating, since they are effectively obtained as a residual from the heat budget equation, the values of $D$ would be changed.

**REFERENCES**


K. J. Weston, Department of Meteorology, The University, Edinburgh. H. Cattle, Meteorological Office, Bracknell, Berks. 30 March 1976

551.510.522: 551.551.8

Comments on 'Budget studies of heat flux profiles in the convective boundary layer over land' by H. Cattle and K. J. Weston (*Q.J. 1975, 353-363*)

By A. K. BETTS

Cattle and Weston have presented interesting boundary layer heat flux profiles derived by the budget method from the time change of the atmosphere $\theta$-profile. However there seems to be some