A First Course In Atmospheric Radiation (2nd Ed.)

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The Sun
Annual Average Radiative Flux

- Outgoing Longwave Radiation
- Absorbed Solar Radiation
- Net Radiation

Flux (W m$^{-2}$)

Latitude

Deficit
Surplus
Deficit

take note of units!
Solar Flux $S_0$

Intercepted Flux $\Phi = S_0 \pi R_E^2$

$S_0 = 1370 \text{ W m}^{-2}$

earth-sun distance = $1.5 \times 10^8 \text{ km}$

sun radius = $6.96 \times 10^5 \text{ km}$

earth radius = $6373 \text{ km}$
Solar Flux

Local Zenith

Surface Area = A

Shadow Area = A \cos \theta_s

F = S_0 \cos \theta_s

flux at a given location & time

daily-integrated flux at a given location
solar declination: tilt of earth’s axis w.r.t. the solar plane

Daily Average Insolation [W m\(^{-2}\)]

Latitude

<table>
<thead>
<tr>
<th>NP</th>
<th>24 hr darkness</th>
</tr>
</thead>
<tbody>
<tr>
<td>60N</td>
<td></td>
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<tr>
<td>30N</td>
<td></td>
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<tr>
<td>EQ</td>
<td>24 hr light</td>
</tr>
<tr>
<td>30S</td>
<td>400</td>
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<tr>
<td>60S</td>
<td>500</td>
</tr>
<tr>
<td>SP</td>
<td>24 hr light</td>
</tr>
</tbody>
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at top of atmosphere - reflection, absorption, by atm&earth not yet considered

Tuesday, March 23, 2010
solar declination: tilt of earth’s axis w.r.t. the solar plane