

Incoming short-wave radiation

The incoming short wave radiation can be estimated based on several formulae. If the [solar radiation at the exterior of the atmosphere](#) I_o is known, the incoming short wave radiation can be estimated based on an empirical formula of Black et al 1954:

$$Q_s = I_o \cdot (0.803 - 0.340 \cdot C - 0.458 \cdot C^2)$$

where C is the mean monthly cloudiness as decimal fraction and I_o is the [extraterrestrial-radiation](#) for the whole month in cal/cm²/day.

Another method of estimating Q_s is by means of the equation:

$$Q_s = I_o \cdot \left(a + b \cdot \frac{n}{N} \right)$$

where a, b are empirical constants, n are observed duration of sunshine hours per day and N are maximum possible duration of sunshine hours.

| Location | a | b | Source |
|--------------------|---------------------------|--------------|---------------------------|
| World | 0.23 | 0.48 | Black et al. 1954 |
| World | $0.23 \cdot \cos \lambda$ | 0.52 | Glover and McCulloch 1958 |
| S.E. England | 0.18 | 0.55 | Penman 1948 |
| Virgina U.S.A | 0.22 | 0.54 | in Penman 1948 |
| Canberra Australia | 0.25 | 0.54 | in Penman 1948 |
| Brisbane Australia | 0.23 to 0.35 | 0.38 to 0.54 | Cartledge 1973 |
| West Africa | -0.12 to 0.26 | 0.99 to 0.50 | Davies 1966 |

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