

# 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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