



## Comparison of daily sunshine duration recorded by Campbell-Stokes, Kipp & Zonen, and satellite sensors

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We compare daily sunshine duration data recorded by Campbell-Stokes (C-S) and Kipp & Zonen (K&Z) instruments. The C-S sunshine recorder is gradually being replaced by the automatic K&Z sensor for the measurement of bright sunshine duration at UK meteorological stations, although C-S recorders still dominate in the full climatological network. This paper builds on previous work evaluating monthly sunshine totals to show that adjustment on a daily basis should give greater accuracy and ensure homogeneity in the historical climate record.

Differences arise between daily sunshine totals measured by the two instruments, mainly because the C-S recorder is prone to ‘over-burn’ in periods of intermittent sunshine. This will depend on the type of weather experienced: the over-reading tendency of C-S recorders should be minimal on days that are overcast or totally sunny. Hence a correction method will work best if we can distinguish “broken cloud” days from clear or overcast days. We obtain adjusted monthly totals by applying updated formulae to the individual daily sunshine amounts. Errors in estimates of ‘C-S equivalent’ monthly sunshine totals for individual stations are likely to be less than 3% on average.

A further challenge for sunshine climate records is the scarcity of in-situ observing sites. Methods for retrieval of sunshine duration from geostationary satellites are now available and provide additional, independent, information that could be used to improve the interpolation of station sunshine data in the Met Office sunshine product. Here we present a comparison between these data and the K&Z in-situ sensors.