
Article:
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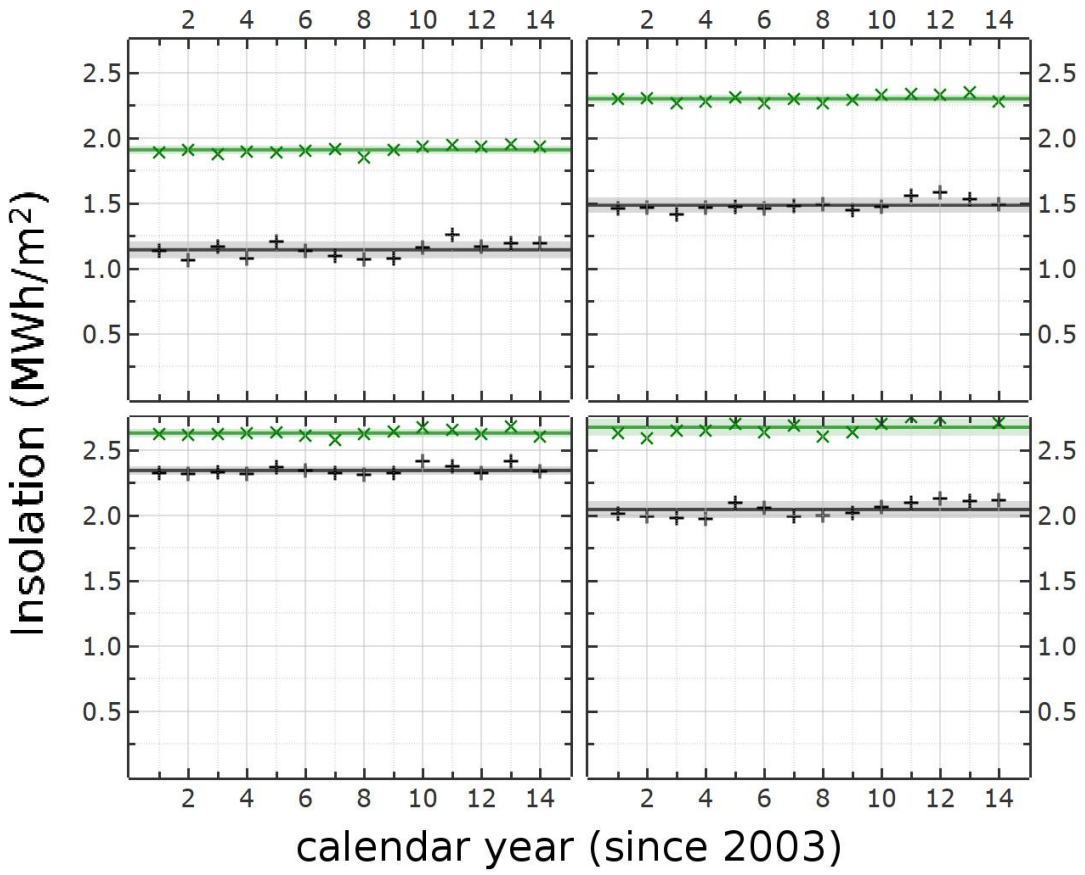
The quest for the optimum angular-tilt of terrestrial solar panels or their angle-resolved annual insolation

Christian Stefano Schuster[a]

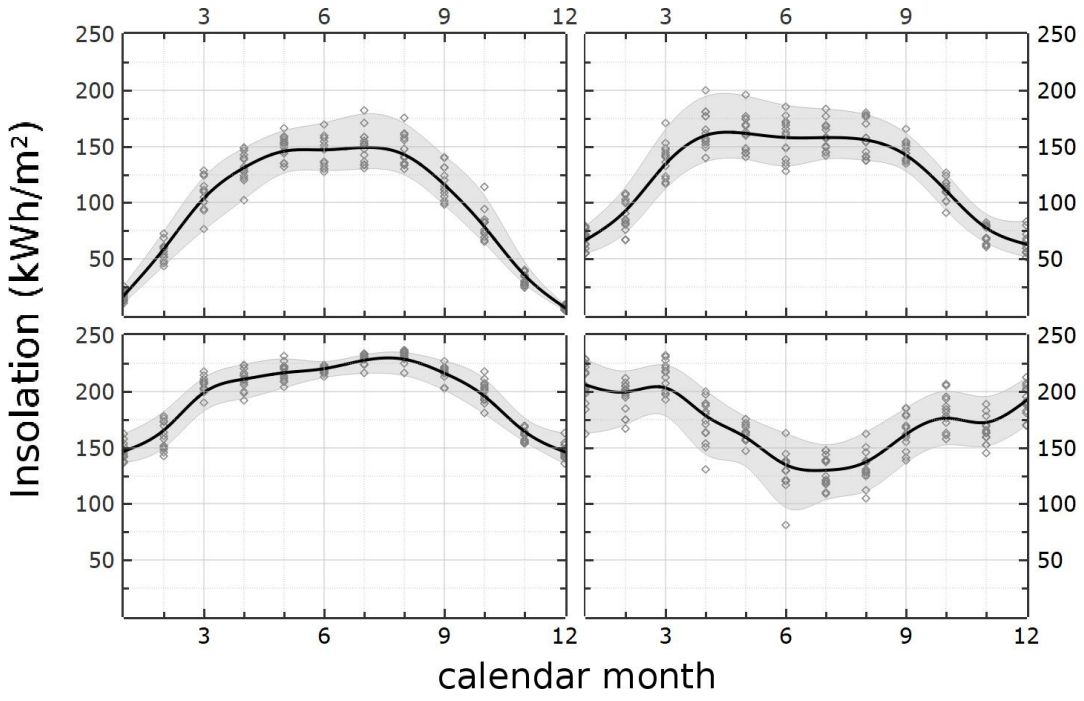
a - Department of Physics, University of York, Heslington, York, YO10 5DD, UK

Correspondence and requests for materials should be addressed to
CSS (e-mail: chriss@physics.org)

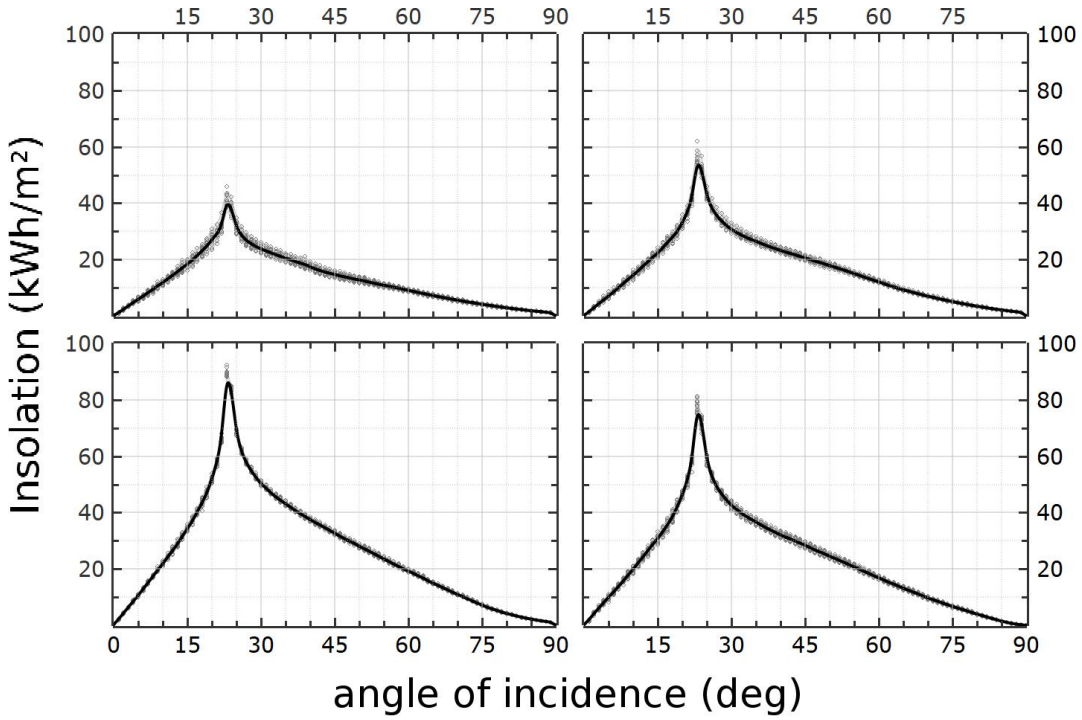
SUPPLEMENTARY INFORMATION



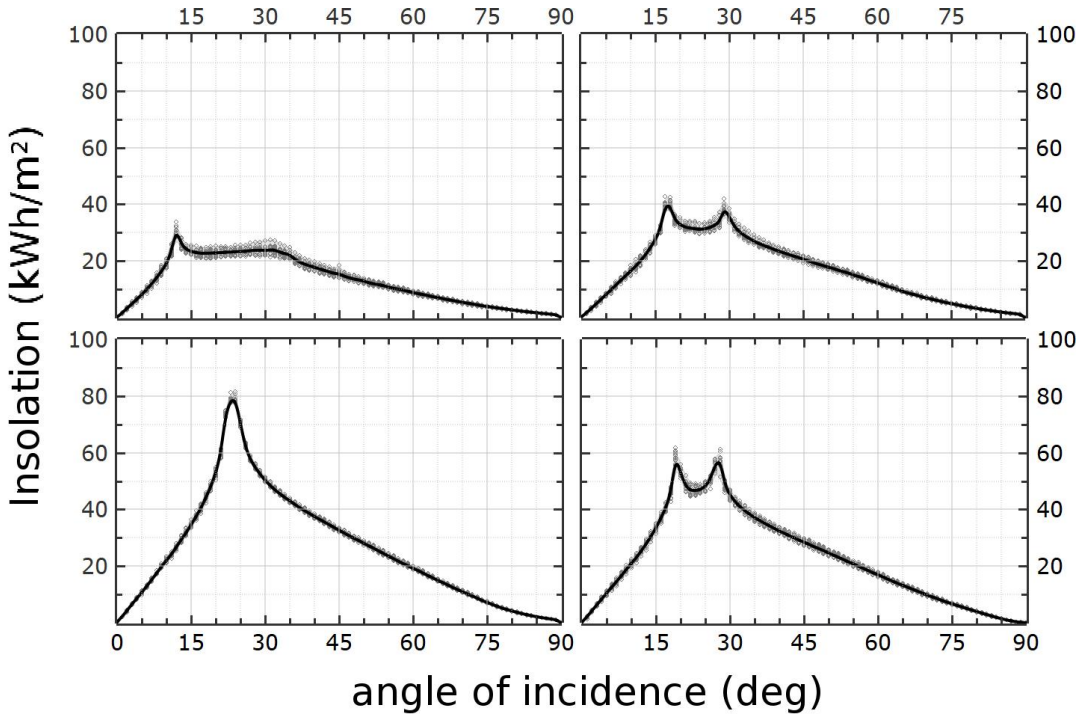
Supplementary Fig. S1. The annual insolation levels between 2004 and 2018 for a *latitude-tilted* surface at Trondheim (top left), Paris (top right), Cairo (bottom left) and Nairobi (bottom right). The cross and diagonal cross symbols represent the all-sky and the hypothetical clear-sky conditions, respectively. Since the annual insolation is a time and spectrally integrated quantity, it is not significantly affected by seasonal weather fluctuations.



Supplementary Fig. S2. The time-resolved annual insolation between 2004 and 2018 for a *latitude-tilted* surface at Trondheim (top left), Paris (top right), Cairo (bottom left) and Nairobi (bottom right). The black solid line refers to the average insolation, whereas the shaded area highlights the statistical deviations due to weather dynamics. The greatest deviations are found for a solar panel at Nairobi, which received almost 40% less insolation in June (2008) compared to its monthly average. The root mean square deviations are 10.94 (Trondheim), 12.66 (Paris), 7.17 (Cairo) and 14.41 (Nairobi) kWh/m^2.



Supplementary Fig. S3. The solar angle-resolved annual insolation between 2004 and 2018 for a *latitude-tilted* surface at Trondheim (top left), Paris (top right), Cairo (bottom left) and Nairobi (bottom right). Statistical deviations by seasonal weather dynamics are almost negligible and are only apparent at the peak position, i.e. near the incident angle of 23.45° (Earth's obliquity). The root mean square deviations are 0.86 (Trondheim), 0.74 (Paris), 0.53 (Cairo) and 0.83 (Nairobi) kWh/m^2, highlighting a greater robustness to climatic effects relative to the time-resolved annual insolation (see Fig. S2).



Supplementary Fig. S4. The solar angle-resolved annual insolation between 2004 and 2018 for an *optimum-tilted* surface at Trondheim (top left), Paris (top right), Cairo (bottom left) and Nairobi (bottom right). The optimum angular-tilt, which theoretically maximises the total annual insolation, is shown in Fig. 3b and listed in Tab. 1 for the mentioned locations. Statistical deviations by seasonal weather dynamics are almost negligible and are only apparent near and between the peak positions. The root mean square deviations are 0.84 (Trondheim), 0.72 (Paris), 0.53 (Cairo) and 0.86 (Nairobi) kWh/m^2.