

Assessing the surface solar irradiance under cloud-free skies in Israel with the McClear model

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The McClear model

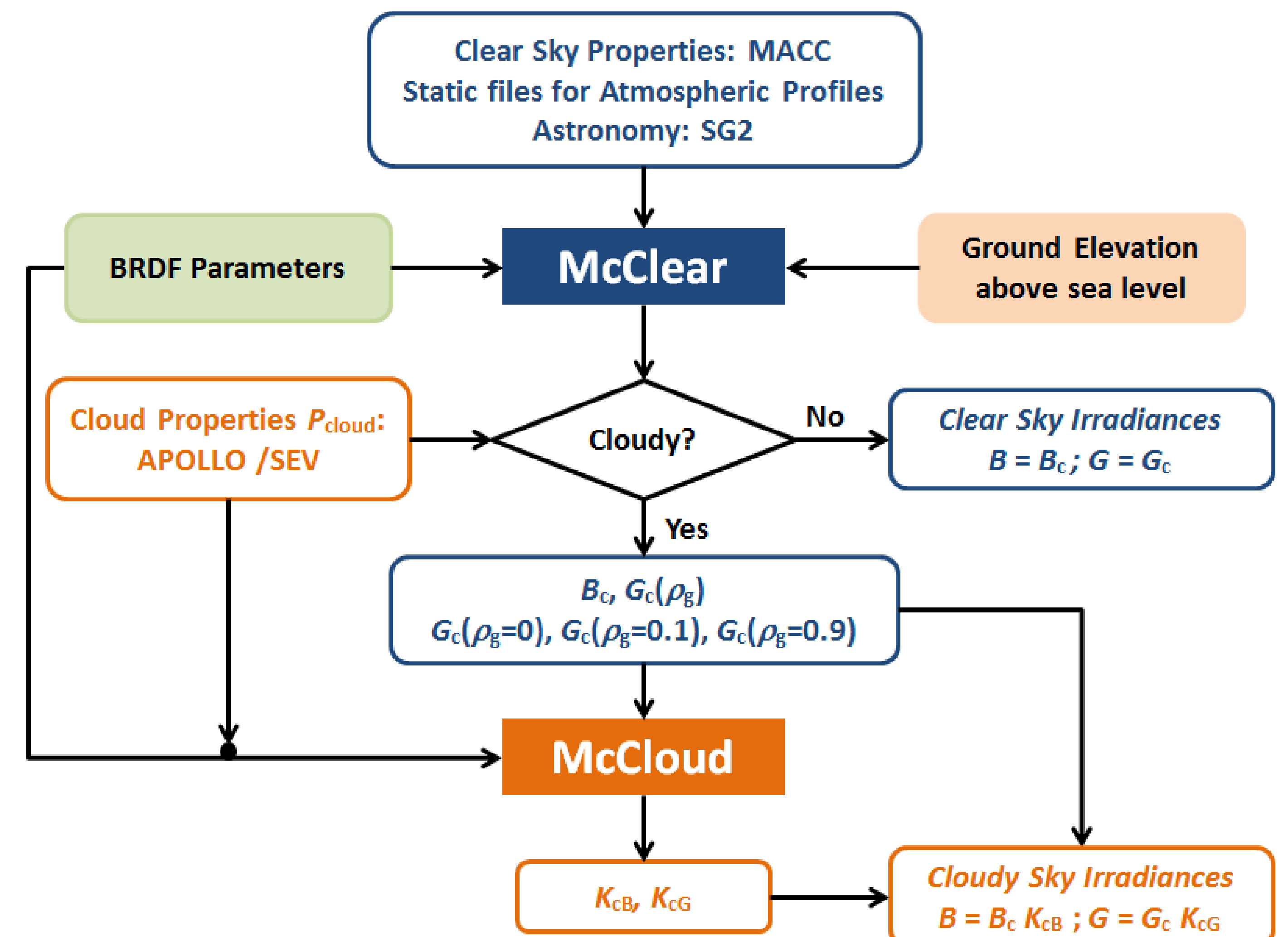
- Estimation of irradiance in cloud-free conditions
- based on the simulation of the radiative transfer in the atmosphere. Fast computation by means of abaci
- Inputs to McClear from the chemical-transport model of the MACC European projects (<http://www.gmes-atmosphere.eu>) (ozone, water vapour, aerosols properties every 3 h), and satellite-derived products (BRDF parameters for ground albedo, elevation above sea level)

The McClear model is a component of the new Heliosat-4 method

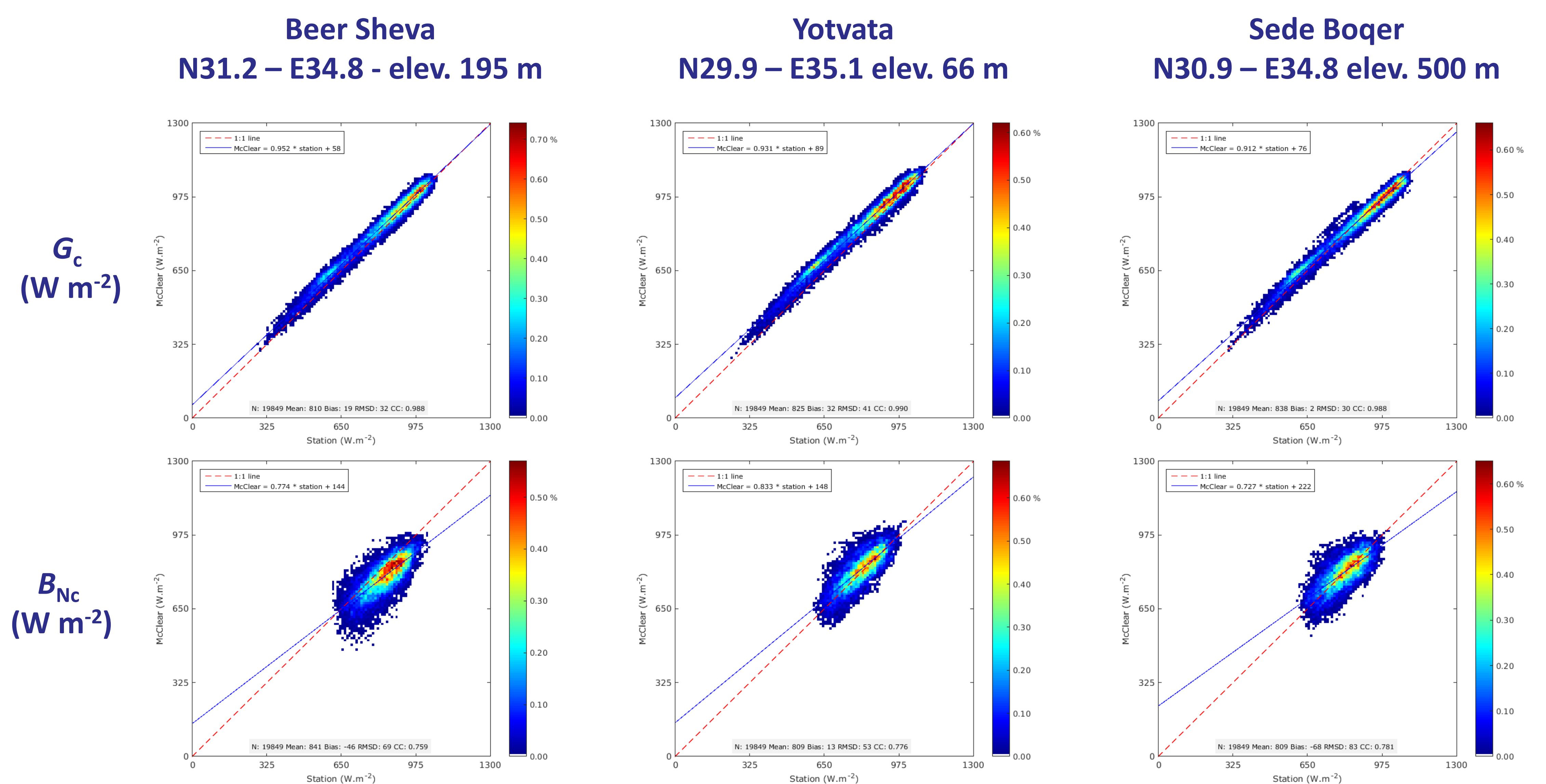
McCclear clear sky irradiation database is freely available on the SoDa web service (<http://www.soda-pro.com>).

McCclear Web Service provides time-series of irradiances with a step from 1 min to 1 month.

Validation already performed with many stations worldwide. Interest here: **three stations very close in desert area**, with many cloud-free cases.



Validation of 1 min Global (G_c) and Direct Normal Irradiation (B_{Nc}) for three Israeli stations



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Correlations between stations for
Ground data
McCclear

G_c	BEE	YOT	SBO
BEE	1	0.991	0.995
YOT	0.994	1	0.994
SBO	0.999	0.996	1

B_{Nc}	BEE	YOT	SBO
BEE	1	0.630	0.884
YOT	0.846	1	0.728
SBO	0.990	0.908	1

McCclear reproduces well the correlation between sites for G_c and not so well for B_{Nc}

Conclusion

- Global irradiance G_c . 2 W m^{-2} (0%) < bias < 32 W m^{-2} (4%). 30 W m^{-2} (3%) < RMSE < 41 W m^{-2} (4%). Correl. coeff.: 0.99.
- Direct irradiance at normal incidence (DNI) B_{Nc} . -68 W m^{-2} (-8%) < bias < $+13 \text{ W m}^{-2}$ (2%). 53 W m^{-2} (7%) < RMSE < 83 W m^{-2} (10%). Correl. coeff.: ~0.77.
- Overall, errors are small => **McCclear predicts accurately the solar irradiation** in clear-sky conditions.
- Similar errors for the three sites for G_c and B_{Nc} to a lesser extent. Demonstrates the **robustness of McCclear + MACC products**.

