EFFECTIVE ACCURACY OF SATELLITE- DERIVED GLOBAL, DIRECT AND DIFFUSE IRRADIANCE IN THE CENTRAL US

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Short term Effective Accuracy

Perez et al., ASRC

Satellite-derived global irradiance

Measured global irradiance

time/site specific data
Hourly RMS Error as a function of station distance

Satellite becomes more accurate beyond 20 km

Satellite’s Effective Accuracy

Perez et al. ASRC
NE-US / Switzerland Study

- Ground measurement networks not designed for research
- Hourly data only
- Global irradiance only
- Humid / temperate climates
- Marked orographic features
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SOUTHERN GREAT PLAINS STUDY

- Ground measurement network designed for research (ARM)
- One minute, hourly and daily data
- Global, direct and diffuse irradiances
- Continental climate
- Limited orographic features
ARM Extended Facility

- WMO class I global, direct, diffuse
- 19 out of 26 stations used for analysis
Daily breakeven distance ~ 60 km
Hourly breakeven distance ~ 35 km
1-minute breakeven distance ~ < 5 km
apparent satellite model accuracy

satellite confidence level -- simple model
(accounting for time mismatch and solar geometry)

Relative RMSE (%)

Distance from station (km)

Effective accuracy

Southern Great Plains

Northeastern US

Switzerland
Daily breakeven distance ~ 75 km
Hourly breakeven distance ~ 45 km
1-minute breakeven distance ~ 20 km
Daily breakeven distance ~ 100 km
Hourly breakeven distance ~ 50 km
1-minute breakeven distance ~ 25 km
CONCLUDING REMARKS

Confirmation / extension of initial investigations
Hourly  Global effective accuracy  ~ 15%
       Direct effective accuracy  ~ 25%
       Diffuse effective accuracy  ~ 35%

\[\text{Effective accuracy} \]
CONCLUDING REMARKS

Confirmation / extension of initial investigations
Hourly  Global effective accuracy  ~ 15%
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        Diffuse effective accuracy  ~ 35%

Need to expand study to arid and tropical/subtropical climates