Meso-scale Mapping of Solar Resource

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http://geomodelsolar.eu
http://www.crses.sun.ac.za/
What is required?

PV

GHI (Global Horizontal Irradiation) or related e.g. GTI (Global Tilt Irradiation)

CSP/CPV

DNI (Direct Normal Irradiation)
Traditionally Well-known Solar Resource Databases

Modern Satellite-based Solar Resource Databases
Modern Solar database – inputs (real-time)

Satellite data

Temporal resolution: 15 or 30 min
Spatial resolution: 3 km

Aerosol Optical Depth (AOD)
125 km (6 hours)

Water vapour
35 km (6 hours)

High-resolution terrain
90 meters
Uncertainty? Which Data is Bankable?

GHI – 5% to 12%
DNI – 10% to 50%

1% - 4%

GHI – 3% to 6%
DNI – 6% to 12%

(Uncertainty of annual values)
Satellite vs. ground measurements??
Satellite vs. ground measurements??
1 year **ground** data at 2% uncertainty

10+ years **satellite** data at 5% uncertainty

10+ years time series at 2.5% uncertainty
Meso-scale Solar Resource Mapping in 4 Steps

1. **Country overview**
   - Satellite derived solar maps

2. **Site Selection for Installing Ground Stations**
   - Use of GIS data overlays

3. **Site-Adaptation of Satellite Data**
   - Reducing uncertainty in satellite data

4. **Disseminating Solar Resource Data**
   - IT infrastructure
   - Country atlas
Step 1: Country overview
Step 2: Site Selection for Installing Ground Meteo Stations
Step 3: Site-Adaptation of Satellite Data

...before data correlation

...after data correlation
Step 4: Disseminating Investor-Grade Solar Resource Data
GHI and DNI is only part of the information required
PV yield output, GTI for tracker systems, etc.

PV for fixed panels

PV energy yield gain from 1-axis tracker
Satellite data/maps are really only good if they have been validated with high quality ground measurements.
Solar Measurement Stations
Source: Meteonorm
Next steps…

Solar Resource Forecasting

Grid Management
Thank You