Solar Resource Data for Energy Modeling

Presented by

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"Improving the Representation of Renewables and High Renewable Scenario Modeling"

Energy Modeling Forum

Snowmass, Colorado

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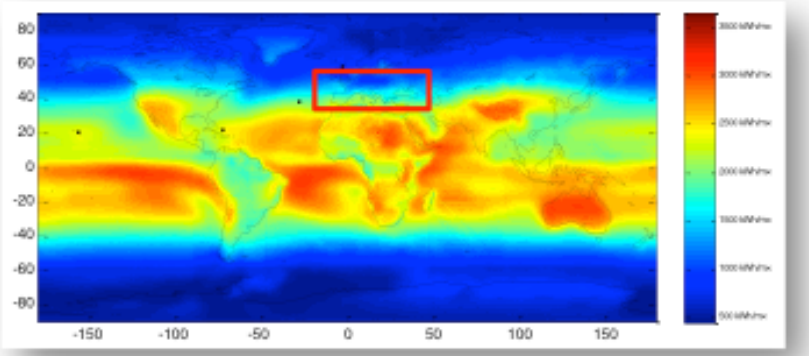
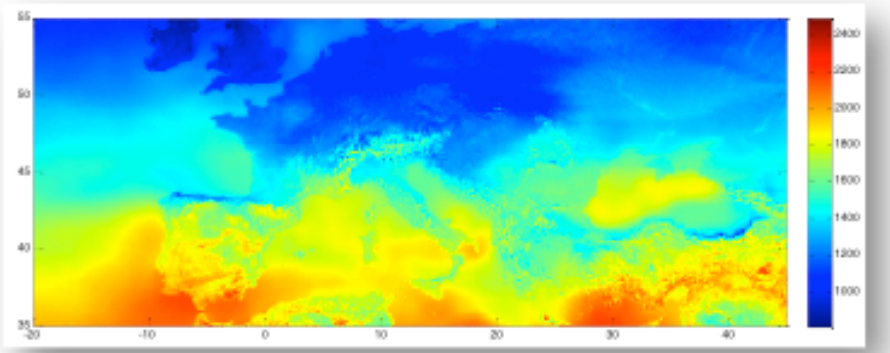
Outline

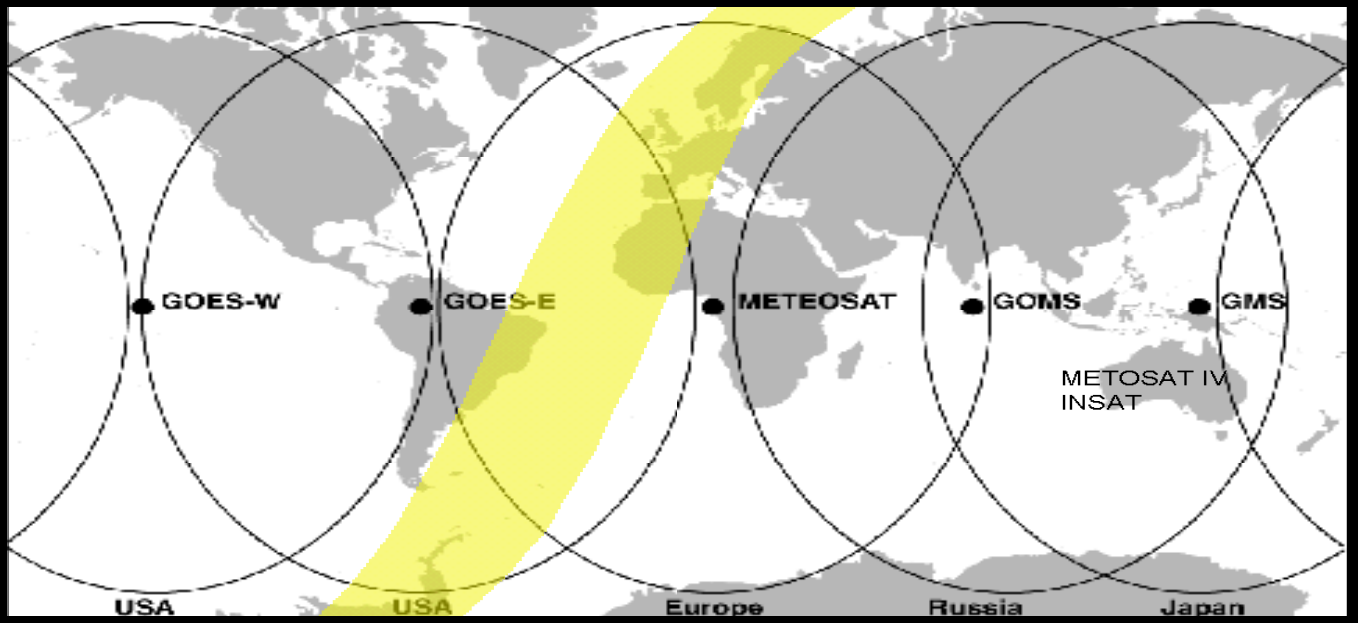
- Status of Global Solar Resource Data Sets
- NASA's SSE Update Plans
- IEA/SHC Tasks 36 and 46
- IRENA Activities

Sources of Global Solar Resource Data

- Ground-based measurements (few and far between!)
- Reanalysis data sets (NCAR-NCEP, CRU)
  - NCAR CFDDA is a global 40-km data set dynamically downscaled from NCAR-NCEP and/or ECMWF
- **Satellite-derived data**

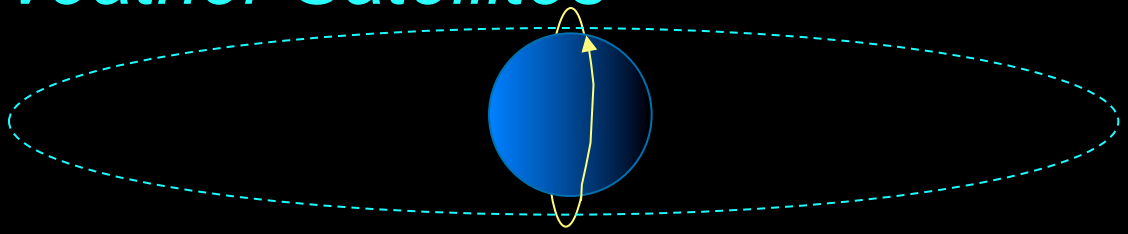






Geostationary Weather Satellites

- *High resolution*
  (decaying at high latitudes)
- *Continuous in time*



Polar Orbiters

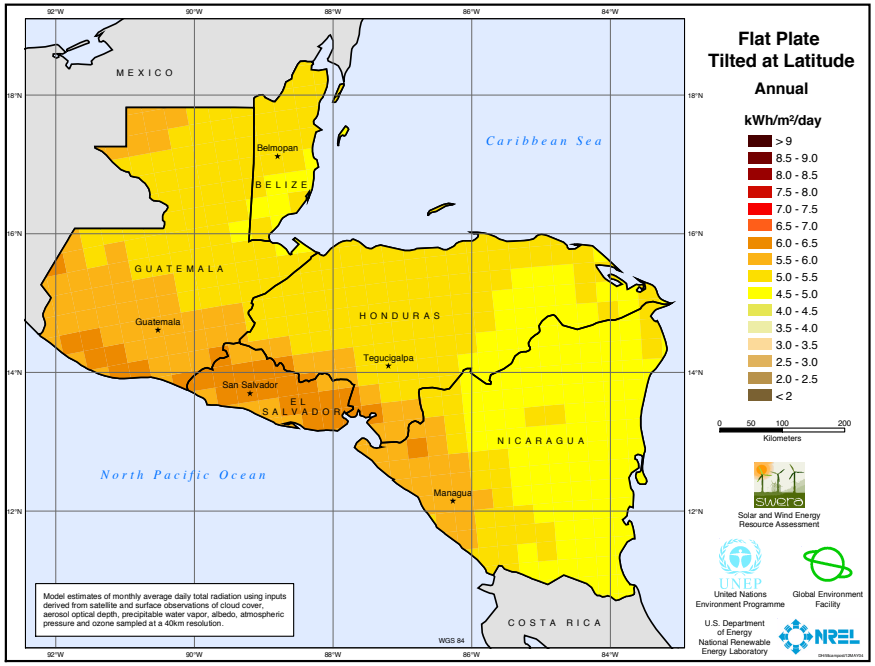
- *Very High resolution*
  at all latitudes
- *Twice a day only*

Status of Downscaled NASA SSE Dataset

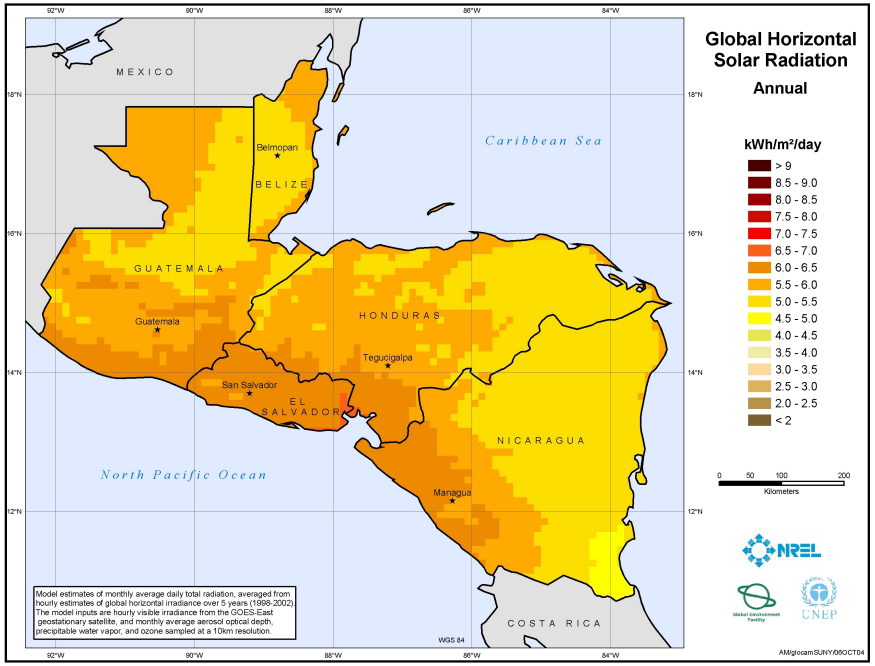
- Current NASA SSE (v. 6.0): 100-km resolution, ~22 years, 3-hourly
- Downscaled NASA SSE: 10-km resolution, 30-year, 3-hourly dataset
- Requires downscaled cloud cover data set from the International Satellite Cloud Climatology Project (ISCCP)
- Approach has been successfully tested using Perez empirical model
- NASA in-house production scheme ready in September 2012
- Production to begin on ISCCP data in October 2012
- Full global data set expected by June 2013
  - May not include polar regions (N of 60^0 north and S of 60^0 south)
  - Should include validation with global network of ground stations (BSRN)

Downscaling Solar Resources

40-km



10-km



Source: Solar and Wind Resource Assessment (SWERA) Project: unep.swera.net

IEA/SHC Tasks 36 and 46

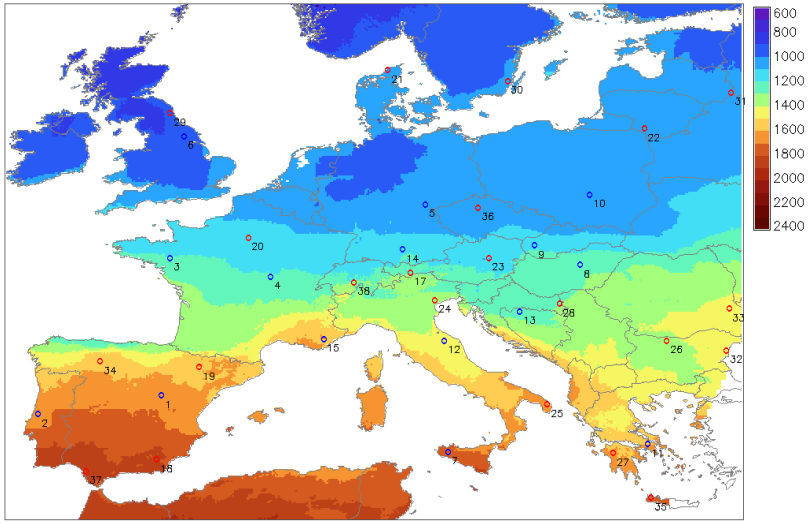
- **Task 36: "Solar Resource Knowledge Management" (2005-2011)**
- **Task 46: "Solar Resource Assessment and Forecasting" (2011-2016)**

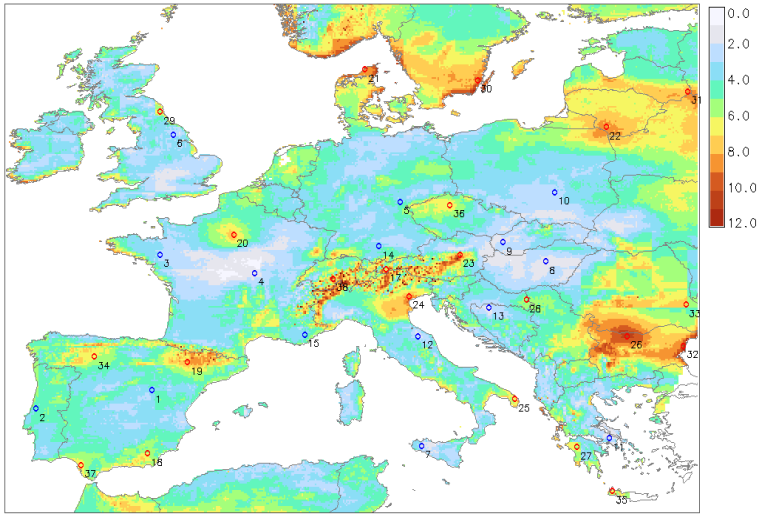
Goals:

Task 36: Provide Solar energy industry and other stakeholders with suitable, accurate solar resource data in easy-to-access formats and understandable quality metrics

Task 46: Provide means for understanding "bankability" of solar data sets, including solar forecasts and short-term solar variability

Application of Benchmarking Procedures





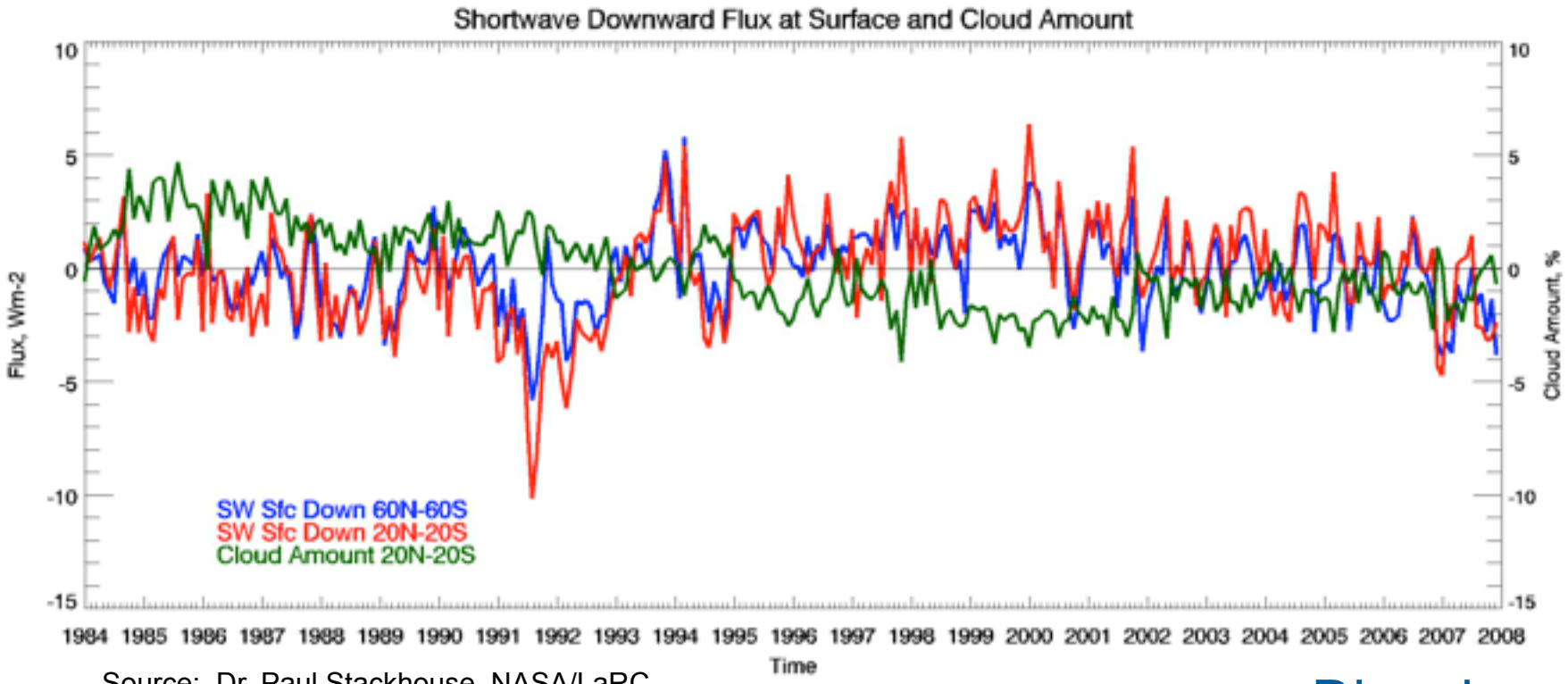
Yearly sum of global irradiation on horizontal surface: (left) average of 6 databases: Meteonorm v.6, ESRA, PVGIS, NASA SSE v.6, Satel-Light and HelioClim-2 [kWh/m2]; (right) standard deviation of the values from 6 databases relative to the overall average [%]. Source: Suri and Cebecauer (Geomodel s.r.o.).

Short Term Variability

DeSoto, Florida 25 MW PV Plant

Source: Windlogics/FPL (Adam Kankiewicz)

Long-Term Trends



Source: Dr. Paul Stackhouse, NASA/LaRC

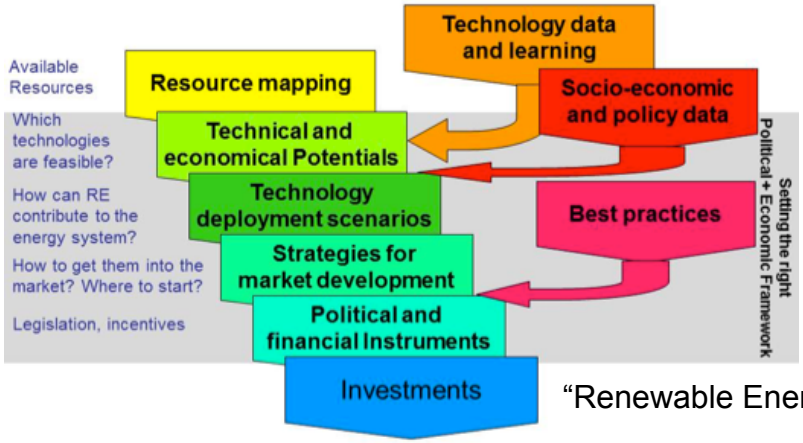
Dimming

Brightening

Dimming Again?

IRENA Report in Preparation: "Pathways from Resource Assessments to Investments in Solar and Wind Energy"

- Report addresses current state of knowledge, guidelines and best practices for developing countries in:
  - Resource Mapping Fundamentals (including solar and wind measurements): Theoretical Potentials
  - Technical, and Economic Potentials
  - Technology Deployment Scenarios
  - Market Strategies, Policies and Financial Instruments, and Investments (i.e. Creating an investment Environment)
  - Summary and Recommendations
- Inputs and reviews are continuing
- Release date: late 2012
- Initial drafts structured around:



"Renewable Energy Markets"

Thank You

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