

IEA PVPS Task 16 – Solar Forecasts (and Resources)



Presentation at IEA Networking Event Switzerland
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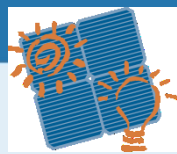
- Why a Solar Task?
- Participation
- Workplan
- State-of-the-art forecasts
- Take home messages



Bureau of Meteorology

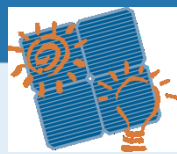
A circular image of Earth from space, showing a bright sun in the center and a vertical red line passing through it. The Earth's surface is covered in clouds, and the sun is a bright, glowing orb. The red line is a vertical line that passes through the center of the Earth and the sun.

[illegible]



Solar Resource Task for three solar TCP's

- Long history:
 - first solar resource task started in 1977 in SHC
 - Change to PVPS in 2017
- Links to three solar TCP:
 - Solar Heating and Cooling (SHC)
 - PV power systems (PVPS) (main TCP)
 - SolarPACES (solar chemistry and concentrating solar power) → SolarPACES Task V



Why a Solar Task?

- Solar resources are the fuel of PV
- Uncertainty in solar belt still high
- Big PV and high penetration need high quality of meteorological information
 - Finer spatial and temporal resolution of data
- Added values
 - Independent benchmarks
 - State of the art descriptions
 - Lower uncertainties lead to lower costs of implementation and to more PV



Participation

Science
(labs and universities)

Met Services
Utilities

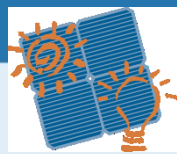
Data providers



Subtask 1: Resources

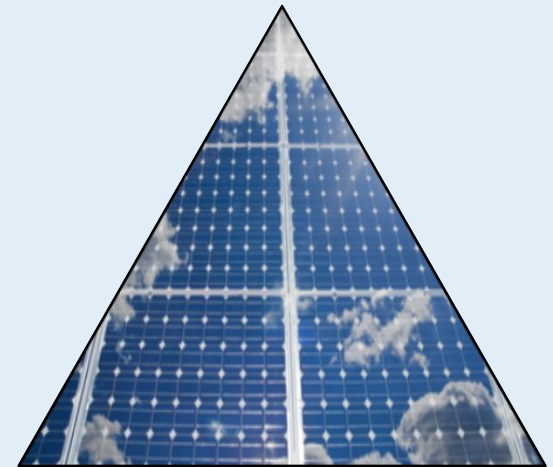
- Evaluation of current and emerging **resource assessment** methodologies:
 - Ground based methods (instruments, soiling)
 - Numerical Weather Prediction models (NWP)
 - Satellite-based methods





Subtask 2: Bankability

- **Enhanced data & bankable products:**
 - Data quality & format
 - Merging of satellite, NWP and ground data
 - Spatio-temporal high variability
 - Long-term inter-annual variability
 - Products for the end-users

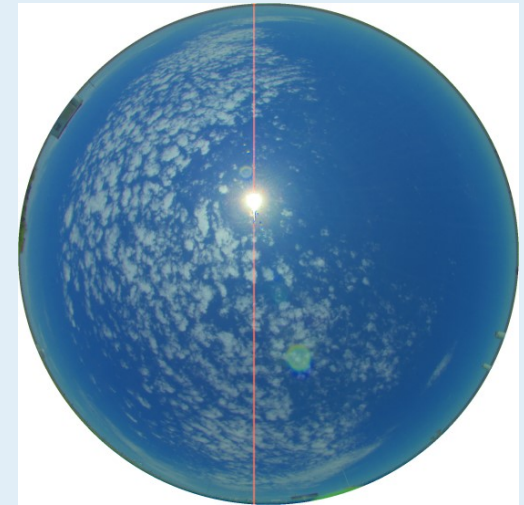


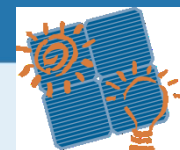
e.g. Methods and sources of www.sonnendach.ch
→ Swiss PV potential: 50 TWh



Subtask 3: Forecasting

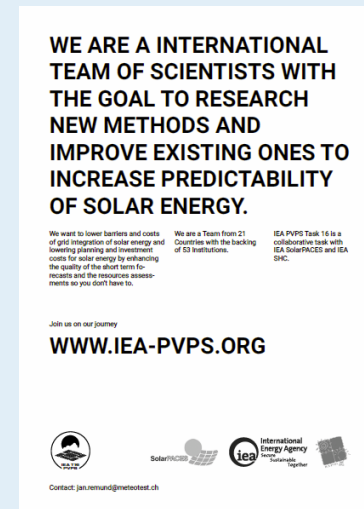
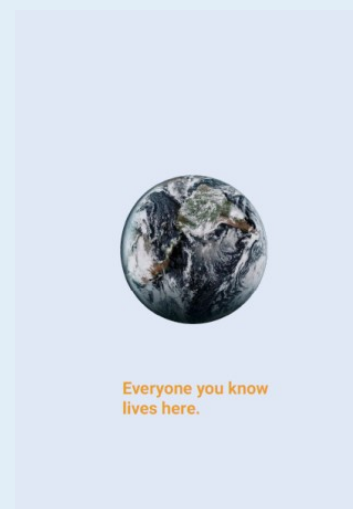
- Evaluation of current and emerging **solar forecasting techniques**:
 - Value of solar power forecasts
 - Regional solar power forecasting
 - Variability forecasting and probabilistic forecasting





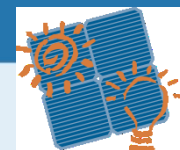
Subtask 4: Dissemination

- **Dissemination and Outreach:**
 - Flyer & Newsletters
 - Webinars (ISES)
 - Conference presentations
 - Workshops
 - Reports



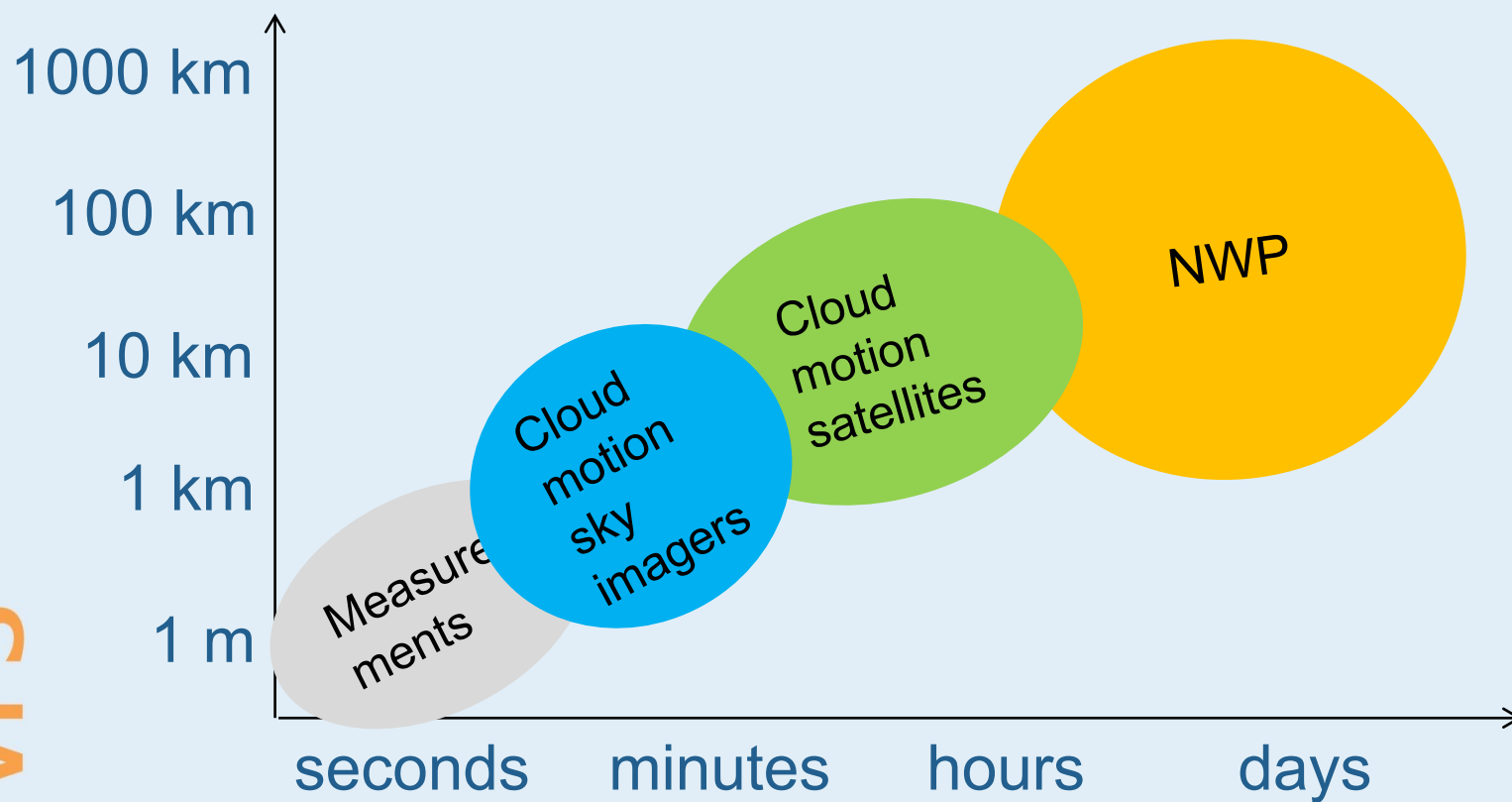
PVPS • July 2017- June 2020

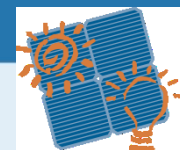
NREL, 2018: Solar handbook:
<https://www.nrel.gov/docs/fy18osti/68886.pdf>



What forecast for what resolution

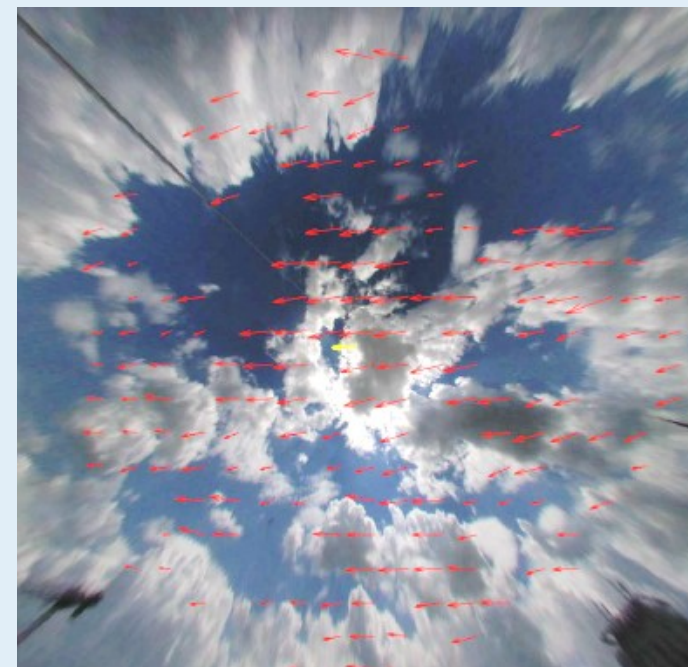
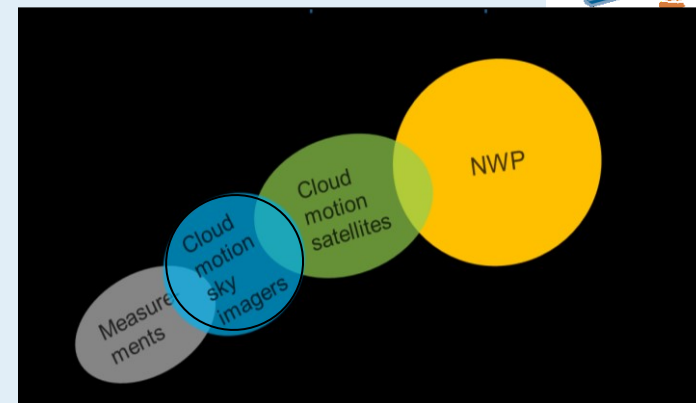
PVPS





Scale: Minute / 1 km

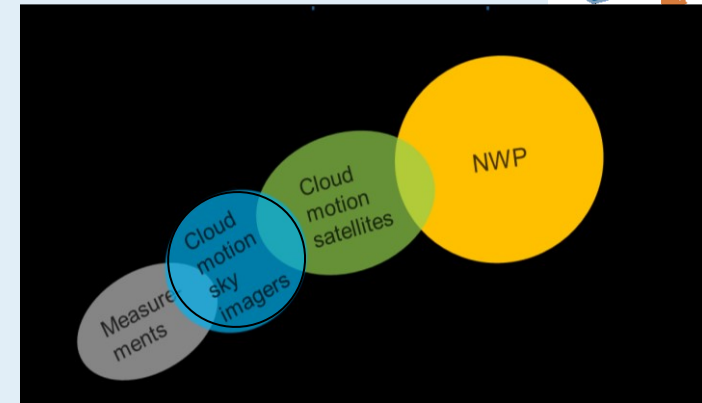
- Instrument: All sky imagers (ASI)
- Method:
 - detection of clouds → cloud vectors
→ cloud forecast
- State:
 - pre-operational
 - RMSE: ? (high)
- T16: Benchmark for ASI (methods) planned in 2019 at test center PSA (Almeria, DLR, Spain)





Scale: Minute / 1 km

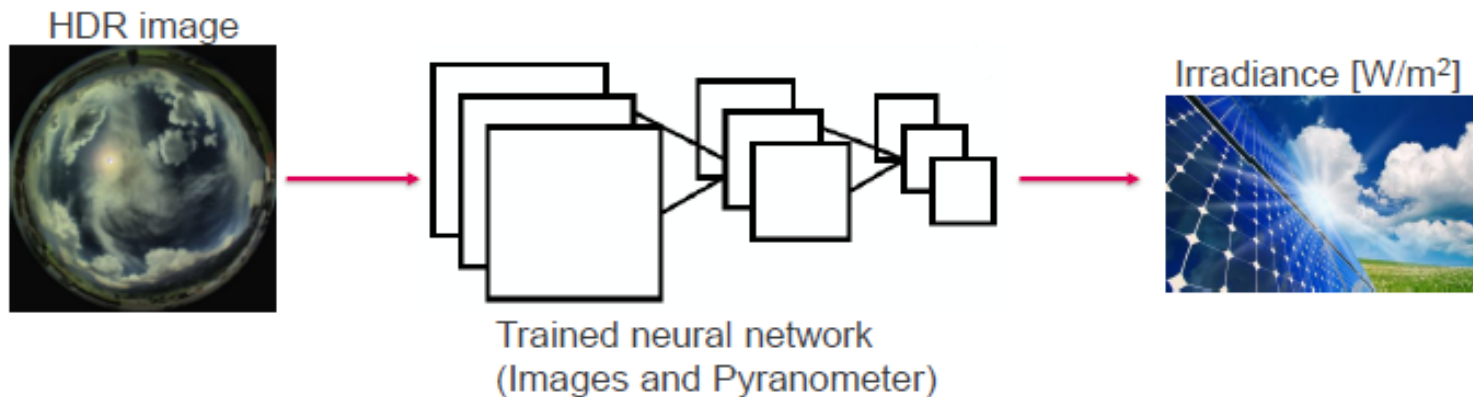
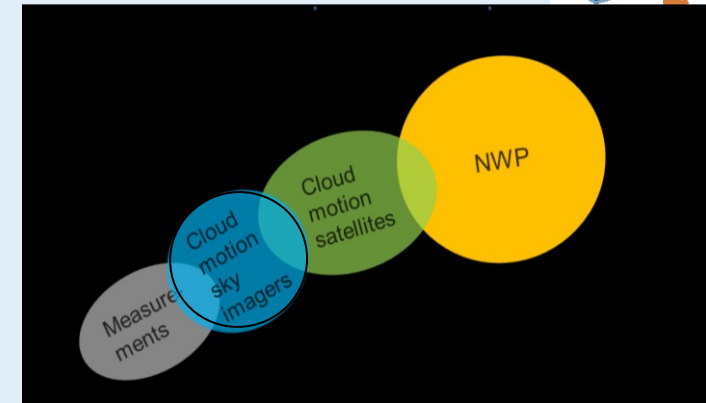
- Instrument: All sky imagers (ASI)
 - Instrument at CSEM:

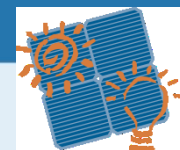




Scale: Minute / 1 km

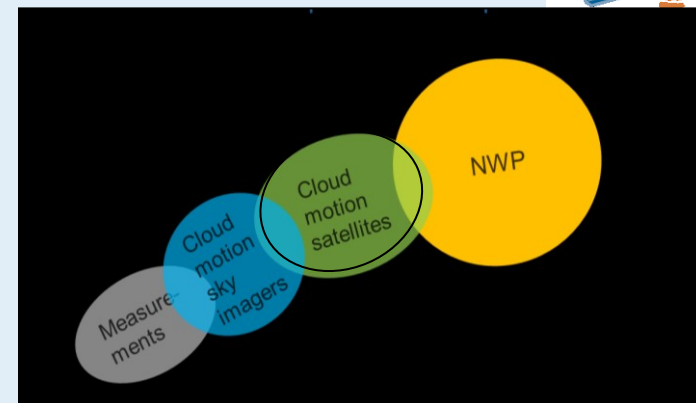
- Swiss network: Alpnach, Bern, Neuchâtel (CSEM / Meteotest)
- Many more exists (e.g. EPFL / Distributed Electrical Systems Laboratory)
- Method used at CSEM:





Scale: Hours / 10 km

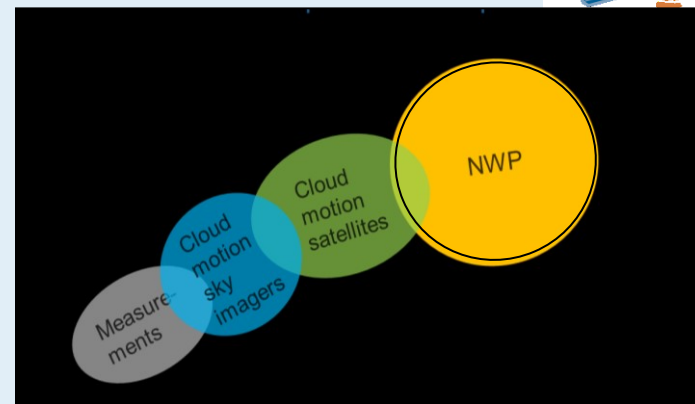
- Instrument: Satellite
- Method:
 - Heliosat (many variations, starting 1985)
 - Physical models (FARMS, Copernicus, ...)
 - Cloud vectors from satellites or NWP
- State:
 - operational
 - RMSE: 10-20% for hourly values (depending on site)
 - MBE: small
- T16: Enhance physical & cloud motion models

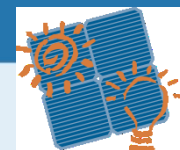




Scale: Days / 100 km

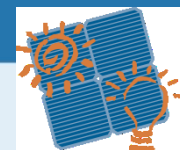
- Numerical Weather Prediction
- Methods:
 - Global and/or nested regional models
 - Model Output Statistics (MOS)
- State:
 - State of the art: multi model MOS incl. IFS (ECMWF)
 - RMSE: 20-40% for hourly values (day ahead)*
 - MBE: small/medium →
strong smoothing for transmission zones: RMSE: 5%
(normalized by installed capacity)
- T16: Benchmark of regionalisation methods





Take home messages

- T16: Solar resources and forecasts for all solar applications
 - Trust machine for solar resources and forecasts
 - Guidelines for measurements, forecasts and benchmarks
 - PV is plannable
- Ongoing work:
 - 2019: year of workshops
 - Benchmarks, basic scientific work & papers
 - 2020: year of reports
 - 2020: end of Task (extension probable)



Questions & Discussion

Thank you for your attention!

Task homepage:

<http://www.iea-pvps.org/index.php?id=389>

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