Solar Platform of the West University of Timisoara

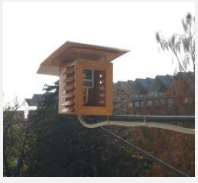
Coordinator: Conf. Dr. Marius Paulescu

The research on photovoltaics at the Physics Department of the West University of Timisoara has begun by 2000 and experienced an impressive development after the commissioning of the Solar Platform in 2008. The main component of the Solar Platform is the Solar Radiation Monitoring Station, the first Romanian radiometric station outfitted for systematic monitoring solar radiation on tilted surfaces. In present, the research on the Solar Platform is focused on three well defined fields: (1) increasing the efficiency of photovoltaic cells, (2) evaluation the performance of photovoltaic systems operating under real meteorological conditions, and (3) monitoring, estimation and forecasting of solar resources. The research team is formed by nine members. The strength of the team stems from its diversity, being formed of researchers with very different interests: physics, mathematics, statistics, astronomy and computer science.

Research infrastructure

- Includes the radiometric station (SRMS), the meteo station and the PV experimental setup.
- Measurements are performed all day long at equal time intervals of 15 seconds. It is the highest rate of monitoring the radiometric quantities in Romania.

Solar Radiation Monitoring Station



- SRMS was built in the frame of the PN II Project PASOR 21039/2007-2010.
- SRMS is equipped with first class pyranometers which fully comply with ISO 9060 standard. The sensors are integrated into an acquisition data system based on a NI PXI platform.

PV experimental setup

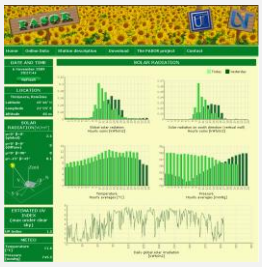
- Three experimental setup for testing PV systems operating outdoor are fully monitored.

Database

- Real-time and records of radiometric data are available online at:

http://solar.physics.uvt.ro/srms

- 2 102 400 – the number of records in a year for each monitoring quantity.
- 10 900 – is the number of visitors of the SRMS site



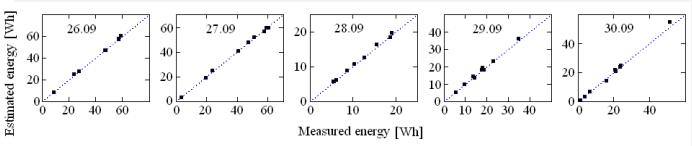
Important outputs

- During 2003 – 2016 more than 40 ISI papers have been published in the modeling solar radiation and photovoltaics fields. From these 14 papers have been published in journals categorized in the first quantile and 21 papers are based on data recorded on the Solar Platform.
- A number of 3 Ph.D. theses have been successful in the field modeling solar radiation at West University of Timisoara

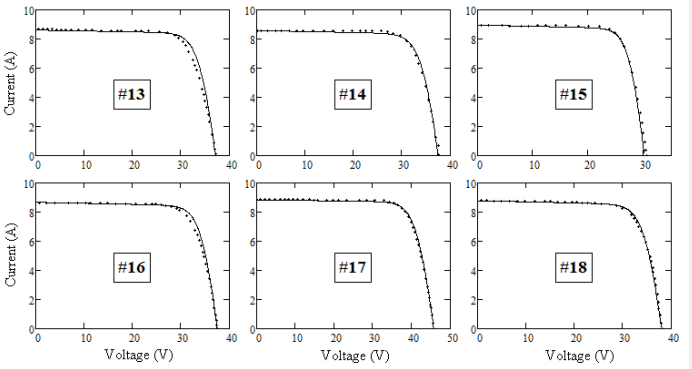
Photovoltaics

Research directions:

- Modeling the quantum solar cells
- Evaluating the current-voltage characteristics of PV modules operating in standard test condition
- Forecasting the output power of PV systems



Estimated vs. measured energy delivered per hour by the PV-R system operating during September 26-30, 2012 on the Solar Platform [1].



Measured and estimated I-V characteristics of six commercial PV modules [2]

Selected publications:

- Mares O, Paulescu M, Badescu V. Energy Conversion and Management 105, 139-148 (2015).
- Paulescu M, Badescu V, Dughir C. Energy 70: 49-57 (2014).
- Paulescu M, Tulcan-Paulescu E, Gravila P. European Physical Journal B. 80, 115-120 (2011).
- Paulescu M, Tulcan-Paulescu E, Gravila P. International Journal of Modern Physics B 24, 2121-2133 (2010).

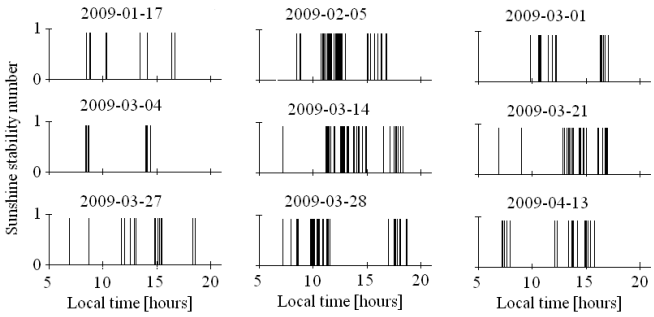
Staff

- *Team leader:*
  - Conf. Dr. Marius Paulescu
- *Senior researchers:*
  - Lect. Dr. Nicoleta Stefu
  - Lect Dr. Eugenia Paulescu
  - Lect. Dr. Paul Gravila
- *Ph. D. Students:*
  - Oana Mares
  - Robert Blaga
- *Associate researchers:*
  - Conf. Dr. Nicolina Pop, Lect. Dr. Delia Calinoiu (Politehnica University of Timisoara)
  - Dr. Remus Boata (Romanian Academy)

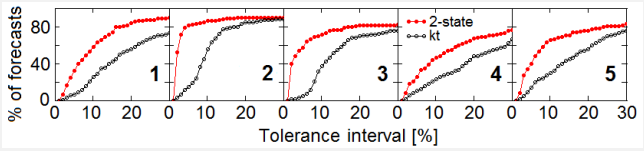
Modeling solar radiation

Research directions:

- Study the radiative transfer through the atmosphere
- Enhancing the accuracy of the estimation solar irradiance at the ground level
- Forecasting solar radiation at different time horizons



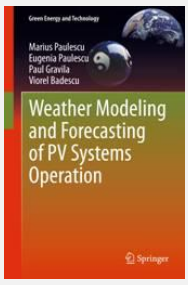
Characterization of the solar radiative regime by means of sunshine stability number [3]



Percentage of forecasts generated accurate to within a given interval centered on the measurements in the first five days August 2010 [1]

Selected publications:

1. *Paulescu M, Mares O, Paulescu E, Stefu N, Pacurar A,,Calinoiu D, Gravila P, Pop N, Boata R. Energy Conversion and Management 79:690-697 (2014).*
2. *Calinoiu D, Stefu N, Paulescu M, Trif-Tordai, G, Mares O, Paulescu E, Boata R, Pop N, Pacurar A. Atmospheric Research, 150:,69-78 (2014).*
3. *. Paulescu M, Badescu V. Theoretical and Applied Climatology 103, 459-470 (2011)*



In 2015 the book was awarded by the ROMANIAN ACADEMY with the Prize "Anghel Saligny"

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