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SCIDOSOL newsletter

Open science for the solar community

On the agenda

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- Meet our new team member

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Valentin BAUER
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Pierre CHAPEL
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Save the date!

Solar Winter School 2025
from 10 to 14 March

EDITO
Welcome to our first newsletter!

We are delighted to present this first edition of our newsletter, dedicated to SciDoSol. This research and teaching chair supports the energy transition by applying data science for solar energy.

Our commitment in innovation and excellence is based on three pillars: academic open research, attractive education and open source based transfer of knowledge to industry and society.

Our goal? To actively contribute to the scientific community, push the boundaries of current knowledge and have a tangible impact on society, thus, advancing science and innovation for a sustainable future.

This bi-annual newsletter will give you a concrete overview of our team's progress, key projects and on-going collaborations.

Enjoy your reading. We look forward to sharing important moments with you.

The SciDoSol team

RESEARCH ACTIVITIES

HIGHLIGHTS ON OUR ON-GOING PhD STUDENTS

Vadim BECQUET
3rd year PhD student

DeepHeliosat

Advancing satellite-based solar resource modelling with deep learning techniques

With a background in data science, physics, and mathematics from Aix-Marseille Université and École Polytechnique, and experience as a data science consultant, Vadim is well-equipped for cutting-edge research.

He is pioneering the use of deep learning techniques to enhance SSI estimation from satellite images.

Max ARAGÓN CERECEDES
2nd year PhD student

GeoFishEye

Simulated sky camera networks for spatial solar irradiance

Max is working on the intersection of computer graphics, cloud-radiation interactions, and generative artificial intelligence.

His research focuses on producing multi-view synthetic sky imagery for training and evaluating machine learning algorithms, with a special emphasis on sky camera networks for SSI modelling.

Jose GOMEZ GOMEZ
2nd year PhD student

SSI Variability

Modelling, characterization and prediction of Surface Solar Irradiance (SSI) variability

Jose is leveraging the synergies between various Earth observation sensors and techniques, combined with machine learning and deep generative modelling, to research innovative methods for modelling the SSI.

His focus is to explore and develop methodologies for generating SSI data with high spatial and temporal resolutions.

MEET OUR NEW TEAM MEMBER

Dr. Yehia EISSA joined the SciDoSol Chair in June 2024 as a full-time researcher. He is an expert in solar energy with extensive experience in academia, notably as a Postdoctoral Researcher and Assistant Professor. His research focuses on understanding solar energy resources in various environments, using advanced modelling and data analysis techniques, to support the transition to sustainable energy solutions.

Dr. Yehia EISSA
Senior Scientist
Expert in solar energy

PhD in Energy & Processes
MINES Paris – PSL

SOCIETY AND TRAINING

solar winter SCHOOL 2024

The Solar Winter School 2024 was organized at the Pierre Laffitte Campus in Sophia Antipolis from March 11 to 15, 2024.

This event brought together over 50 international participants, including postgraduate, master's and doctoral students, researchers and engineers in the field of solar radiation and solar energy.

Main activities:

Lectures on the latest advancements in solar irradiance modelling and forecasting

Practical workshops on pyranometric measurements and solar forecasting techniques

Networking sessions to further collaboration and knowledge sharing

Showcasing in situ measurements

Find True North & pyrheliometer DIY workshop

LOW-TECH UNDERSOLAR PROJECT

In Sophia Antipolis, from March to May 2024
Engineering trimester with second-year Civil Engineering students

Supported specifically by Total Energies, under the framework of SciDoSol, in collaboration with a colleague of the CEMEF (experts in glass materials modelling), Mines Paris – PSL proposed to the second-year Civil Engineering students an engineering trimester named UNDERSOLAR.

This session was dedicated to concentrated thermal systems invoking notably low-tech response to environmental challenges.

By combining technology with a low-tech approach, the student's work paves the way for a more sustainable energy transition.

They designed and implemented different low-tech solar systems such as:

- a concentrated solar furnace in collaboration with craftsmen from the Verrerie de Biot glassworks able to reach 1100°C in the (small) cavity placed in the focal point of the optical system
- two types of solar cookers: cylindro-parabolic and isolated box

▲ A practical demonstration of the Lytefire solar food oven

◀ Solar furnace using a Fresnel lens to concentrate the beam solar radiation (capable of melting glass at over 1000°C)

MIG solaire

Métiers de l'Ingénieur Généraliste
General Engineering Professions

MIG (Métiers de l'Ingénieur Généraliste) is a part of the training program for the first year aiming at introducing with a 3-week intensive project the general engineering professions.

Solar resource as an energy source for the transition of Communauté d'Agglomération de Sophia Antipolis (CASA)

The MIG Solaire 2023 program allowed 15 first-year students from the Civil Engineering Cycle to work on projects related to the energy transition of the Sophia Antipolis Urban Community. It took place over a period of 3 weeks in November 2023.

Objectives of the program:

- Assess the solar potential of the CASA region
- Develop innovative solutions combining engineering and landscape design
- Contribute to the local energy transition

▲ After a visit to the CNR in Lyon, the students visited the Castellet solar power plant with a team from Solaïs, a SciDoSol stakeholder.

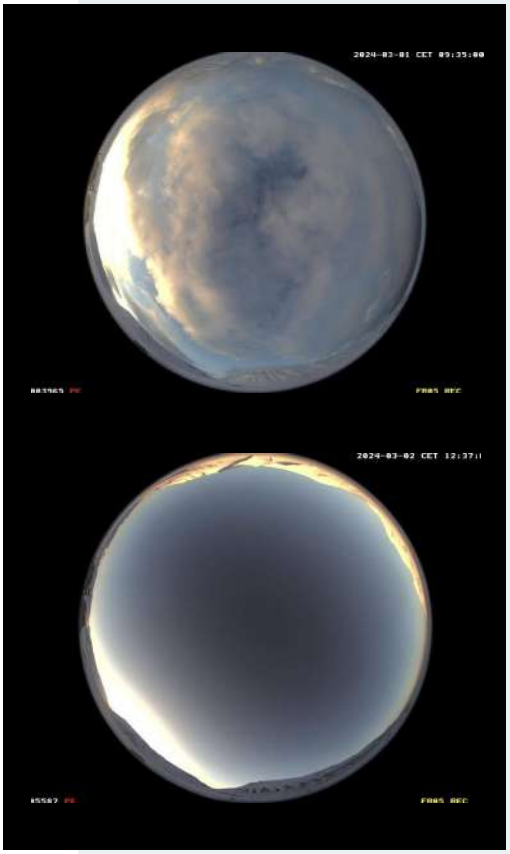
SPOTLIGHT ON THE INTERNS

Arthur PAOLINI
Engineering student at
MINES Paris – PSL

Solar Measurements in Polar Regions

Arthur has undertaken a 6-months internship during his gap-year at the University of Svalbard, Norway (UNIS).

His project focused on developing an innovative method to measure solar irradiance in Arctic regions using a fish-eye camera. This approach is designed to overcome the challenges posed by harsh Arctic conditions.



▲ Example of two hemispherical sky images from the fish-eye camera installed by Arthur in Svalbard

Objectives:

- Replace traditional pyranometers with a versatile, camera-based method for measuring solar irradiance
- Improve temporal and spatial resolution for more accurate solar energy forecasting in extreme environments

◀ The fish-eye camera used for the study (Mobotix Q25)

The solar array of the solar research station of UNIS at Longyearbyen in its natural environment ▶

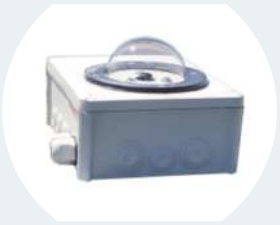
Valentin BAUER
Student at the Technical University of Vienna

Low-Cost All-Sky Imaging for solar radiance estimation

Valentin is developing a low-cost all-sky imager using a Raspberry Pi and a compatible fish-eye camera. His project focuses on estimating sky radiance at a specific location on Earth, leveraging affordable hardware and open-source sensor and software.

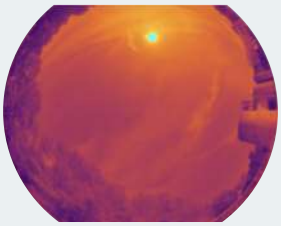
Objectives:

- Create an accessible tool for measuring solar radiance for the scientific solar community and industries
- Utilize affordable technology to support renewable energy applications



Camera

Color Image



Sky Radiance Estimate

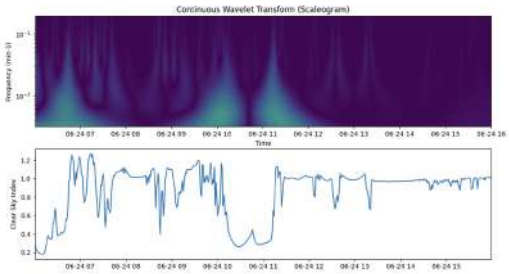
Pierre CHAPEL
Engineering student at MINES Paris – PSL

SSI Variability

Characterizing Surface Solar Irradiance (SSI) data using wavelet transforms

Pierre is focusing on the mathematical modelling of Surface Solar Irradiance variability.

He is using wavelet transforms to model the statistical nature of the SSI under different atmospheric conditions.



▲ Example of the scaleogram of a time series of SSI using Continuous Walvelet Transforms (CWT)

Objectives:

- Develop new metrics to gauge how realistic synthetic SSI data is
- Improve the understanding of SSI variability through advanced mathematical techniques

SOLAR WINTER SCHOOL 2025

SAVE THE DATE!

The 3rd edition of Solar Winter School will take place on the week of **March 10-14, 2025**

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