

nextSENSE: solar energy nowcasting and forecasting

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NOA-BEYOND, Greece

Introduction

- Mitigation of climate change → Global and international initiatives → Renewables will play a key role
- Solar Energy relative to other renewables
 - ✓ Cheaper
 - ✓ Creates more jobs
- UN 2030 Agenda for Sustainable Development :
UN Sustainable Development Goal 7
 - 7.1: ensure universal access to affordable, reliable, and modern energy services
 - 7.2: increase the share of renewable energy in the global energy mix
- EU directives for renewable energy goals
 - The Paris Climate Agreement
 - The GEO Initiative GEO-VENER (GEO Vision for Energy) and GEO-CRADLE initiative



The problem

Increased demand for renewable energy has led to the need for **fast, accurate, high spatial and high temporal resolution** energy forecasts → optimize production and integration to electricity grid.

In order to **now-cast** and **forecast** solar energy in different time scales, we need to know and understand changes in the atmosphere, and how they affect solar radiation

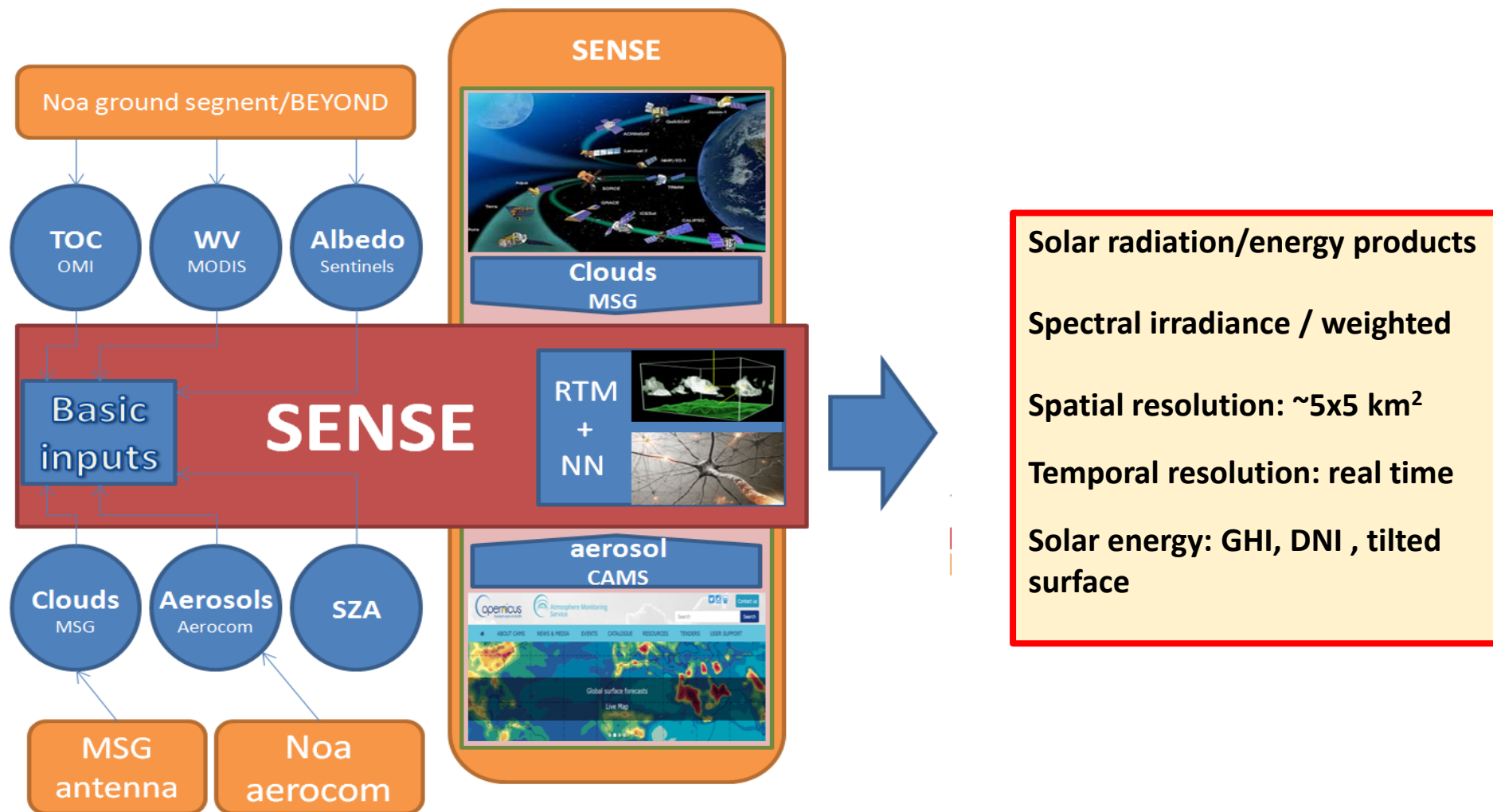
European EO resources: Utilize and provide innovative and mature products and services for renewable energy development and management

The Solar Energy nowcasting and short-term forecasting system (nextSENSE)

- **Objective:** provide EO and Copernicus (CAMS) based nowcasting (real-time) and short/long-term forecasting of broadband and spectral surface solar irradiance and solar energy, at high spatiotemporal resolution (coverage: Europe, Mediterranean basin, MENA)
- Support of TSOs, DSOs and national solar plant development initiatives.
- **Expected user community:** Grid operators, Power and Electricity corporations, ministries, energy trading companies, researchers in Energy and citizens.
- **Supporting infrastructure:** GEO-CRADLE, Beyond Collaborative Ground Segment Data Site

- Partners:     

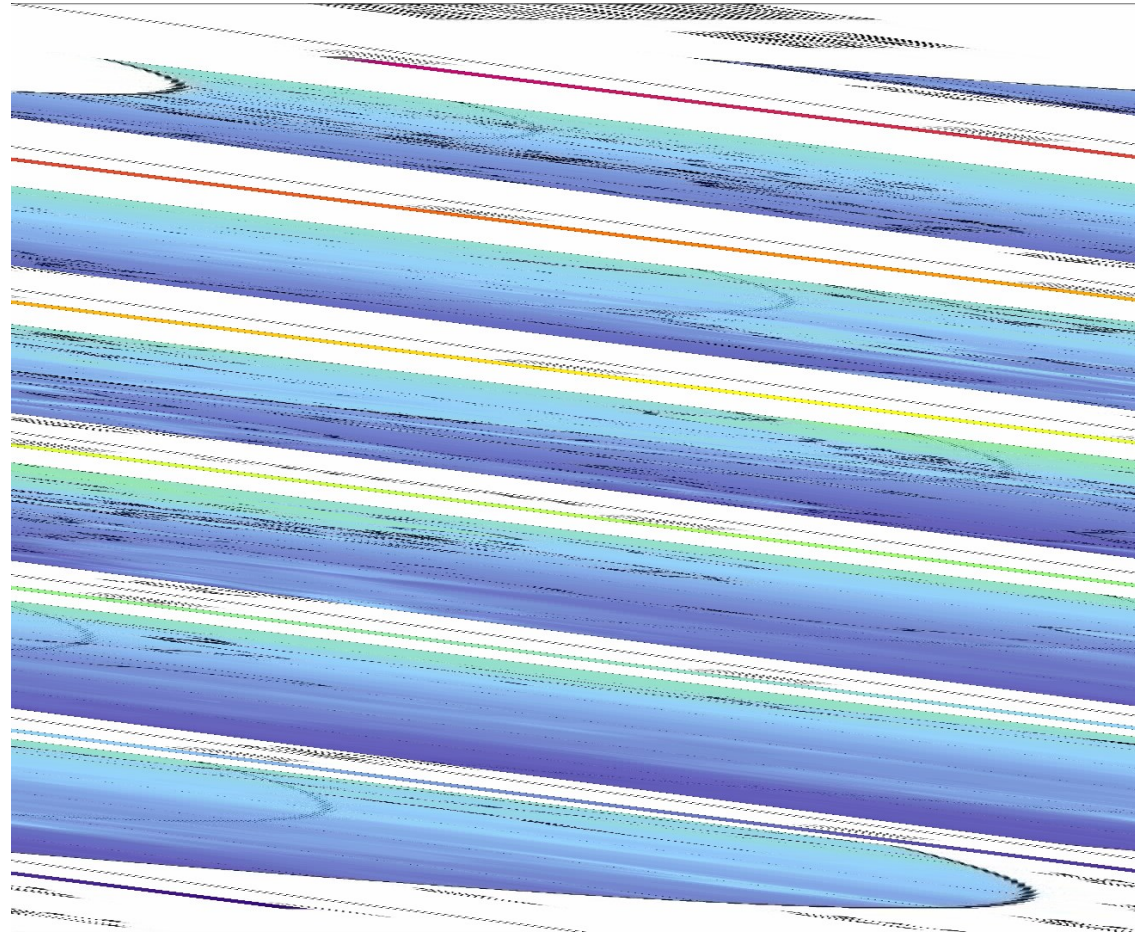
The System: from Sense to nextSENSE



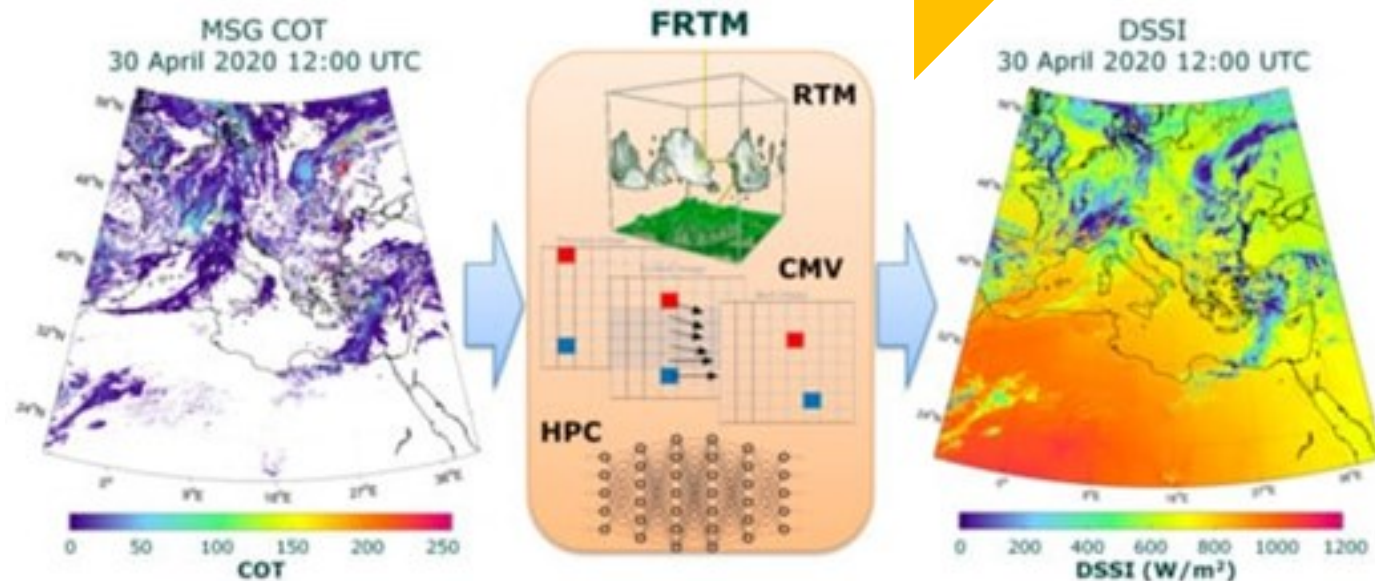
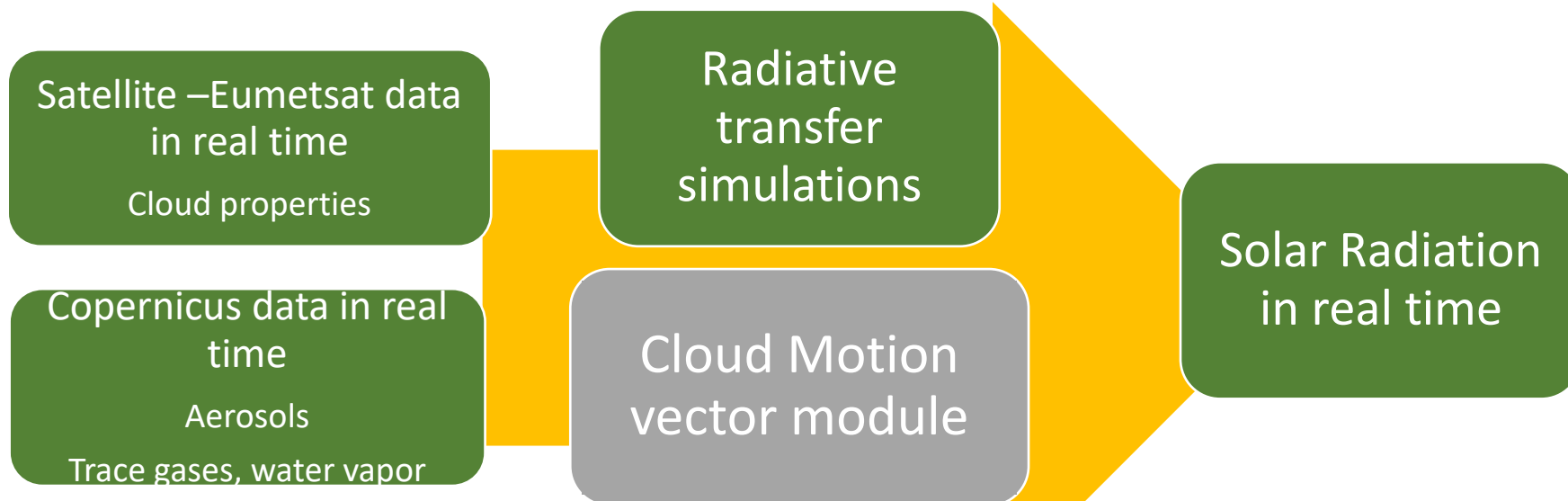
SENSE System EU Geo-cradle project 2016-2018
PMODWRC & NOAA/Beyond

The System: from Sense to nextSENSE

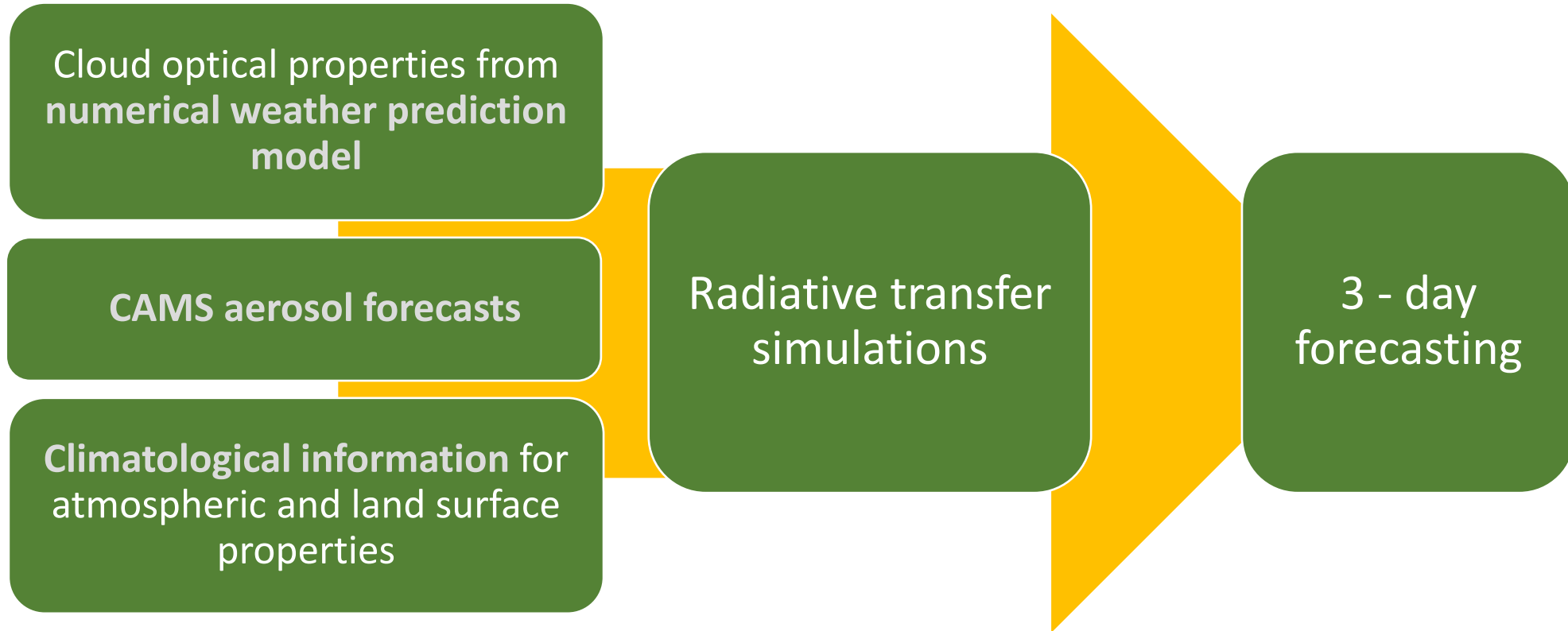
Fast RTM scheme: calculate spectra for 1.5M, 5 x 5 km pixels in less than 3 minutes



Upscaling Sense and developing nextSENSE



Further development: long-term forecasting



- Long-term forecasting is being tested for 25 positions in Greece

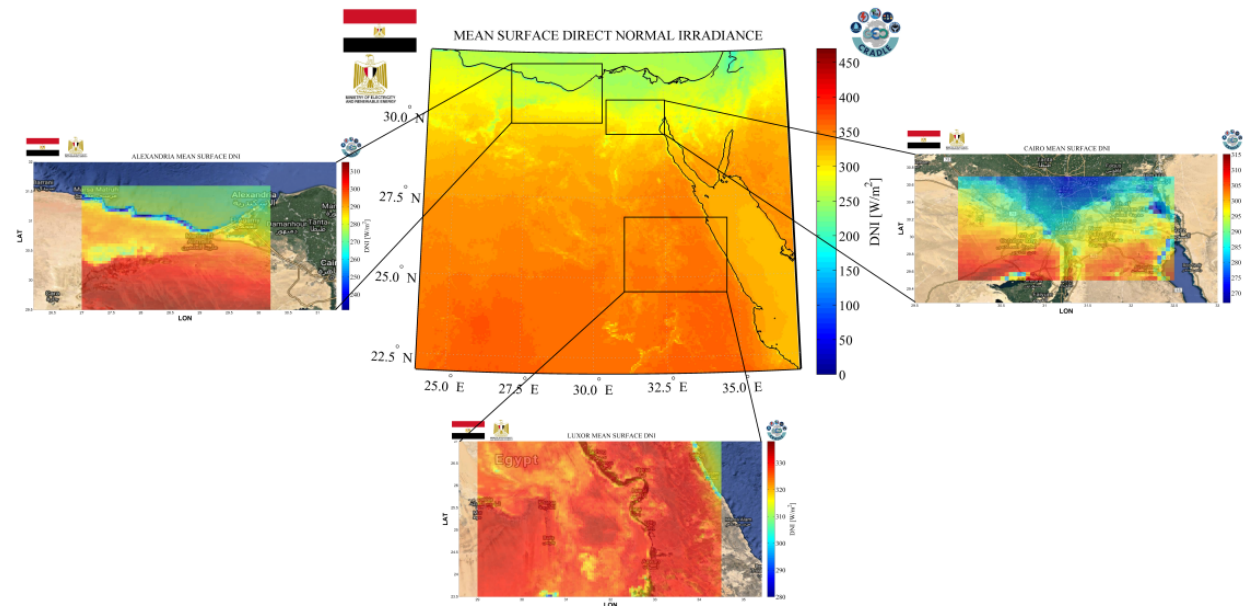
Solar energy applications and users

Ministry of electricity and renewable Energy of Egypt

Mahdi Yacoub Heart Foundation Center, Egypt



Solar park characterization/planning and economic studies

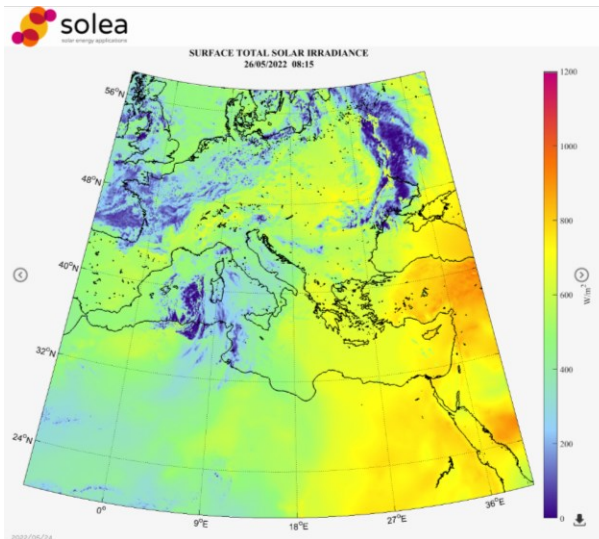


Solar energy applications and users

Public Power Corporation (PPC), Greece

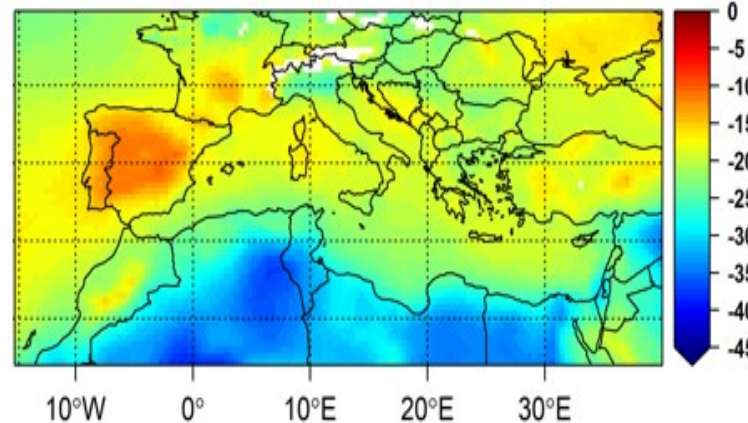


Nowcasting of solar radiation and aerosol effects



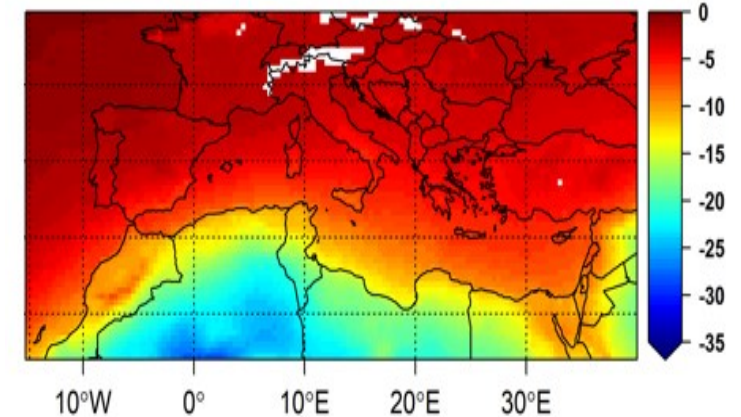
<http://solea.gr/solar-energy-management/>

DNI % Attenuation (CAMS AOD550)
Annual (2003-2017)



inDust

DNI % Attenuation (CAMS DOD550)
Annual (2003-2017)

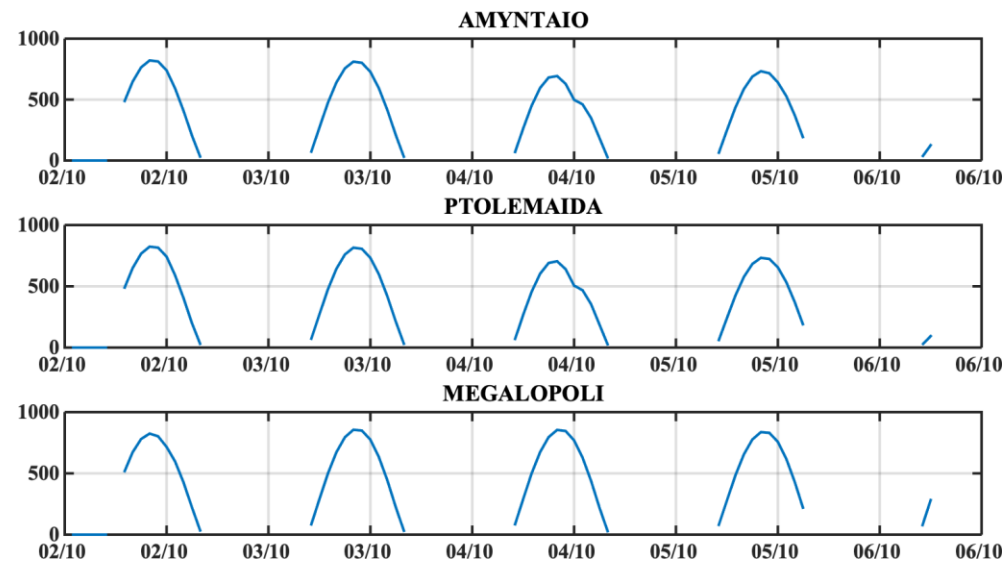


Solar energy applications and users

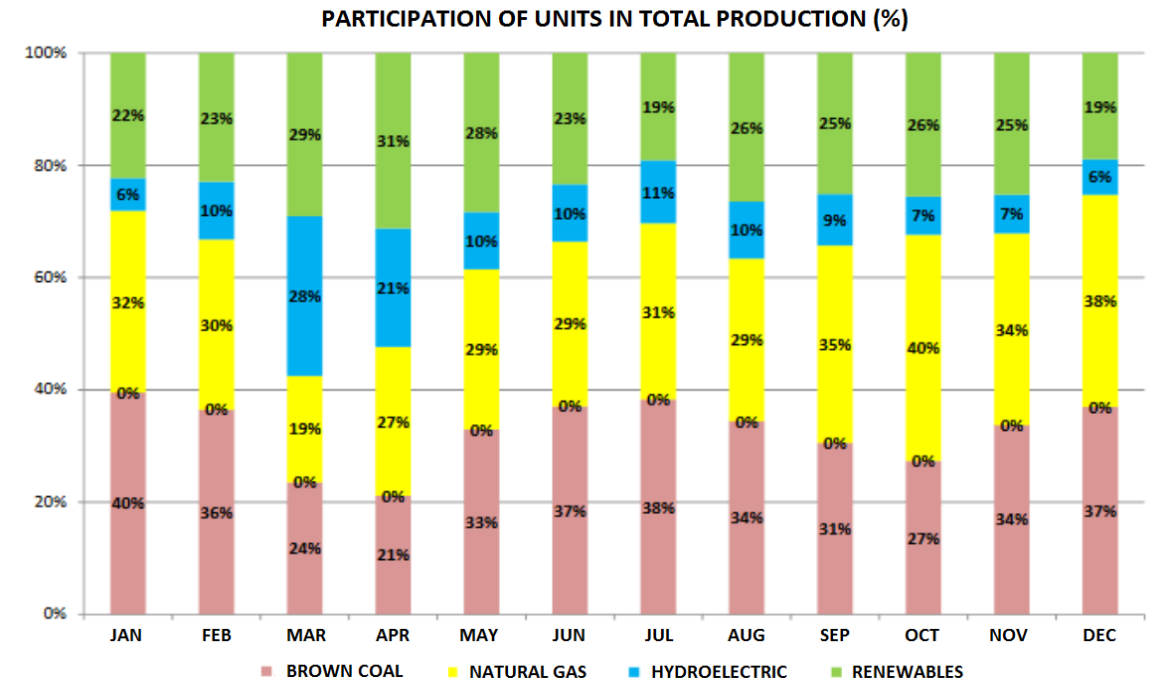
Independent Power transmission operator (IPTO)



Long-term forecasting of solar radiation



GHI long-term forecasts at the position of three PV parks



Renewable share to electricity grid

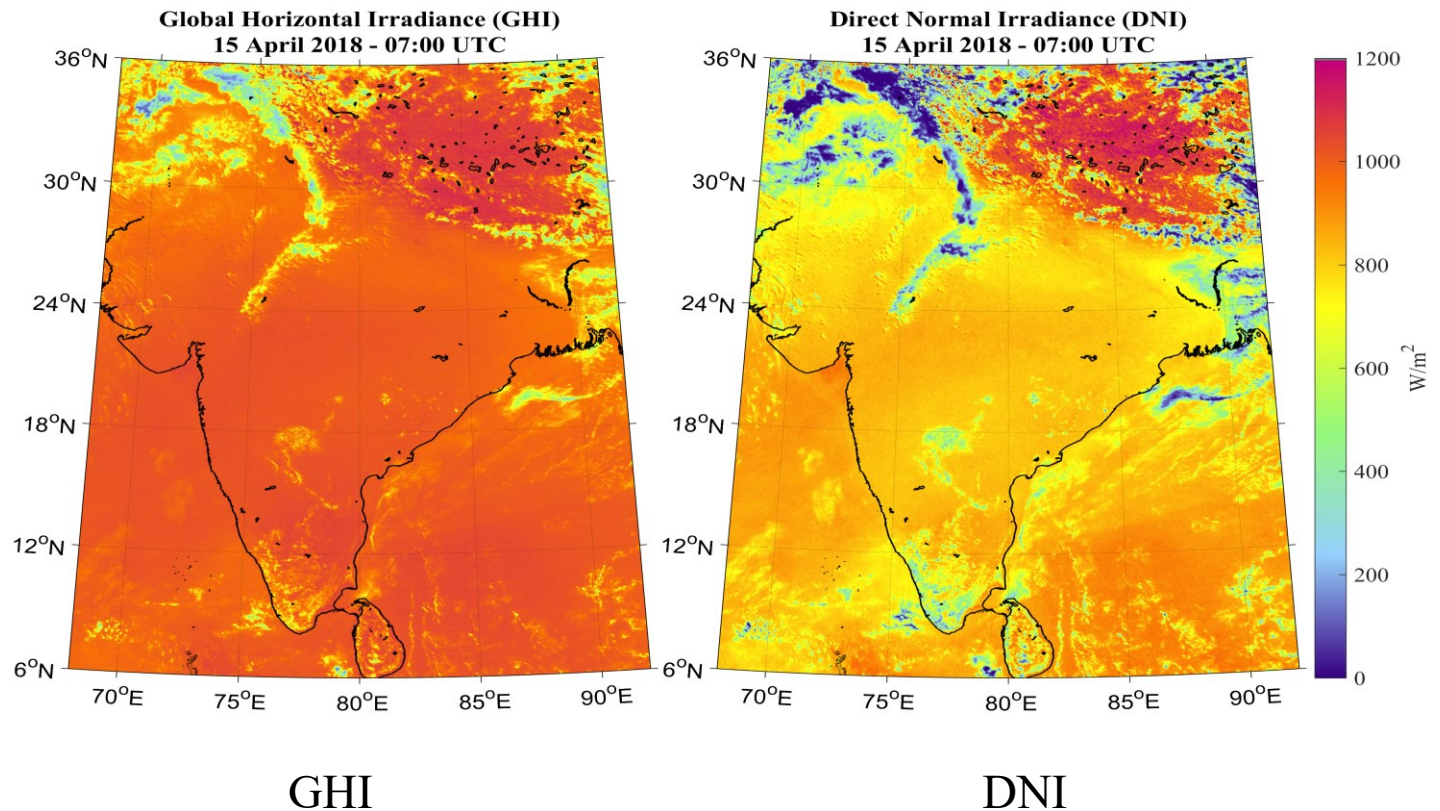
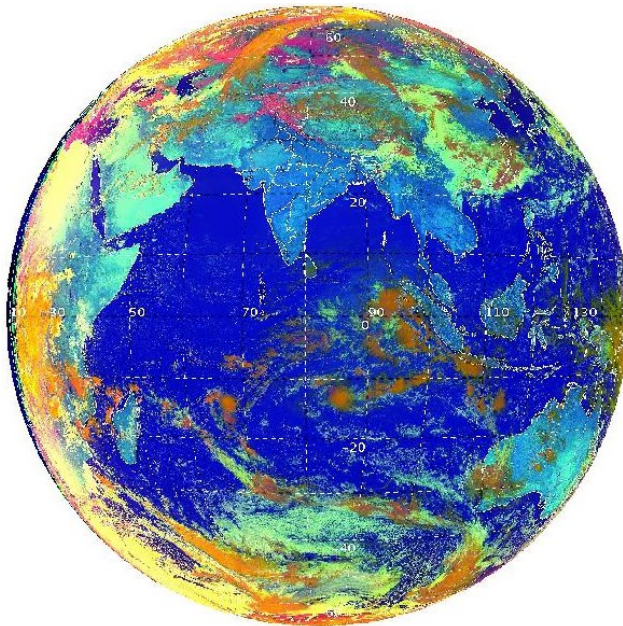
Solar energy applications and users

Independent Power transmission operator, India



Expanding the domain: India and users

INSAT 3D satellite full domain

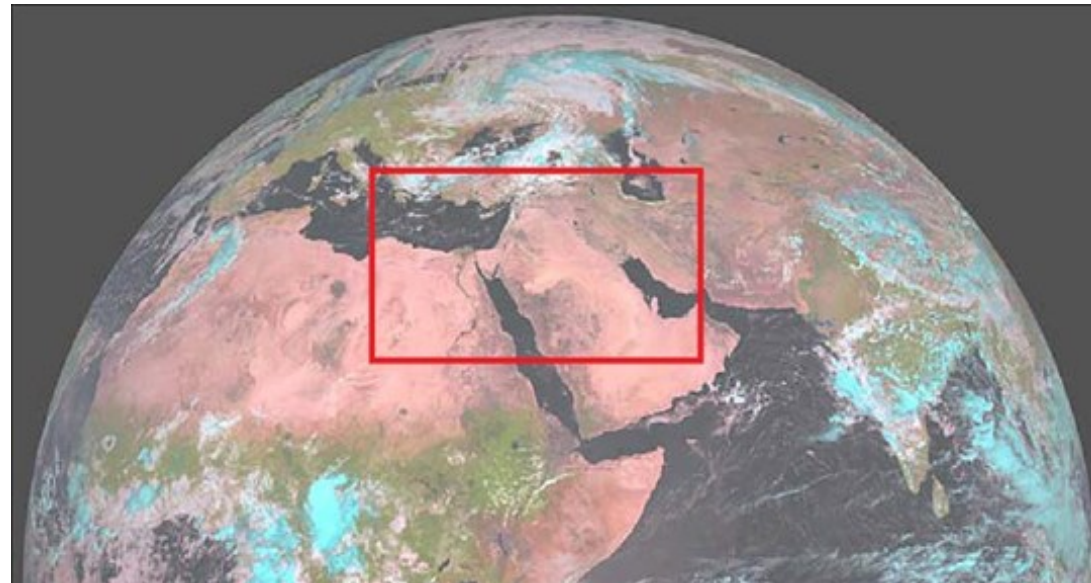


Solar energy applications and users



Cyprus: solar energy assessment (Eratosthenis Center of Excellence)

The nextSENSE system will be adjusted to the needs of Cyprus and the broader regions of the Eastern Mediterranean Basin and the Middle East (CySENSE)

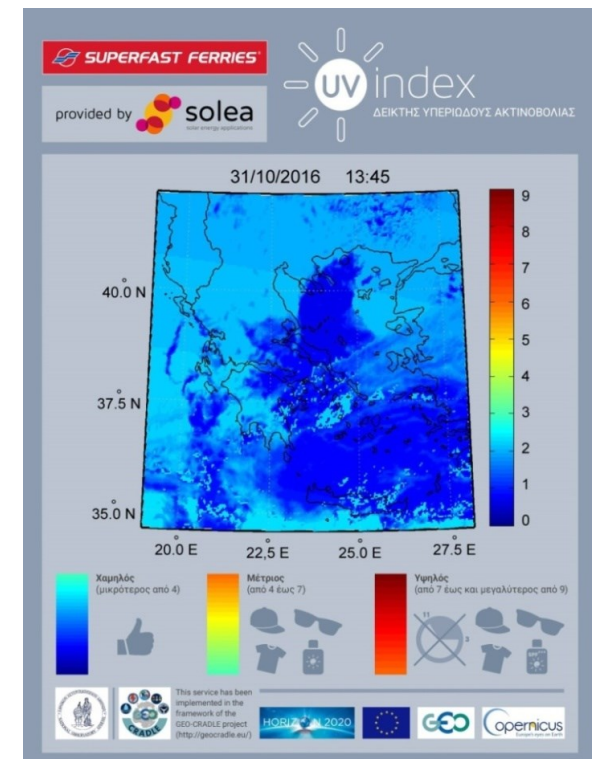
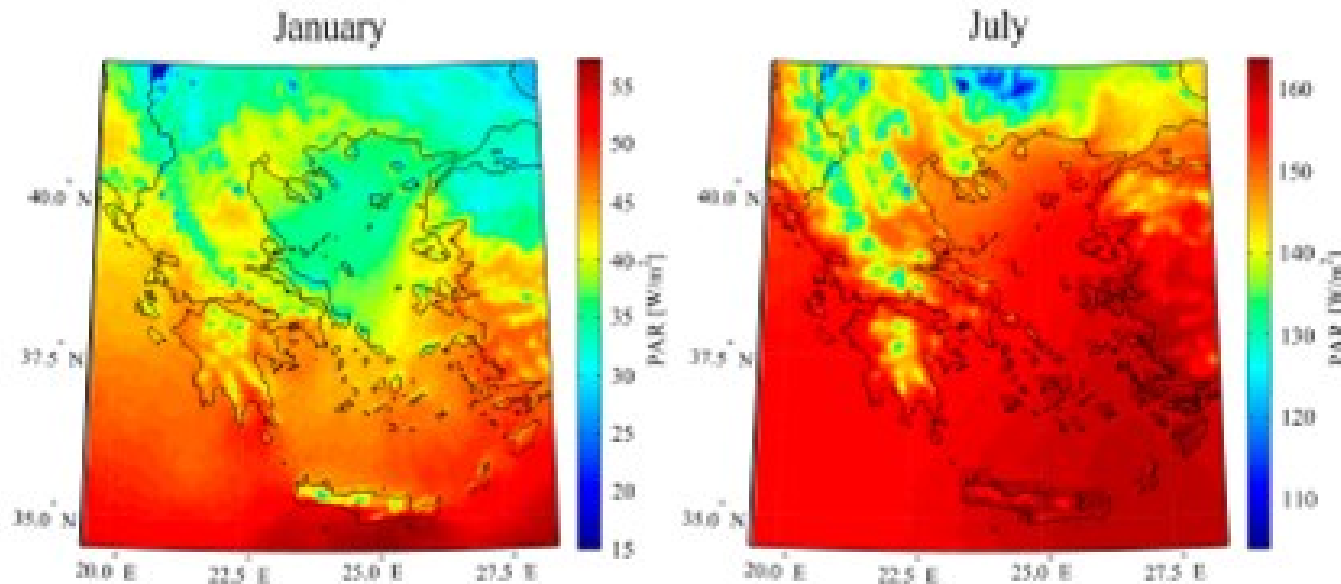


nextSENSE: other applications

Spectral products:

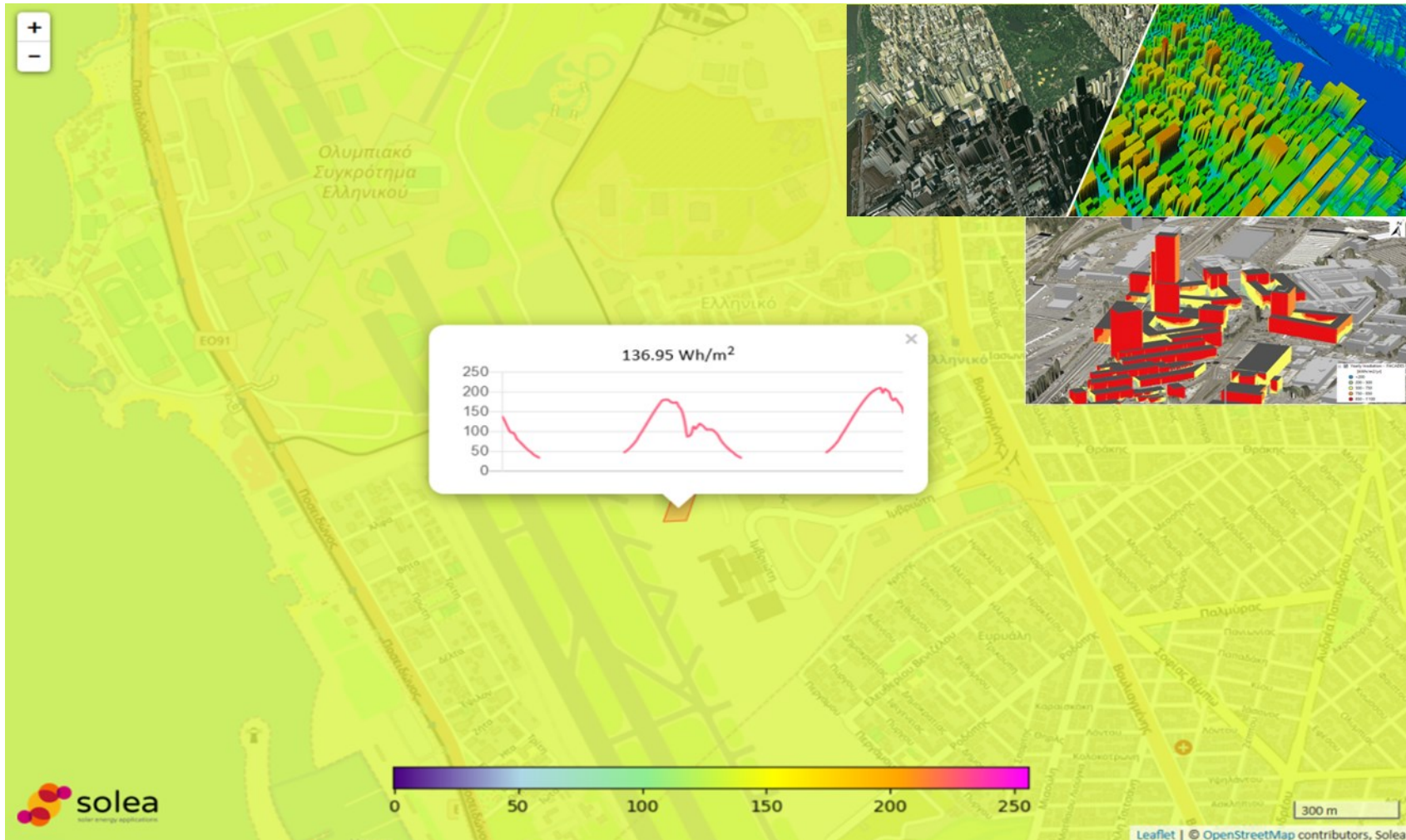
Health: UV Index (skin), DNA, Vitamin D

Agriculture: Photosynthetically Active Radiation (PAR)



nextSENSE: other applications

Solar energy on roof-tops



Summary

- Exploitation of high-quality Earth-Observation information → High resolution solar radiation and energy nowcasting and forecasting
- NextSENSE, UVIOS: Useful tools for solar energy nowcasting and forecasting
- Potential for further development and applications for scientific and operational use

Thank you for your attention!

The nextSENSE team

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