

Access To Solar Energy Applications Using EO Data Through GEO Activities: Validation And Demonstration Of The SENSE System

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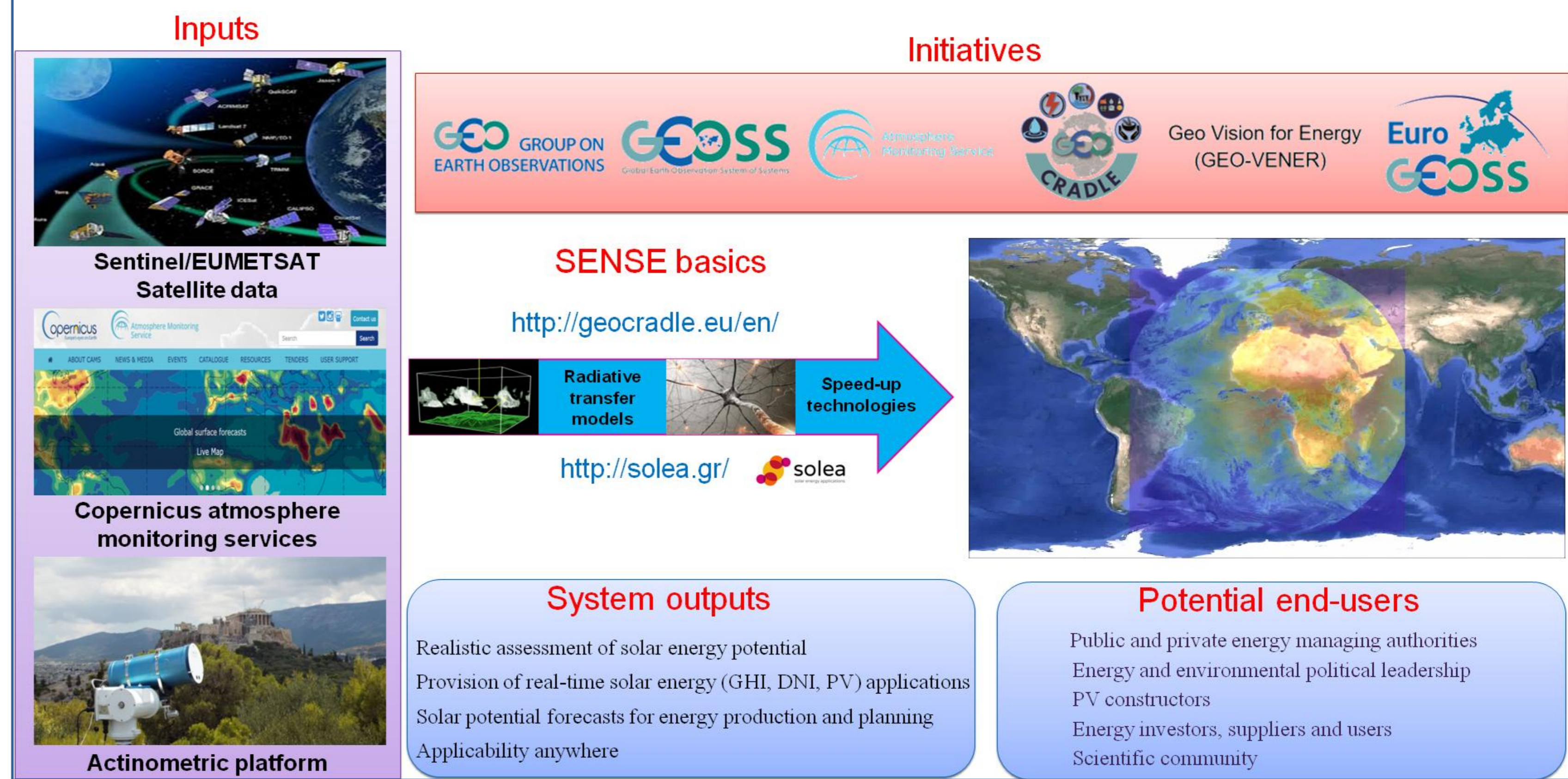
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Motivation

Southern Europe and North Africa present unique solar energy potential and its exploitation is critical for the regional sustainable development, through an effective energy planning, power transmission and distribution. In the framework of the H2020, EU-funded **GEO-CRADLE** project (<http://geocradle.eu/en/>), we have demonstrated a novel Solar Energy Nowcasting System (SENSE; <http://solea.gr/>), in order to provide tailored solutions to the Energy Sector. It addresses solar energy related end-user needs that have been defined during the course of GEO activities (e.g. GEO-Vener) and other initiatives (International Energy Agency, United Nations, SDGs, etc). The niche for this feasibility study is the operational, satellite-driven SENSE that produces instant estimates and short-term forecasts (STF) of solar energy in high spectral, spatial and temporal resolution (1nm, 0.05x0.05 degrees, 15min). SENSE is a sophisticated energy management system and is based on the synergy of Radiative Transfer Model (RTM) simulations, speed-up technologies (neural networks and multi-regression functions) and Big Earth Observation (EO) Data as inputs in real-time. The exploitation of EO data through GEO activities and SENSE will provide access to advanced solar energy related products, in support to large scale solar farm projects, grid operators, national and private electrical transmission and handling entities, so as to guarantee the uninterrupted energy flow and the power grid stability.

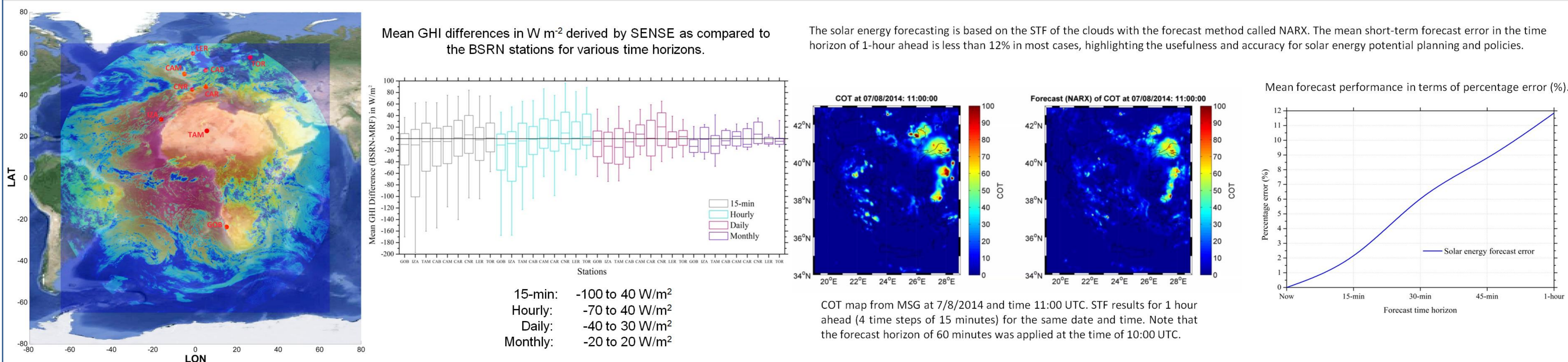


The Solar Energy Nowcasting System (SENSE)

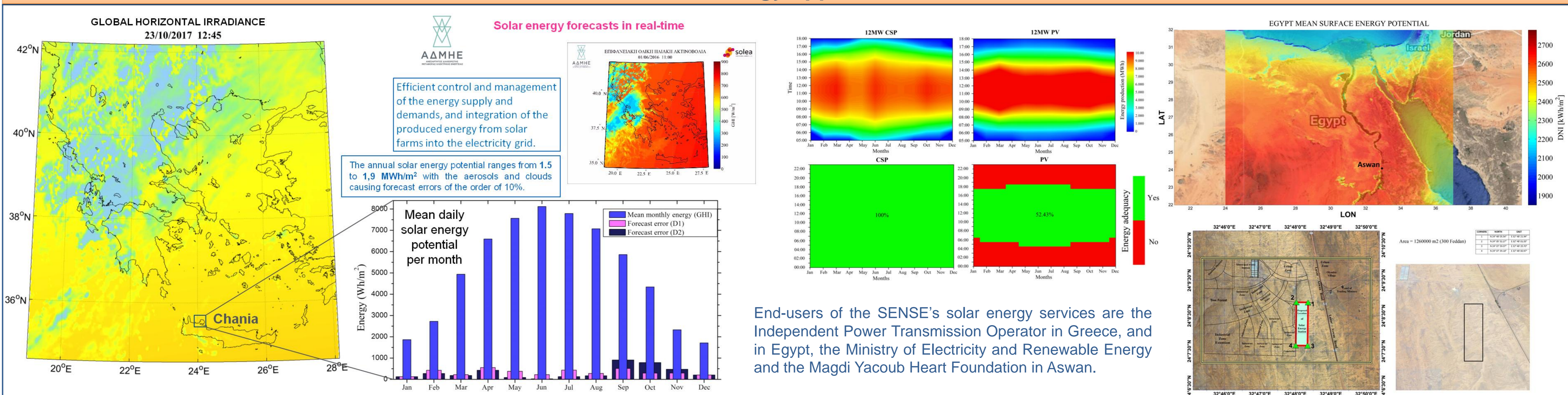


Reliability of SENSE

The reliability of SENSE's outputs and STF was tested against Baseline Surface Radiation Network (BSRN) measurements, under various atmospheric, climatological, geographical and altitudinal conditions. For the SENSE's STF of 0 to 3 hours ahead, we performed a cloud motion vector analysis by using a nonlinear autoregressive exogenous model (NARX).



Solar energy applications



Conclusions

The solar energy management systems (SENSE) using EO and Copernicus data are ideal for:

- Realistic assessment of solar energy potential.
- Provision of solar energy applications of high precision in real time.
- Solar potential forecasts for efficient energy planning and electrical production control.



Major applications & contribution to emerging technology

- Location studies for the placement of PV and CSP installations.
- Large scale and precise solar energy calculations to assist public authorities in energy planning policy.
 - Supporting the work of various scientific communities.
- Provision of specialized data of high spectral precision for private and public sectors dealing with health protection, energy consumption and solar energy exploitation.



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References.

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