# Assessing aerosol related uncertainties in the NextSENSE2 system

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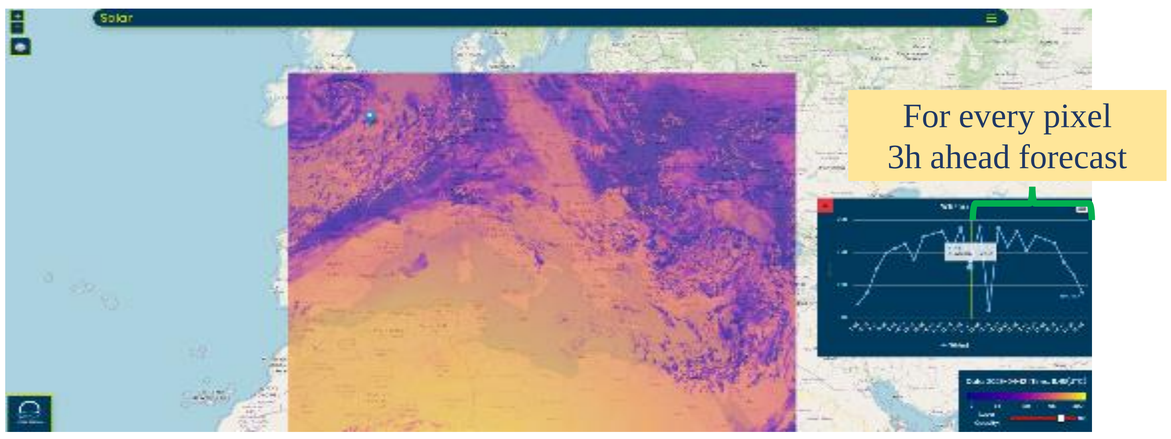
## 1 NextSENSE2

Solar energy short term (3h ahead) forecasting operational system

**https://beyondweb1.space.noa.gr/solar/**




**Operational area**: Europe and MENA region (Middle East and North Africa)
**Spatial resolution:** ~5km x5km at subsatellite point
**Temporal resolution:** 15min

## 2 The aim of this study

➢For areas with rare cloudiness, especially during the dry period of the year, aerosols are the main attenuator of solar energy reaching the earth's surface [1], hence **accurate aerosol related optical properties** are important for accurately estimating the available solar energy potential.

➢In this study, the **accuracy** of the aerosol optical properties used as input to the NextSENSE2 system (Table 1, first two columns) is assessed, under clear sky conditions, using ground-based measurements (Table 1, third column) from 10 stations (Figure 1) from the AERONET network [2] for a whole year (2017).

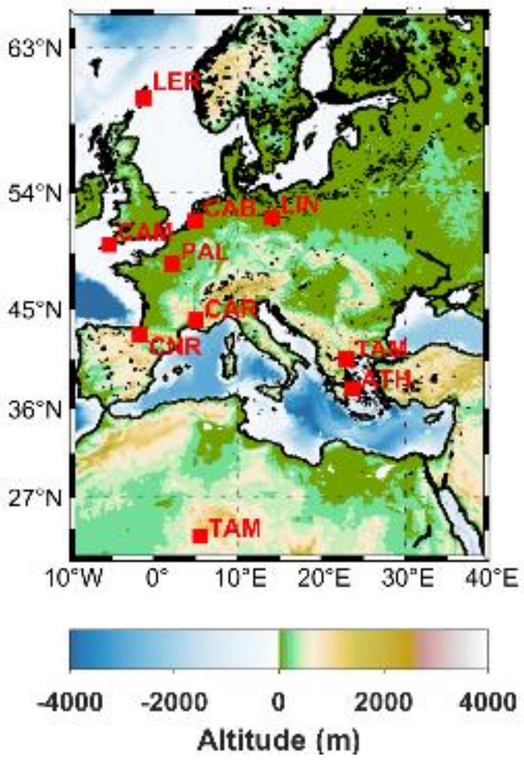



**Figure 1.** AERONET stations used in this study.

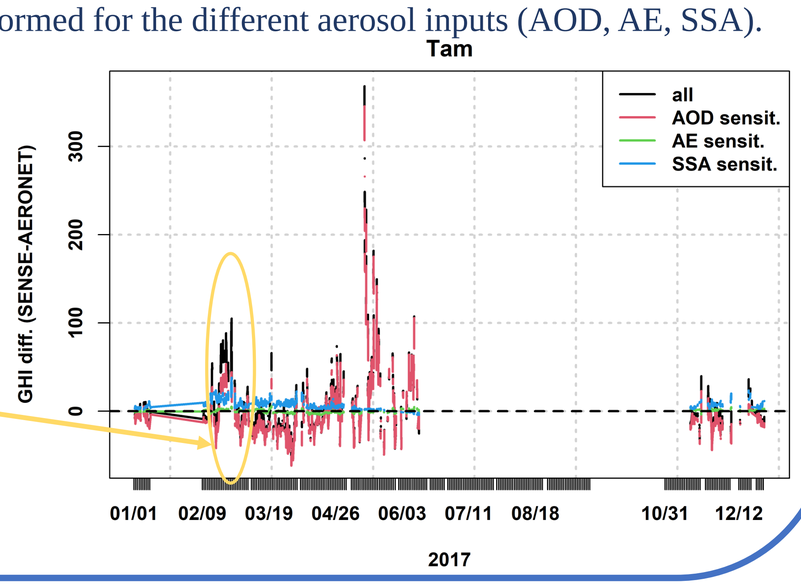
**Table 1.** Aerosol optical properties

| | NextSENSE2 Inputs | Ground based Measurements AERONET |
|---|---|---|
| aerosol optical depth (AOD) at 550nm | 1-day forecast from Copernicus Atmospheric Monitoring Service (CAMS) | Interpolated from 500nm measurements |
| single scattering albedo (SSA) at 550nm | Monthly mean climatology [3] | Mean of 440nm and 675nm retrievals |
| Angstrom exponent (AE) 470nm-850nm | Monthly mean climatology [3] | Calculated from AOD at 440nm and 870nm |

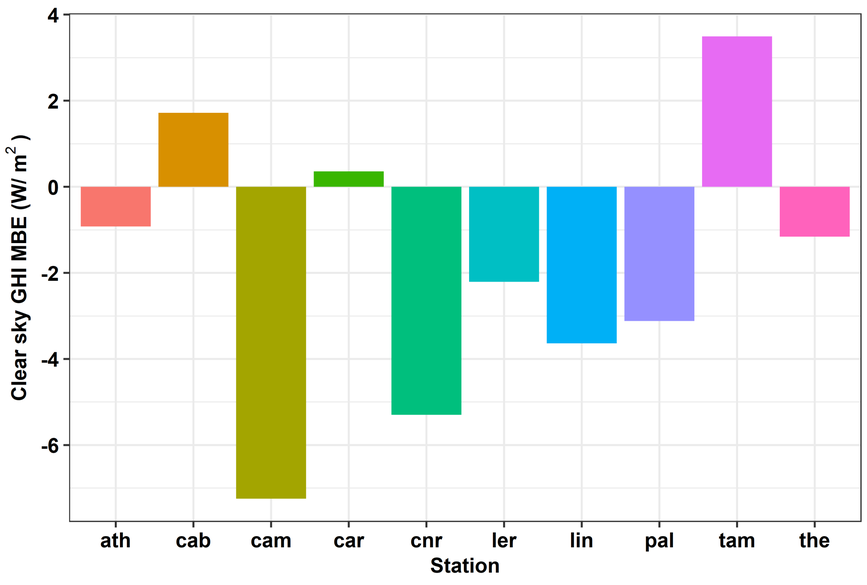
## 3 Example of an aerosol affected Station – Tamanraset

The related uncertainties introduced to modelled GHI using NextSENSE2 aerosol inputs were assessed against modelled GHI with ground-based aerosol inputs from the AERONET network.
Sensitivity analysis was performed for the different aerosol inputs (AOD, AE, SSA).

- GHI differences mainly due to differences in AOD
- Cases where SSA enhance the AOD effect



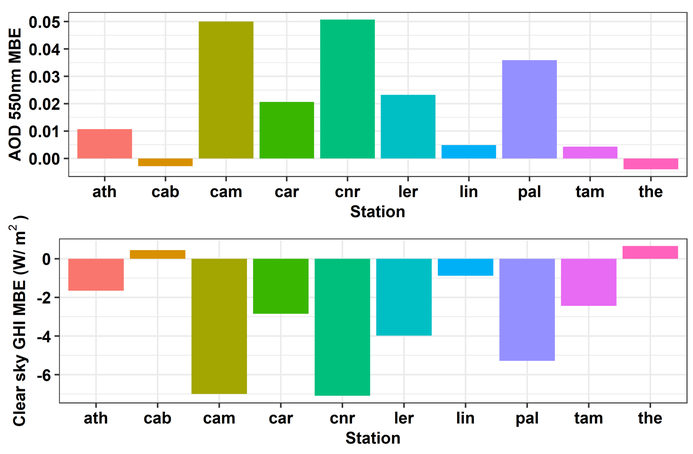

## 4 Clear sky GHI differences due to aerosol inputs



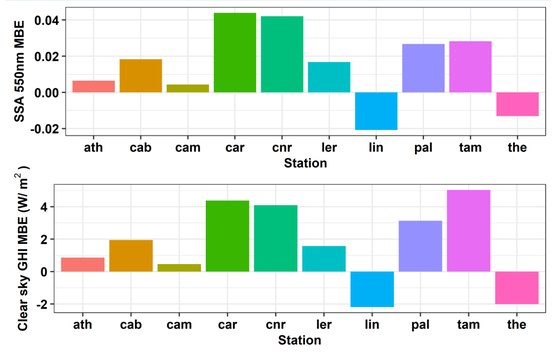

- Small **underestimation** of NextSENSE2 clear sky GHI for most stations
- The overall clear sky GHI MBE is -0.9 W/m$^2$ (<1%)

- **Differences in AOD** explain clear sky GHI differences for most of the stations, and sometimes these differences are enhanced by differences in SSA (Cab, Lin)
- Overestimation for Car and Tam and underestimation for The is explained by **SSA differences**

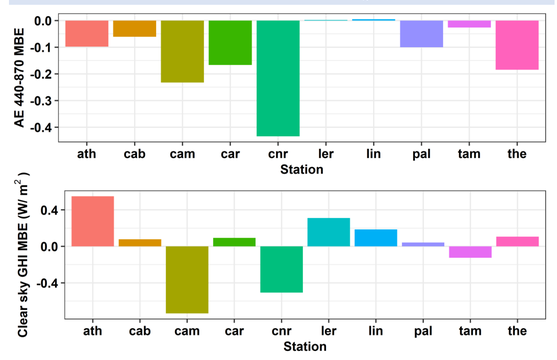
AOD sensitivity




SSA sensitivity




AE sensitivity

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**References**
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