

# D3D Project Newsletter — Months 33–42

**Period:** Months 33–42

**Project:** *Deep 3D Scattering of Solar Radiation in the Atmosphere due to Clouds* (D3D)

**Funded by:** Hellenic Foundation for Research and Innovation (H.F.R.I.)

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## 1. Project Overview — Project Completion & Legacy

Months 31–36 marked the successful completion of the D3D project. The consortium delivered a fully validated, end-to-end framework for estimating solar radiation under cloudy conditions using 3D cloud reconstructions, physical radiative transfer modeling, and deep learning surrogates.

D3D leaves a strong scientific and technological legacy, providing new tools, datasets, and methodologies that significantly advance atmospheric radiation research.

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## 2. News Highlights (Months 33–42)

- The project presented its final results at international scientific conferences, showcasing the operational performance and scientific impact of the D3D methodology.
  - The D3D website released final scientific visualizations and summaries, illustrating the complete cloud-to-radiation processing chain.
  - A final internal dissemination event was organized, bringing together researchers to discuss future applications and collaborations.
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## 3. Publications & Dissemination

The final period concluded with:

### Journal Articles

- Andreas Kazantzidis, Stavros-Andreas Logothetis, Panagiotis Tzoumanikas, Orestis Panagopoulos and Georgios Kosmopoulos, *Deep 3D Scattering of Solar Radiation in the Atmosphere Due to Clouds-D3D* † • Presented at the 17th International

Conference on Meteorology, Climatology, and Atmospheric Physics—COMECAP 2025, Nicosia, Cyprus, 29 September–1 October 2025, [MDPI](#)

### **Conference Presentations**

- Kazantzidis, Solar resource and forecasting: the challenge of retrieving aerosol and cloud properties from all-sky imagers, Harmonia Workshop on aerosol data users and applications, ERATOSTHENES Centre of Excellence, June 2025
- A. Kazantzidis, S.A. Logothetis, P. Tzoumanikas, Orestis Panagopoulos - Kontostavlakis, Quantifying aerosol and cloud effects on solar radiation via all-sky imagery and 3D cloud modeling, ISES, SWC Nov. 2025
- Kazantzidis, New challenges in solar energy resource and forecasting in MENA region, GEMENA, 2025

### **Book chapters**

- A Kazantzidis, SA Logothetis, P Tzoumanikas, Temporal and Spatial Scales, Security Enhancement for Climate Change Impacting Urban Resources-SECCURE, Springer Nature, 2025/10/30

These outputs ensure long-term visibility and reuse of the project's results.

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## **4. Research Progress by Work Package**

### **WP1 — Final Network Closure**

The ASI network completed its operational cycle, providing a unique long-term dataset of sky imagery and radiance measurements.

### **WP2 — Final 3D Cloud Dataset**

A comprehensive library of validated 3D cloud scenes was finalized and prepared for open scientific use.

### **WP3 — Final Radiative Transfer Validation**

Extensive cross-validation between measurements, MYSTIC simulations, and deep learning outputs confirmed the reliability of the D3D methodology.

### **WP4 — Deployment-Ready AI Models**

The deep learning surrogates reached full maturity and are now suitable for operational integration in solar energy and atmospheric monitoring systems.

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## 5. Key Achievements & Impact

- First operationally viable 3D radiative estimation system
  - Demonstrated superiority over classical 1D radiation approaches
  - Real-time capability through deep learning surrogates
  - Strong impact on solar energy forecasting and climate research
  - Open tools and datasets for the scientific community
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## 6. Looking Ahead — Beyond D3D

The D3D methodology opens new pathways for:

- Next-generation solar forecasting systems
- Climate model validation
- Atmospheric remote sensing
- Real-time decision support for renewable energy systems

The project consortium is already preparing follow-up initiatives building on the D3D legacy.

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