



# ÉCOLE THÉMATIQUE DART 2026

**Dates** : 01 - 04 Juin 2026 (9H - 18H)

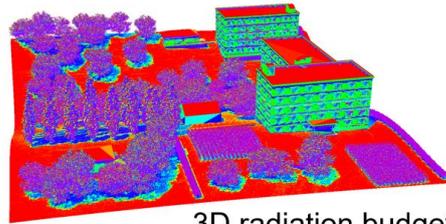
**Location** : Room 312, Maison De La Formation Jacqueline Auriol,  
Université Toulouse III, 1 Rue Tarfaya, 31400 Toulouse, France

**Registration deadline** : April 17 2026

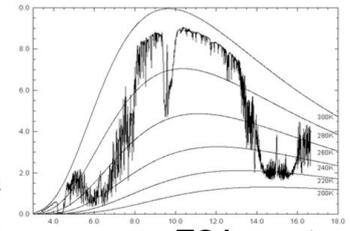
**Contact** : [yingjie.wang@iut-tlse3.fr](mailto:yingjie.wang@iut-tlse3.fr)



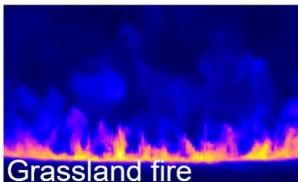
Satellite Images



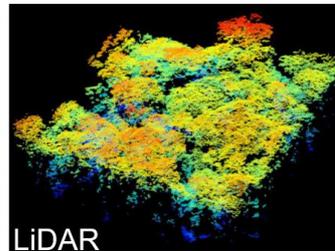
3D radiation budget



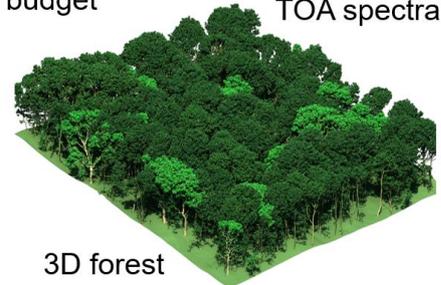
TOA spectra



Grassland fire



LiDAR



3D forest

## OBJECTIVES

Understanding the interaction of radiation with terrestrial surfaces and the atmosphere is essential on two levels: interpreting remote sensing signals as information about observed land surfaces and modelling surface processes where radiation plays a role. DART (<http://dart.omp.eu>) is one of the most precise and comprehensive 3D radiative transfer models in the remote sensing community. It has been developed at CESBIO since 1992 with support from CNRS, Université Toulouse III, CNES, IRD, and INRAE. Patented in 2003, it enables the simulation of radiative budgets as well as remote sensing observations for all types of urban and natural landscapes.

This training aims to provide participants with an understanding of the challenges and needs of radiative transfer modeling, an overview of the state-of-the-art of DART, and its various applications in different research contexts. It also offers the opportunity to study the physics of remote sensing and radiative transfer theory, master the use of DART for simulating remote sensing observations and terrestrial surface radiative budgets, and apply DART in their own research projects.

**\*\* Pre-training recommendations:**

*Obtain a free license (<https://dart.omp.eu>) and the user manual.*

*Bring a good laptop (RAM  $\geq$  16GB), although computers will be available.*

FORMATION

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## PROGRAM

### 1. INTRODUCTION AND PHYSICAL BASIS

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- **Opening and general introduction**
- **Theoretical Course:**
  - Importance of 3D radiative transfer models
  - Radiometric quantities: Radiance, brightness temperature, etc.
  - Radiative transfer equations: Solutions and modeling (DART)
  - Applications in Earth observation (space missions, inversion, etc.)

### 2. THEORY AND FEATURES OF DART

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- **Theory:** Principles, Architecture, and Modelling of DART
- **Features:**
  - Modes: Active/passive remote sensing, radiation budget
  - 3D Scenes: Buildings, vegetation, terrain, atmosphere, etc.
  - Light Sources: Spectrum, direction, intensity, etc.
  - Sensors: Pushbroom, cameras (perspective/ortho/hemispheric, etc.)
  - Products: Remote sensing, radiative balance

### 3. RADIATION PHYSICS USING DART

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- **Implementation of Major Features (Schematic Scenes)**
  - Understanding DART parameters and products
  - Analysis of radiometric quantities (irradiance, albedo, etc.) and specific effects (hot-spot, multiple scattering, Monte Carlo noise, etc.)
- **Realistic Canopy Creation (Citrus Orchard)**
  - Simulation of BRF, albedo, satellite observation, and atmospheric effects
  - Study of atmospheric effects, signal contribution by element type, etc.
- **Thermal Emission of a Realistic Canopy (Citrus Orchard)**
  - Simulation of directional brightness temperature and satellite observation
  - Fire detection in a vegetated canopy

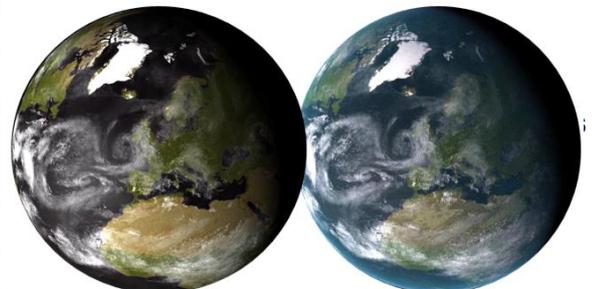
### 4. ADVANCED APPLICATION & SCIENTIFIC STUDIES

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- **Round table:** Needs and challenges of 3D radiative transfer models
- **Pytools4DART:** Python API for large-scale simulations
- **DAO:** Python API for creating complex 3D landscapes
- **Application of DART** to practical cases or individual projects



DART simulation of Brussels city



Earth simulation without/with atmosphere