

LSGS & RILS RESEARCH SEMINAR

DART: Recent Advances in Radiation Budget, Atmospheric Radiative Transfer, Thermal Emission and Error Propagation

22 DEC 2026 (TUE)
10:30 - 11:30
Z414, POLYU
ENGLISH

Prof. Yingjie WANG

Associate Professor
Toulouse University, France



ABSTRACT

New satellite instruments and methodologies for their data processing and Cal/Val activities are continuously evolving. To interpret correctly a broad suite of various Earth observations, one requires increasingly accurate radiometric measurements and models. In this context, sophisticated physical models that simulate the radiative transfer in the Earth-Atmosphere system are essential. More accurate and simultaneously more efficient modelling is becoming increasingly feasible thanks to recent advances in numerical solutions of radiative transfer equations, 3D reconstructions of land surfaces and clouds, and advanced computer technology. Discrete Anisotropic Radiative Transfer (DART, https://dart.omp.eu/#/) is one of the most comprehensive 3D radiative transfer models used by the remote sensing community. Developed at CESBIO since 1992, it simulates remote sensing observations and radiation budget for any 3D natural and urban land surfaces with topography and atmosphere, from visible to thermal infrared domains. DART is used by various space agencies (e.g., CNES, ESA, and NASA) to support the preparation of future satellite missions, such as Sentinel-2 NG, LSTM, and TRISHNA. A number of research institutes use DART for a wide range of remote sensing applications, including leaf traits' retrievals, surface variables' inversions, and sensitivity analysis. In this contribution, we present recent DART advances introduced by the DART team (CESBIO, France) and collaborating institutes, with a focus on applications in quantitative remote sensing, specifically:

1. General principles of the DART model, including its physical basis, algorithms, products, and simulations' accuracy.
2. Recent developments, e.g., Jacobian matrices (error propagation), machine-learning emulation of atmospheric radiative transfer, spherical-shell atmosphere, Monte Carlo radiation budget, mobile LiDAR, night-time imaging, large-scale thermal imaging, etc.
3. Applications of the DART model in quantitative remote sensing, including sensitivity analysis, inversion of land surface variables, training of machine learning models, correction of directional effects, and preparation of future satellite missions.

BIOGRAPHY

Yingjie Wang is an associate professor at University of Toulouse, attached to CESBIO. He received the Bachelor's degree at Peking University in 2016 and the Ph.D. degree at University of Toulouse in 2022. His research interests include: (1) the 3D radiative transfer modelling in the land surfaces and the atmosphere, (2) 3D energy balance modelling in soil-vegetation system, and (3) the study of forest and crop by remote sensing. Yingjie Wang currently serves as the scientific co-leader of the DART team at CESBIO. He also co-leads the development of the 3D energy balance model BALENO in collaboration with the University of Bonn (Germany) and CRNS (Tunisia). Building on his expertise, he has contributed to several research projects supported by the French and European space agencies (CNES and ESA), including 3D Earth, ARAMIS, and LSTM, through the application of the DART model. In recognition of his achievements, he was nominated for the "Jeune Talent France-Chine" and "Top 10 Leading Chinese-Origin Tech Talents in Europe" awards in 2026.

Moderator:
Prof. Tiangang YIN, Assistant Professor of LSGS, member of RILS

All are welcome! Please register now to join us on-site!

Enquiry: lsdept@polyu.edu.hk

REGISTER NOW

THE HONG KONG POLYTECHNIC UNIVERSITY 香港理工大學

DEPARTMENT OF LAND SURVEYING AND GEOSPATIAL SCIENCE 土地測量及地理空間科學系

RILS 土地及空間研究院 Research Institute for Land and Space