# SEMI-LAGRANGIAN SCHEMES FOR PARTIAL DIFFERENTIAL EQUATIONS IN APPLIED MATHEMATICS

**ELISABETTA CARLINI[*], ADRIANO FESTA[†]**

[*] Sapienza Università di Roma,
Dip.Matematica "Guido Castelnuovo",
P.le Aldo Moro, 5 00185 Roma RM
elisabetta.carlini@mat.uniroma1.it

[†] Politecnico di Torino
DISMA - Dipartimento di Scienze Matematiche
"Giuseppe Luigi Lagrange"
Corso Duca degli Abruzzi, 24, 10129 Torino TO
adriano.festa@polito.it

## ABSTRACT

Semi-Lagrangian (SL) schemes have emerged as a powerful class of numerical methods for solving partial differential equations (PDEs) in various applied mathematics contexts. These schemes combine the advantages of Lagrangian and Eulerian approaches, offering stability for large time steps and efficiency in handling advection-dominated problems. This minisymposium aims to bring together researchers working on theoretical developments, computational techniques, and applications of SL methods across different scientific and engineering disciplines.

In this mini-symposium we will present recent advances in SL methods for PDEs, including novel formulations and stability analyses, and some applications contextes in fluid dynamics, meteorology, plasma physics, or other fields. An objective of this proposal is to foster collaborations between numerical analysts and applied scientists to further develop and refine SL techniques.

**Some topics of interest are:**

High-order or structure-preserving SL methods.

SL methods for Hamilton-Jacobi equations, optimal control and Mean Field Games.

Parallel, GPU-accelerated or AI enhanced implementations of SL techniques.

Applications of SL schemes in geophysical flows, plasma simulations, and beyond.

This minisymposium will provide a platform for researchers to exchange ideas, present innovative work, and discuss future directions in the development of SL schemes for PDEs in applied mathematics.

## REFERENCES

[1] Falcone, M., & Ferretti, R. (2013). *Semi-Lagrangian Approximation Schemes for Linear and Hamilton-Jacobi Equations*. Society for Industrial and Applied Mathematics (SIAM).

[2] Staniforth, A., & Côté, J. (1991). *Semi-Lagrangian Integration Schemes for Atmospheric Models: A Review*. Monthly Weather Review, 119(9), 2206-2223.