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Guest editorial: Computational methods for thermal and energy problems – selected papers from ThermaEcomp24

The international conference *ThermaEcomp2024 – Computational Methods for Thermal and Energy Problems* (www.thermaecomp.com/public/index.php) was successfully held at the University of Montenegro from 9 to 11 September 2024. The conference featured several plenary and keynote lectures alongside regular contributed presentations. A central objective of ThermaEcomp is the support of early-career researchers, particularly doctoral students. In this spirit, the conference awards the *Roland Lewis Prize* for the best presentation by a PhD student.

This special issue of the *International Journal of Numerical Methods for Heat and Fluid Flow* brings together selected contributions from keynote speakers and recipients of the best student presentation awards. A brief overview of the included papers is provided below.

As expected, the selected papers span a wide range of topics within thermal and energy sciences and engineering. Contemporary thermal and flow research is increasingly influenced by data-driven methodologies, with or without the explicit use of artificial intelligence and machine learning. The first three papers in this special issue fall within this category. The first paper explores the application of Graph Neural Networks (GNNs) for radioactive waste monitoring (Hembert *et al.*, 2026). The second paper applies genetic algorithms to the thermal management of an aircraft Environmental Control System (ECS) (Negi *et al.*, 2025). The third paper presents a method for constructing a complete solution map from a limited number of field measurements, offering a pathway towards rapid digital twin development (Bielajewa *et al.*, 2026).

The next group of five articles focuses on heat exchange and energy storage. Local thermal non-equilibrium (LTNE) effects in microchannel heat sinks are investigated in Nonino and Savino (2026), where a porous medium approach is employed for modelling. In Piccirillo *et al.* (2026), a coupled electrochemical–thermal model is developed to analyse the thermal management of cylindrical lithium-ion batteries. The work presented in Jain *et al.* (2026) introduces a numerical model of a thermochemical energy storage (TCES) process in a porous reactor bed containing potassium carbonate (K_2CO_3) salt hydrate. Heat transfer enhancement and improved thermal mixing using a triple-tube heat exchanger are examined in Pagliarini *et al.* (2025), combining numerical modelling with experimental validation and focusing on passive heat transfer mechanisms. The final paper of the special issue (Suzzi and croce, 2026) investigates the impact of hydrophobic and superhydrophobic surfaces on in-flight aerofoil anti-icing, using a modelling approach based on a discontinuous wetting layer represented as an evolving population of droplets.

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