



EACWE 2025

The 9th European African Conference on Wind Engineering

Trondheim, Norway, 16-19 June 2025



Mini symposium – 07

Advances in modeling and control of vibrations of energy systems under climatic loads



Energy systems encompass a wide array of **infrastructure and technologies dedicated to generating, transmitting, storing, and utilizing energy**. This includes power generation facilities such as wind turbines and solar panels, as well as the extensive grids and storage solutions that facilitate energy distribution. These systems are critically exposed to a variety of environmental and climatic factors—such as **wind, ice, rain, and waves**—which can significantly impact their efficiency, durability, and operational lifespan.

Wind turbines, along with networks of power lines and substations, are crucial in the transition toward sustainable energy production but are particularly susceptible to **climatic stresses** due to their direct exposure to the atmosphere. With the increasing demand for **cleaner energy solutions**, there has been a corresponding growth in the size and capability of wind turbines, enhancing their potential but also exposing them to **greater environmental challenges**.

This mini-symposium aims to address the **forefront of advancements in the modeling and control of wind turbines and energy systems**, focusing on improving their durability and operational efficiency.

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Visit the conference website:

<https://www.ntnu.edu/eacwe2025/>

The session will cover a variety of topics, including, but not limited to:

- Advanced **aerodynamic modeling** specifically designed for optimizing energy systems under climatic stresses.
- Structural and dynamic modeling to enhance **wind turbine performance** in the face of climatic loads and other dynamic pressures.
- Comprehensive analysis of **vibration and fatigue** in turbine components to predict and mitigate potential failures.
- Implementation of a range of control strategies—active, semi-active, and passive—to reduce structural vibrations under varying environmental conditions.
- Detailed exploration of the impacts of **climatic actions** (wind, ice, rain, waves, etc.) on the structural integrity and efficiency of energy systems.



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