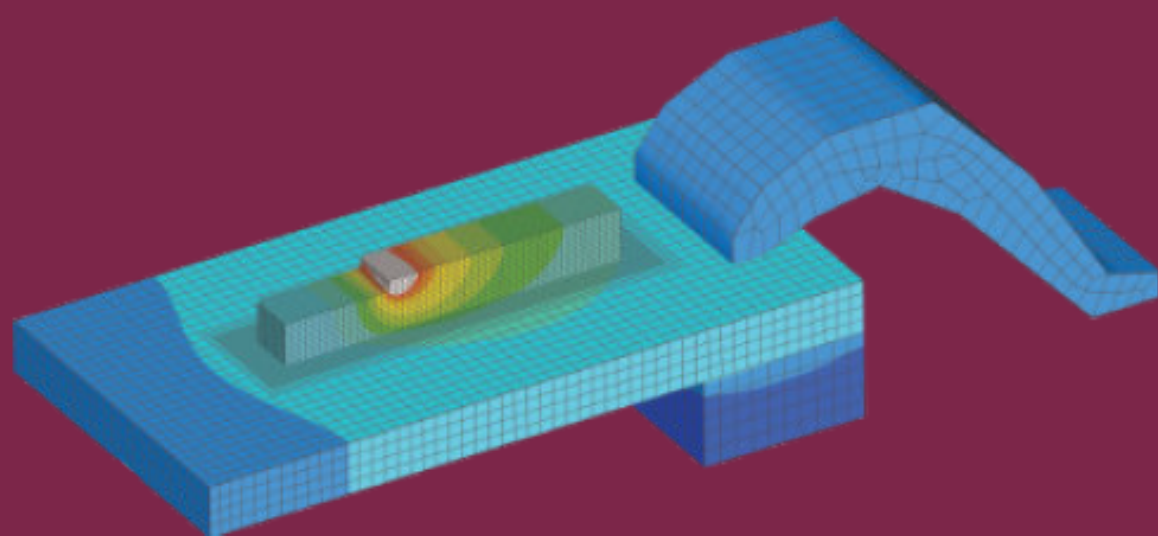

MATHEMATICAL MODELLING OF WELD PHENOMENA

14

Edited by
C. Sommitsch
N.ENZINGER
P. Mayr



**MATHEMATICAL MODELLING OF
WELD PHENOMENA 14**



The delegates of the 14th International Seminar ‘Numerical Analysis of Weldability’ held from 21 - 24 September 2025 at Schloss Seggau near Graz, Austria

MATHEMATICAL MODELLING OF WELD PHENOMENA 14

Selected peer reviewed papers from the
14th International Seminar
Numerical Analysis of Weldability
September 21 - 24, 2025
Graz - Schloss Seggau - Austria

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INTRODUCTION

This volume contains the papers presented at the 14th International Seminar ‘Numerical Analysis of Weldability’, held from September 21st to 24th, 2025, at Schloss Seggau near Graz, Austria. As always, this location provided an inspiring environment encouraging friendly and intensive discourse between scientists and engineers. The conference stood up to its reputation as one of the most important forums in the science of welding. The meeting was organized by the Institute of Materials Science, Joining and Forming (IMAT) of Graz University of Technology, and the working group ‘Mathematical Modelling of Weld Phenomena’ of Commission IX of the International Institute of Welding (IIW).

The unique tradition of publishing (all articles refereed, typeset and edited in uniformity; each article is required to be comprehensive in its content) could be maintained also for this edition to serve the welding community as reference literature. The continuity of the previous thirteen volumes, Mathematical Modelling of Weld phenomena 1 – 13, has therefore been preserved thanks to the monumental efforts of the Seggau team of IMAT. Special thanks goes to Bettina Schreiner-Föböl, who was in charge of the entire work of coordinating the peer review as well as Isabella Knollseisen for assisting her in the layout creation and editing procedure in a highly ambitious manner. Volume 14 is again published by Verlag der Technischen Universität Graz and all papers have a DOI and are available open access.

The 2025 seminar was attended by more than 90 delegates coming from 15 countries participating in both, oral sessions and poster presentations in the following sessions:

- I. Welding Processes
 - a. Arc Welding, Melt Pool & Solidification
 - b. Laser & Electron Beam Welding
 - c. Additive Manufacturing
 - d. Special Joining Processes

- II. Joint Properties
 - a. Microstructural Modelling in Weld Metal and Heat Affected Zone
 - b. Microstructure and Mechanical Properties
 - c. Residual Stresses and Distortion
 - d. Cracking Phenomena & Hydrogen Effects

- III. Methods
 - a. Modelling Tools and Computer Programs

The most important observations of this seminar were the fact that modelling approaches in the meantime penetrate many fields of application in welding and recently in additive manufacturing. It helps to solve complex tasks and optimize the welding processes and materials used. By this, it helps to enhance the safety, reliability and economy of welded structures. This was impressively shown by many authors who in addition could verify the calculation results by experimental investigations.

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The 2025 IIW Kenneth Easterling Best Paper Award was won by the paper “Modeling and simulation of the anisotropic thermal expansion of Ti-6Al-4V processed by LPBF”, *T. Mayer, P. Capozzi, M. Hofmann, F. Friso, R. Radis* from ZHAW School of Engineering in Switzerland. This paper has been valued by an international committee as the best contribution made over the three years proceeding on the advancement of knowledge or practice in respect of mathematical modelling of weld phenomena.

The next International Seminar ‘Numerical Analysis of Weldability’ will take place from September 24th – 27th, 2028 at Schloss Seggau.

Christof Sommitsch, Norbert Enzinger and Peter Mayr
Graz, May 2026