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*1<sup>st</sup> ADDitively Manufactured OPTimized Structures by means of Machine Learning*

*2<sup>nd</sup> International Conference on Optimization Driven Architectural Design*

*2<sup>nd</sup> Engineering and Applied Sciences Optimization*



# The Use of 3D Printed Models of the Landscape in Hydraulic Studies

G.-Fivos Sargentis, Evangelia Frangedaki, Theano Iliopoulou, Panayiotis Dimitriadis, Nikos D. Lagaros



National Technical University of Athens

School of Civil Engineering

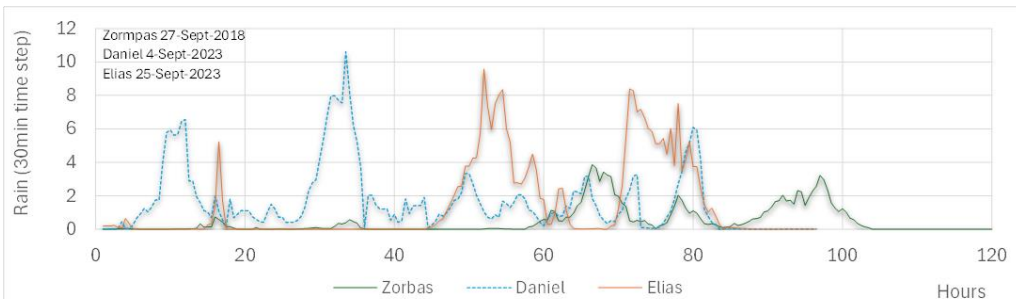
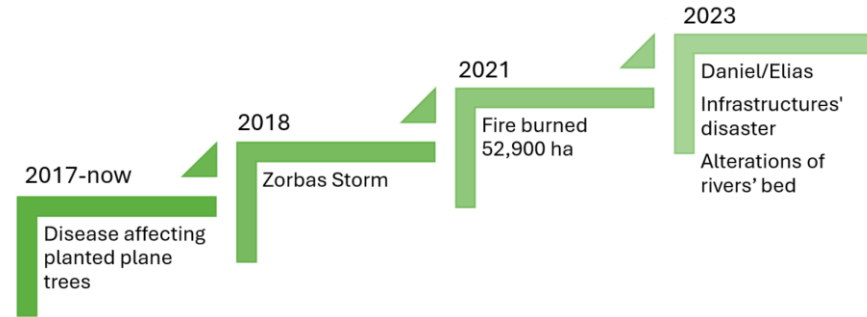
# Contents

- Introduction
- Physical models in hydraulic studies
- Creation of physical models with 3D printing
- The 3D printed model and the study of hydraulic characteristics and water flow
- Conclusions

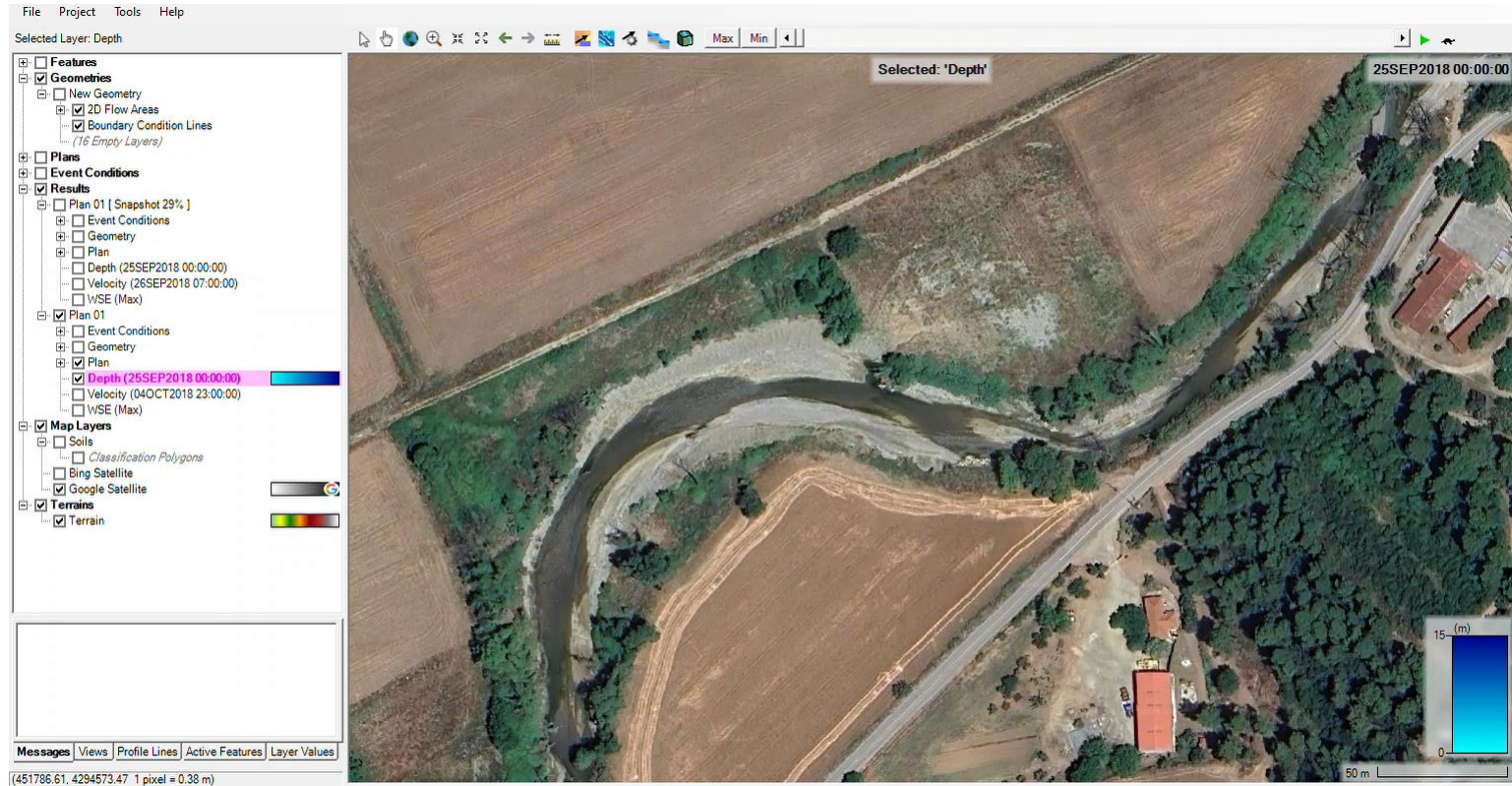
# Introduction

- Physical three-dimensional models of hydraulic studies were an initial approach to studying hydraulic behavior [1, 2].
- However, they faced various challenges, such as creating the terrain relief with proper materials, or modeling rainfall [3].
- Advances in the science of hydraulics managed to describe water movement, and with the development of computers, it became possible to model it in space [4].
- Nonetheless, modeling contains many uncertainties [5, 6] and requires significant computational power.
- To overcome such issues, this research presents the possibility of printing the terrain relief using 3D printing [7, 8, 9] and studying water movement in a physical maquette.

# The area of case study



# Simulation in HEC-RAS



# Field research



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DJI\_0211

# Creation of 3D model



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Featureless Object Mode

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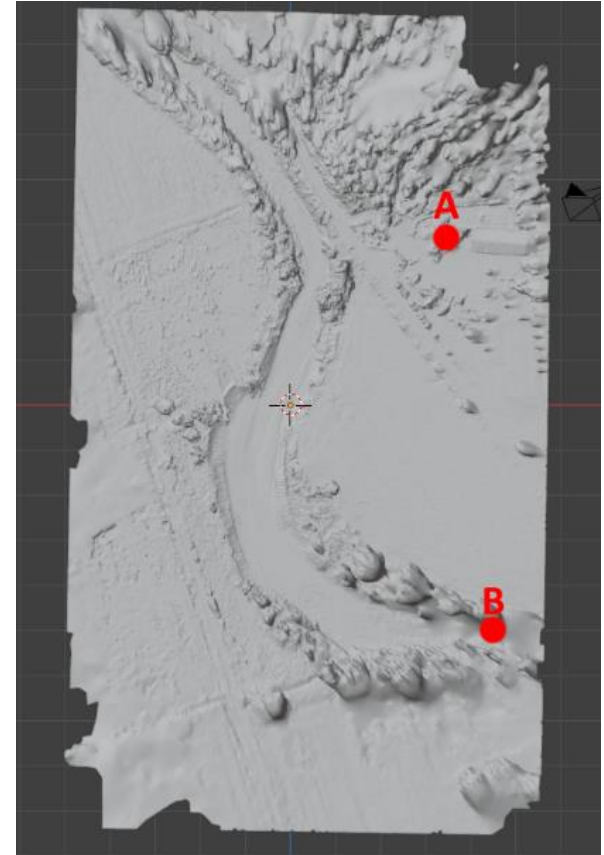
Photogrammetry for professional 3D model quality,  
works for featureful objects or scenes

[10]

# Creation of 3D printed models



[10]



[11]



# Before and after Daniel and Elias storms



# Conclusions

- As shown by the HECRAS simulation, the hydraulic model is capable of tracking the overall flood, but it does not provide a detailed picture of what is happening in the specific area under study.
- In this particular case, however, the hydraulic similarity can be estimated with considerable accuracy, allowing for the implementation of protective works that could safeguard the area in question.
- In general, it appears that simulating hydraulic behavior using physical models can serve as a valuable tool in clarifying uncertainties present within hydraulic models.

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