

AMELIA High Performance Computing cluster

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The AMELIA cluster

In the context of DARIAH-IT and OPERAS-IT infrastructures in the H2IOSC project, funded by Italy's National Recovery and Resilience Plan (PNRR), a datacenter named AMELIA was designed and created in the area of Naples of the Istituto per le Applicazioni del Calcolo (CNR) with the aim of providing to an open and multidisciplinary environment for conducting innovative and computationally intensive research on complex digital data and objects. The cluster hosts STONEVERSE platform available at <https://stoneverse.iac.cnr.it>, a FAIR-ready open platform that enables researchers to execute, optimize and share mathematical-based algorithms and datasets describing chemical degradation processes on porous materials constituting built heritage. Moreover, the AMELIA facility represents a resource for research in scientific computing and AI developments, with applications in cultural heritage, quantum mechanics and numerical linear algebra. The cluster characteristics are summarized in the following Table 1. A pictorial representation of cluster topology is reported in Fig. 1, while in Figg. 2 cluster layout (left) and nodes (right) are shown.

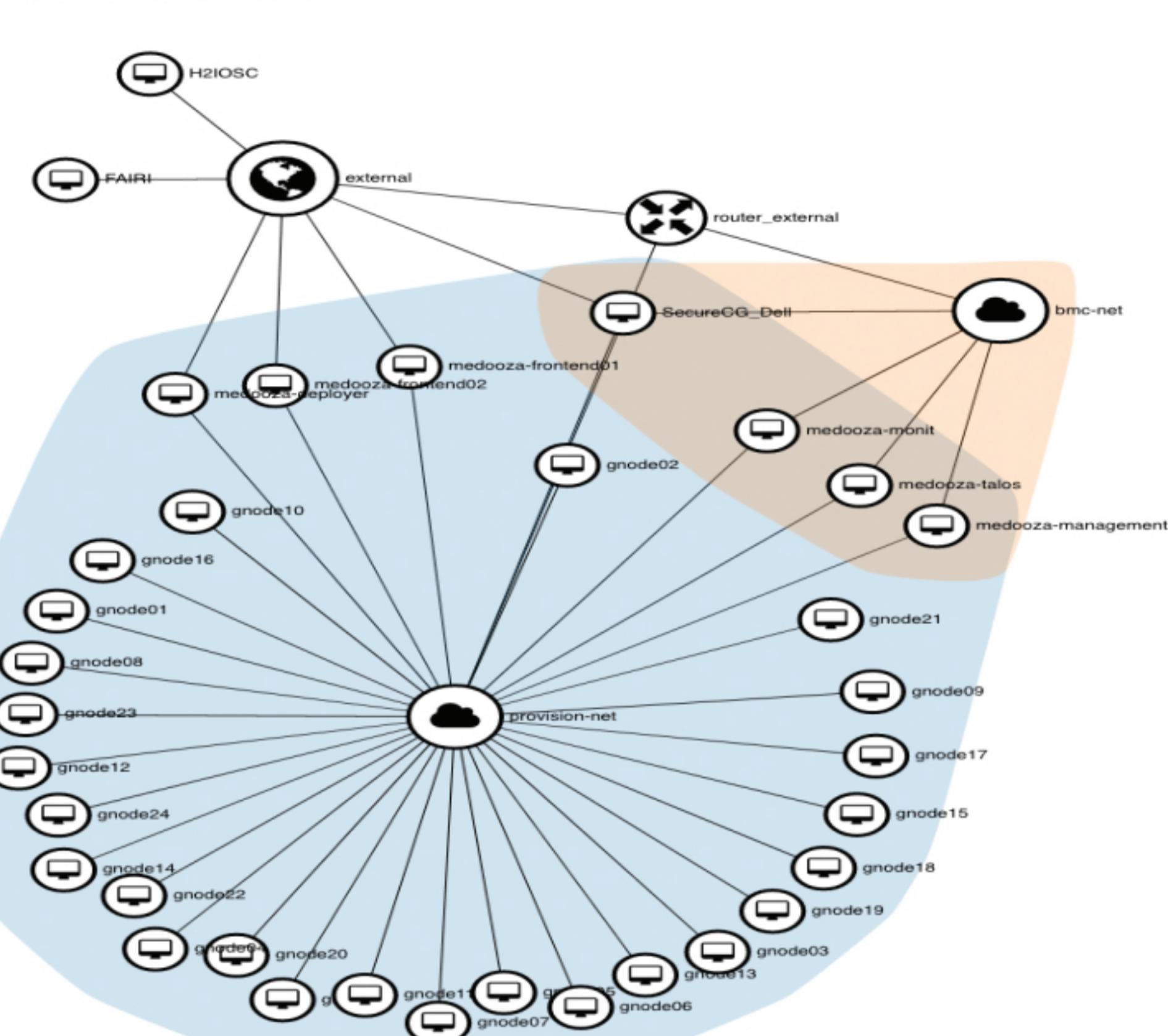


Figure 1: The cluster topology

Architecture	Cluster of GPU-accelerated nodes
Interconnection	Infiniband HDR 200 Gb/s
Control network	4 Ethernet 1 Gb/s
CPU model	2 sockets of 32 cores Intel Xeon Gold 6883 2.00 GHz
GPU type	NVIDIA A30 24GB 933GB/s Memory PCIe Gen4: 4GB/s
Peak performance	380 TFLOPS CPUs and 1TFLOPS GPUs
Number of nodes	25 Compute and 4 Control
RAM each nodes	1.0 TB DDR3 REGISTERED ECC height
OS	Rocky Linux 8.9 - OpenStack
Scheduler	SLURM 23.11.6
Storage	512 GB of system disk every node 7 TB of local scratch disk every node. (/scratch/local) 650 TB of Storage Area Network (/ifs/hpc)

Table 1: Cluster characteristics



Figure 2: The cluster layout (top) and nodes (bottom).

In the following Figg. 3-4-5 some numerical elaborations ran on AMELIA resources are reported.

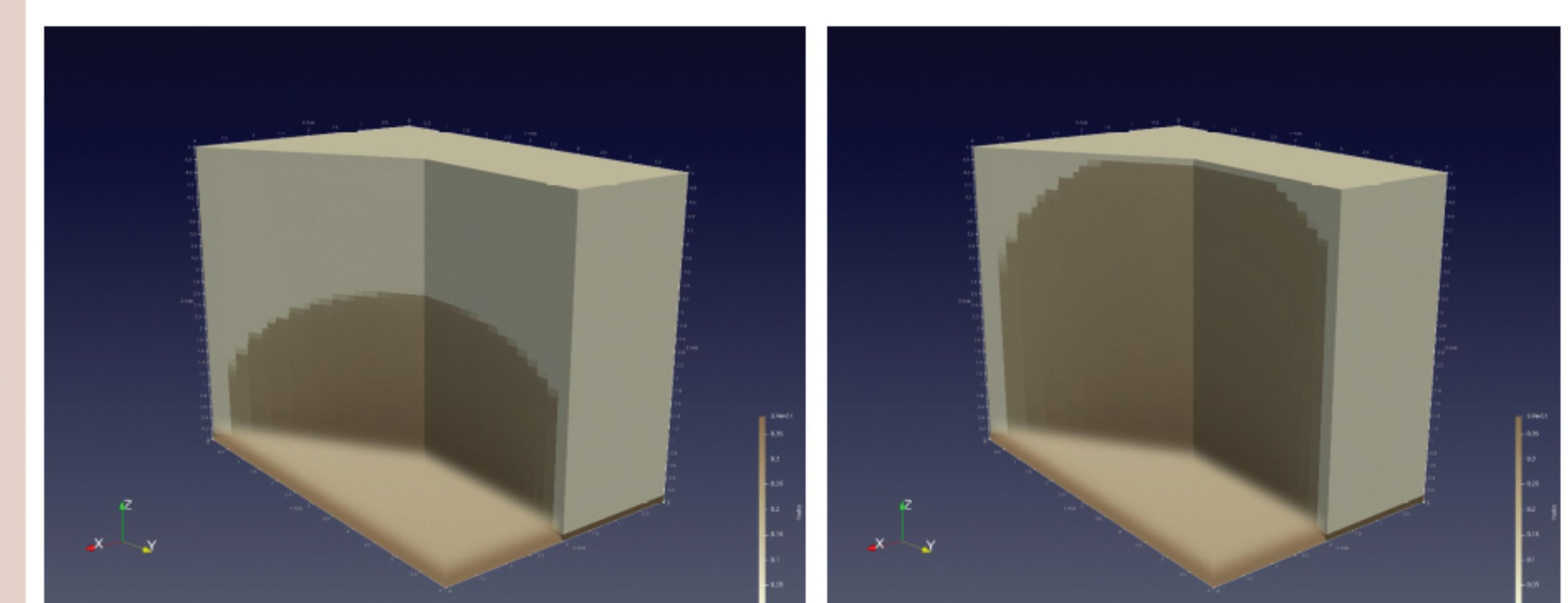


Figure 3: Temporal evolution of the imbibition profile from the 3D simulation at time $t = 0$ (left) and time $t = 3$ h (right). Courtesy by [1]

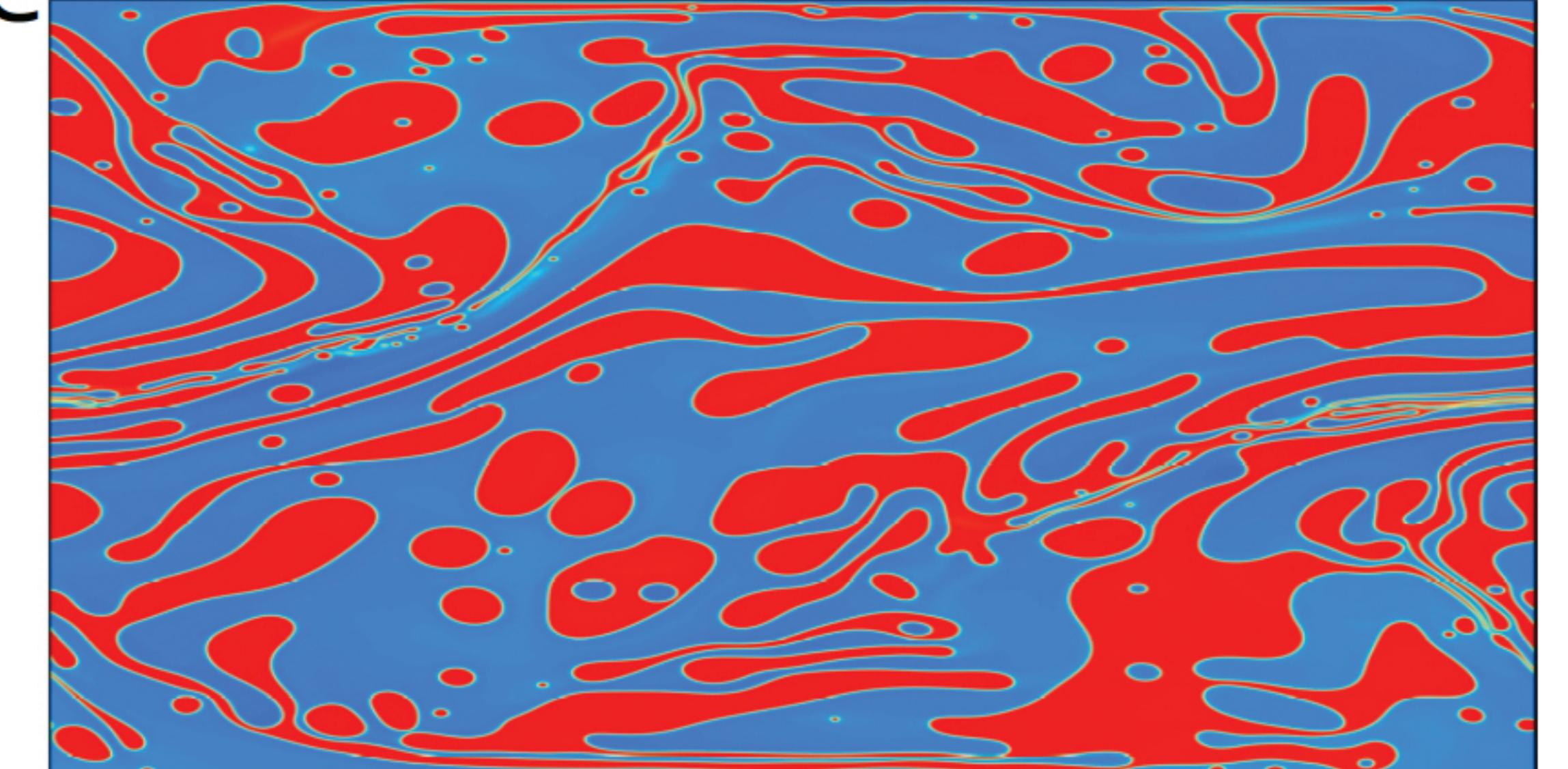


Figure 4: Simulation of oil droplets dispersed in water. Courtesy by [2]

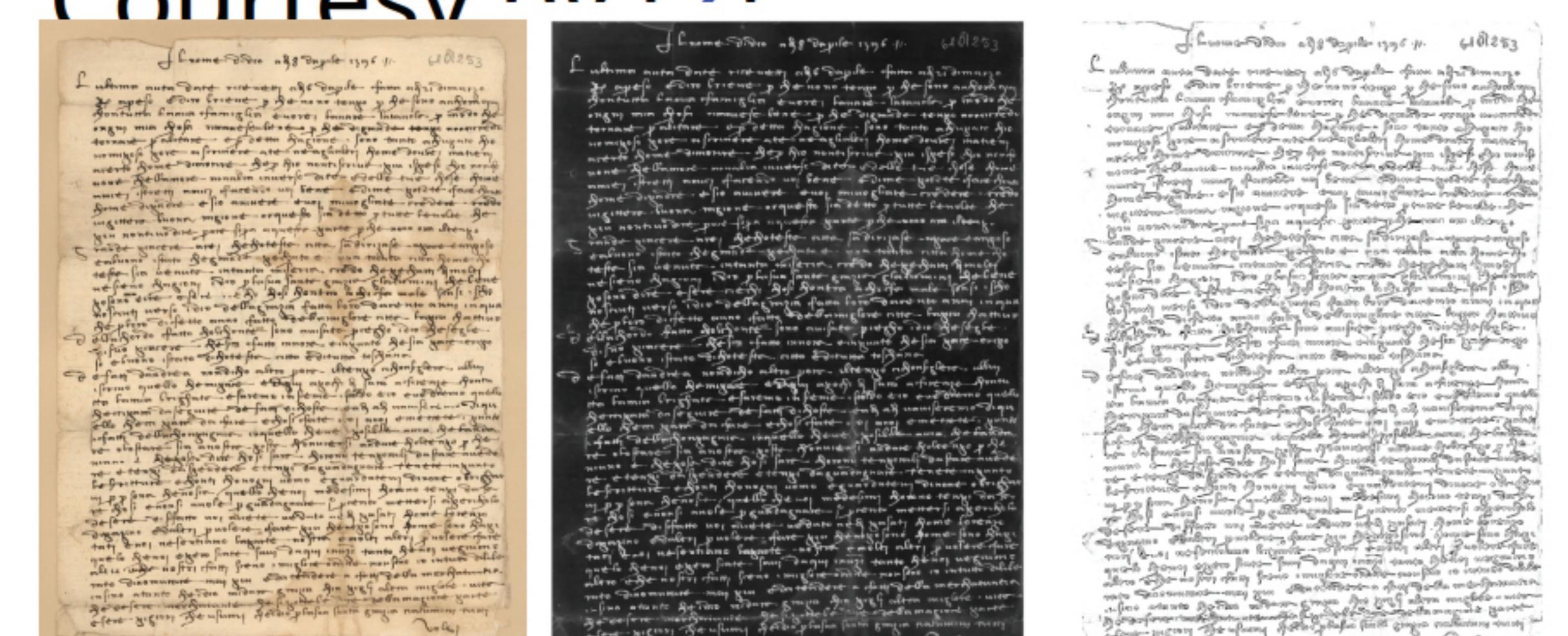


Figure 5: Text recognition of medieval manuscript. Original text (left panel). Two steps of hand written text recognition pre-processing procedure (middle and right panels) [3].

References

- [1] Onofri E., Bizzarro S., Tassa S., Czech M. and Bretti G. StoneVerse: Models and Methods in Cultural Heritage. The Open-Science Platform for Reproducible Modelling of Stone Decay. To appear on DH25 (2025).
- [2] Bernaschi M. and Pelusi F.: Thermal convection in emulsions: heat transfer properties and role of droplets. In preparation, 2025.
- [3] Pedone M., Ceccherini I., Coradeschi F., Perino M. and Pinna F.: Automatic text recognition of had-written medieval manuscripts. In preparation, 2025.