



Dutch participation to EPOS: the European Research Infrastructure for solid Earth sciences

Martyn Drury (1), Richard Wessels (1), Ernst Willingshofer (1), Otto Lange (2), Kees Wapenaar (3), David Bruhn (3), Anke Dählmann (3), Phil Vardon (3), Reinoud Sleeman (4) and Bernard Dost (4)

(1) Utrecht University, Department of Earth Sciences, Utrecht (2) Utrecht University, University Library, Utrecht (3) Delft University of Technology, Department of Geoscience & Engineering, Delft (4) Koninklijk Nederlands Meteorologisch Instituut, De Bilt

1. The scientific challenge driving EPOS-NL

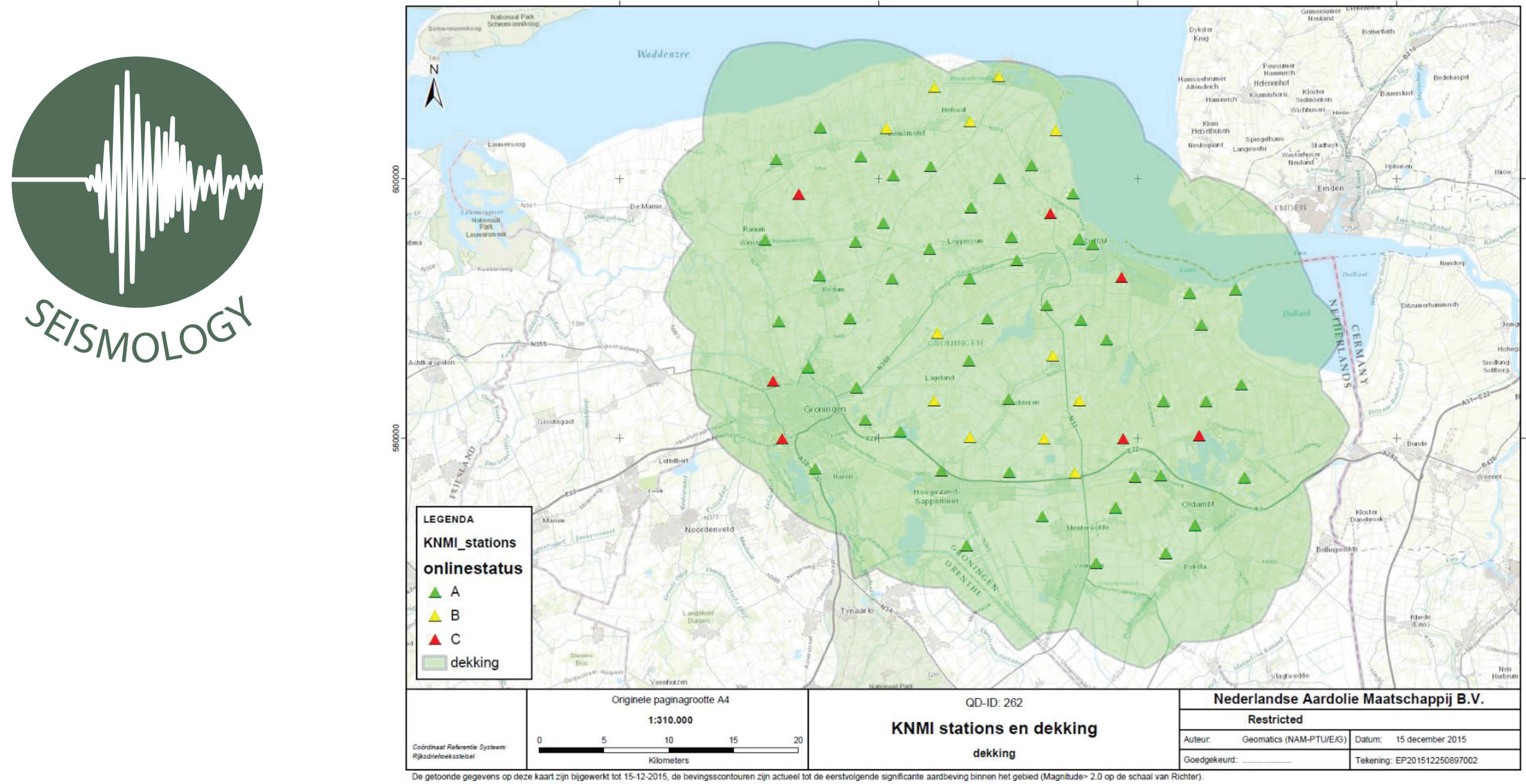
EPOS-NL is the Netherlands’ contribution of National Research Infrastructures (NRIs) to the **European Plate Observing System (EPOS)**, which is a pan-European project with the goal to improve and facilitate the integration, access, and (re)-use of solid Earth science data, services, and facilities. EPOS-NL is a consortium of Utrecht University, KNMI, and TU Delft, and is on the Dutch National Roadmap for Large Scale Research Infrastructures. The objective of EPOS-NL is to integrate and expand the national infrastructure for frontier-breaking research, in the fields of:

- **Geo-energy:** exploration and exploitation of new, low carbon geo-energy resources in the Netherlands and Europe, in particular geothermal energy.
- **Geo-storage:** geological storage of CO<sub>2</sub>, fuels like natural gas and renewably generated hydrogen, and wastes related to energy production.
- **Geo-hazards:** such as induced earthquakes and subsidence caused by human activities in the subsurface.

This new research infrastructure supports **multi-scale, multi-physics research** that delivers a quantum leap in imaging of subsurface structure and processes and in predictive modelling, and fosters development of **open access data services**. The EPOS-NL clusters are shown below.

2. SYSTEM-SCALE NATURAL LABORATORIES

A. Groningen gas field seismic network (KNMI)

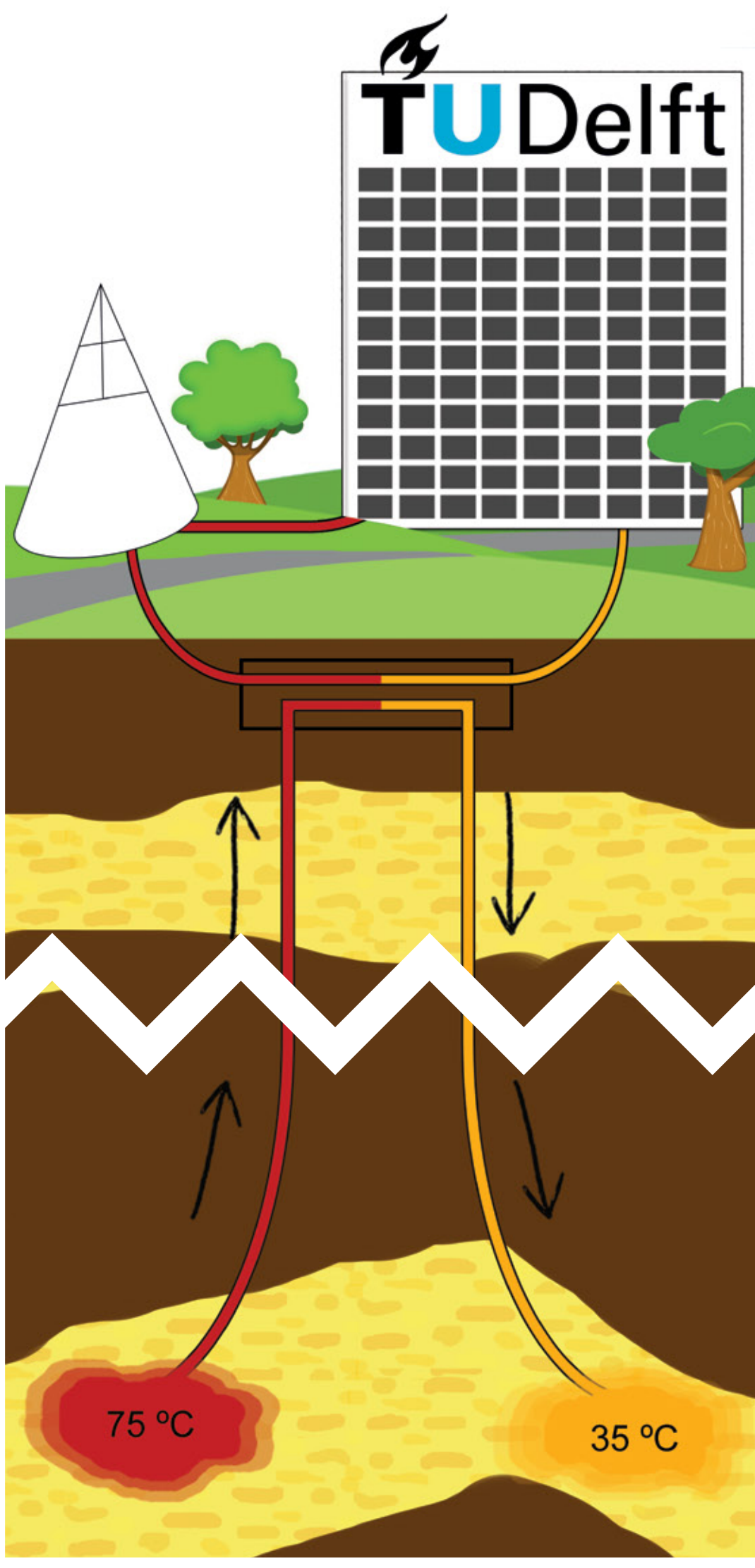


The Groningen gas field is a unique natural observatory for induced seismicity. **Big data** from the dense seismic network of borehole stations in Groningen will be integrated in the ORFEUS Data Centre and made **openly available** to the geoscientific community through the EPOS Thematic Core Service Seismology.

B. DAPwell geothermal well (TUD)

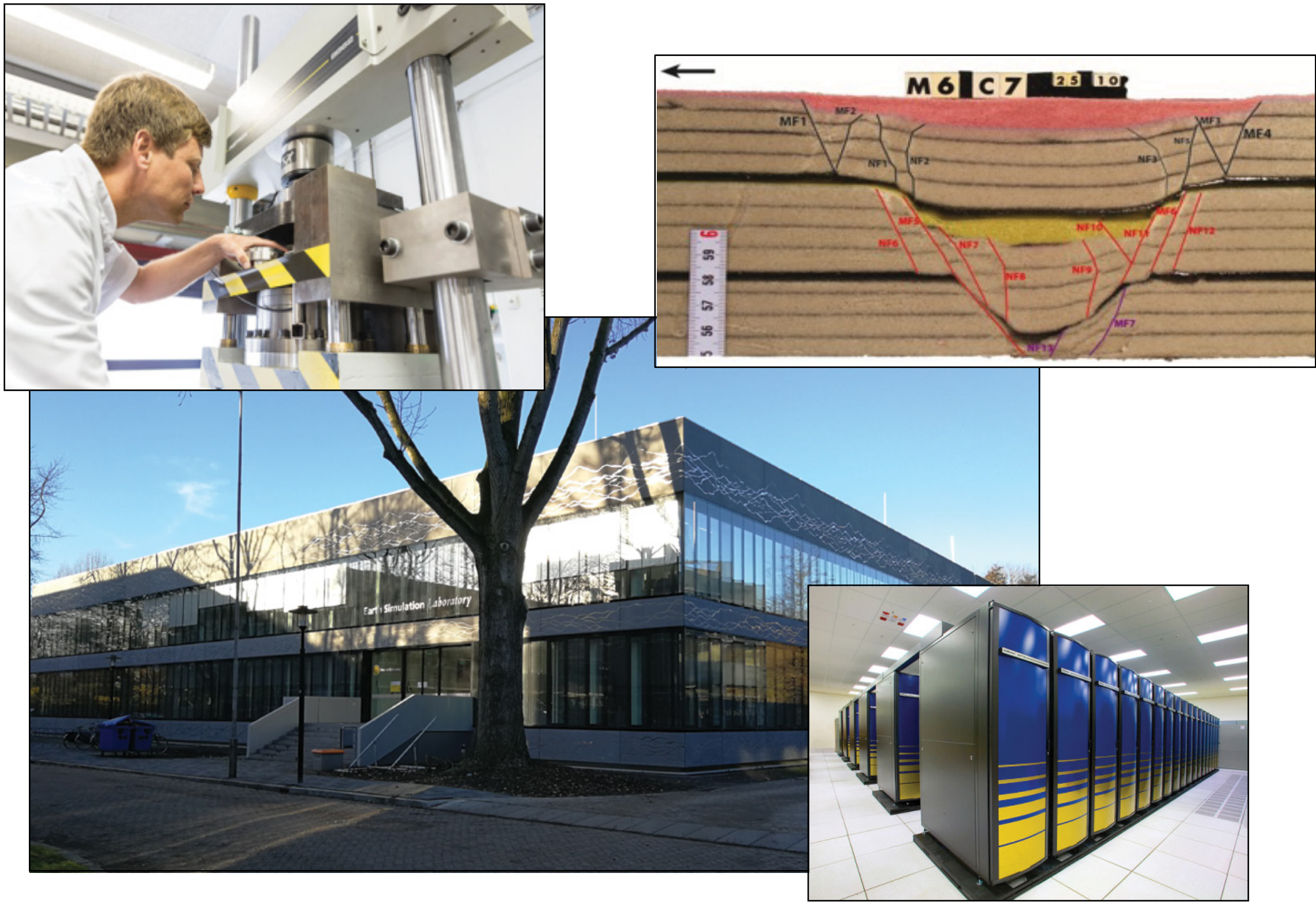


A deep **geothermal doublet**, built with extensive embedded monitoring and testing instrumentation, and including new materials (composite casing), will be installed on the TU Delft campus. Cores will be analysed in the laboratory to determine the petrophysical properties of the reservoir rocks and a seismic network at the surface will monitor fluid flow between injector and producer well.



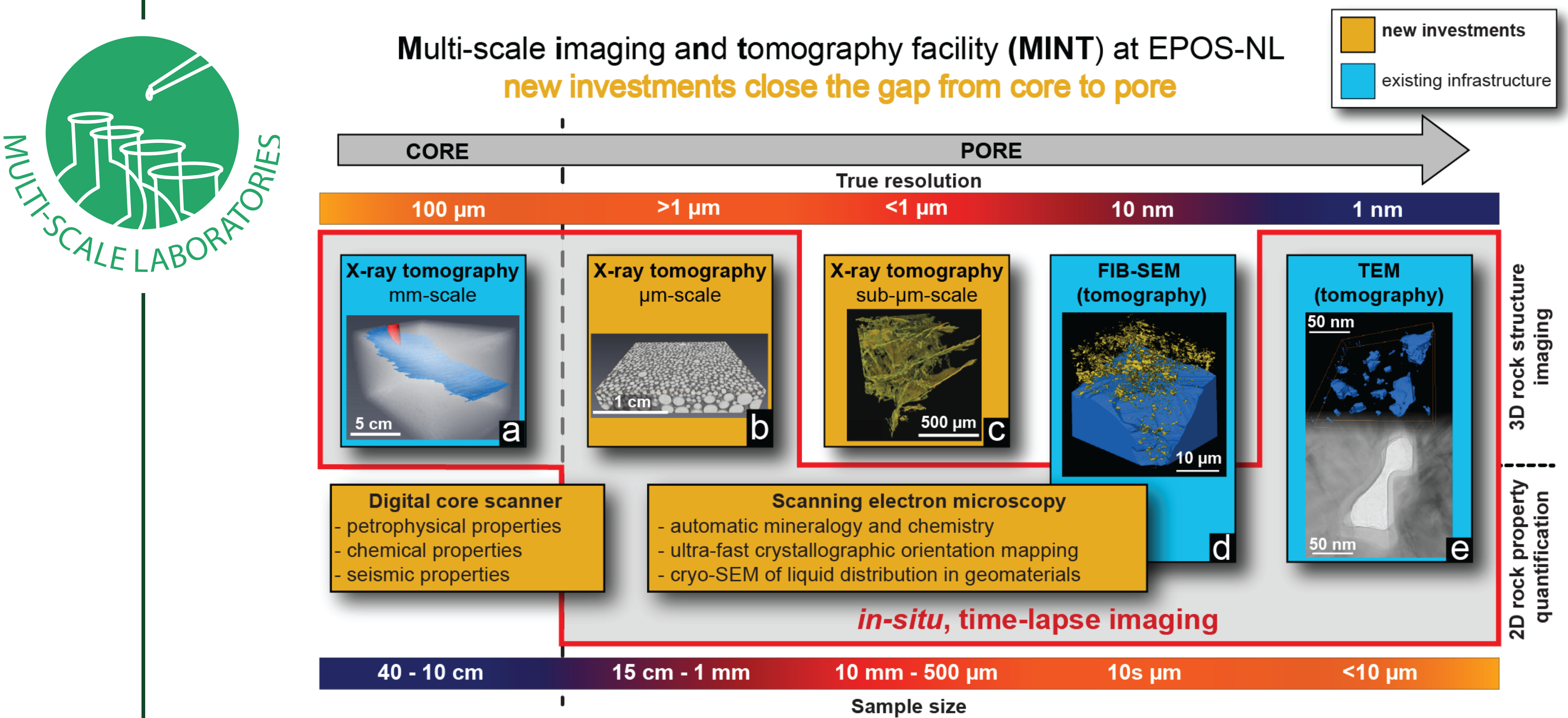
3. INTEGRATED LABORATORIES FACILITIES

C. Earth Simulation Laboratory (ESL; UU)



The ESL will integrate the existing world-class **multi-scale, multi-physics** experimental facilities at UU (HPT Laboratory and TecLab) with existing **numerical modelling and imaging facilities for seismological research**. New facilities will include a high-resolution imaging of the 4D internal deformation of analogue models and an ultra-high resolution HPT testing machine able to deform rock samples and simulate fault slip under geothermal, flow-through conditions.

D. Multi-scale Imaging and Tomography (MINT; UU & TUD)



A cluster of instruments enabling visualization and correlation of 3D and 2D structures within rock samples at all scales ranging from meters to nanometres. It will include **X-ray tomography systems** with a range of resolutions and sample size capabilities and cutting-edge **automated electron microscopes**. MINT will be able to image rocks at all scales and allow notoriously difficult sub-micron pore and fracture networks to be analysed and scaled to larger rock structures.