玛丽居里爱尔兰博士后项目

诚邀：国立科克大学欧洲强子对撞机隧道项目申请

地点：前两年在欧洲核子研究中心(大型强子对撞机隧道)，第三年在爱尔兰国立科克大学

Principal supervisor Dr. Zili Li at University College Cork, Ireland and co-supervisor: Prof. Kenichi Soga at UC Berkley, US. If interested, please feel free to send your CV to zili.li@ucc.ie

Salary: 53k ~ 59k euros per year

Eligibility

Candidates should have a PhD degree in Geotechnical / Geological / Tunnelling engineering or will obtain one in a few months. Candidates with background in tunnel engineering and numerical modelling are encouraged to apply, while English certificate (e.g. IELTS / TOEFL) and international research experiences are highly appreciated.

Long-term behaviour of CERN tunnel in the molasse region

Postdoctoral Position to be supervised by Dr. Zili Li

The world-famous Large Hadron Collider (LHC) particle accelerator is housed tens of metres below the ground surface in a large-scale underground tunnel network at the European Centre for Nuclear research (CERN). Hundreds of miles of deep CERN tunnels were excavated decades ago lined with spray shotcrete in a weak sedimentary rock called the red molasse, which is a type of highly heterogeneous rock mass comprising an irregular, alternating sequence of sandstones and marls with distinctly different mechanical properties. Such complex ground condition may result in significant bending moment in the tunnel lining and consequently lead to cracks, water infiltration and other structural distress years after tunnel construction.

In this study, a series of soil-fluid coupled finite element analysis was conduct to investigate the long-term behaviour of CERN Tunnel: TT10 in the molasse region. For simplicity, the tunnel behaviour was investigated in 2D plane strain condition at a representative transverse cross section. The horseshoe tunnel cross section was modelled using 8-node quadratic elements with local mesh refinement, whilst engineering properties of different layers of sandstones, marls and other rocks surrounding the tunnel were considered with a particular interest in ground permeabilities. Results show that the tunnel lining permeability relative to the surrounding rock plays an important role on the tunnel deformation mode during long-term ground consolidation after construction. In particular, the ground permeability anisotropy in the complex molasse region greatly affects the earth pressure distribution on the tunnel lining and hence results in critical tunnel damage (e.g. cracks and heaving at the tunnel invert). The consolidation-induced structural damage in turn creates new local seepage path around the tunnel circumference for continuous water infiltration and exacerbates further tunnel distress with time.