Large-scale Monitoring of Urban Environments by Fiber-optic Seismology: Lessons from Six Years of the Stanford DAS Project

Professor Biondo Biondi

**Barney and Estelle Morris Professor
Department of Geophysics
Stanford University
U.S.A.**

9 December 2022

10:00 a.m. – 12:00 noon

**Lecture Theatre 5, 2/F., Science Centre
The Chinese University of Hong Kong**

**Zoom Link (Mixed-mode)
ID: 992 4969 9833 Passcode: 983837**

ENQUIRIES   3943 5494
eesc@cuhk.edu.hk

The capability of turning fiber-optic cables into seismic sensors has the potential of providing datasets that "illuminate" Earth processes in a way that would be impossible with data recorded by conventional seismic sensors. Fiber-optic seismology enabled by Distributed Acoustic Sensing (DAS) technology can produce continuous and densely sampled data recorded from difficult to access locations and at an affordable cost.

One of the most exciting applications is leveraging pre-existing telecommunications infrastructure to collect seismic and elastic-deformation data under cities at unprecedented scale and spatial density. I will share what we learned from the experience of continuous recording under Stanford campus that we started in September 2016 and that led to recording data with a 50-km fiber cable this past Fall. I will discuss four of the most promising applications that we are developing: 1) near-surface imaging and monitoring, 2) local-seismicity analysis, 3) infrastructure monitoring, and 4) urban traffic monitoring. I will present the challenges to fully realize these goals and discuss the opportunities for students to develop and apply their technical skills in signal processing, machine learning, and geophysical inversion and to lead the development of this exciting new research field that will have an important role in supporting the long-term sustainability of our cities.
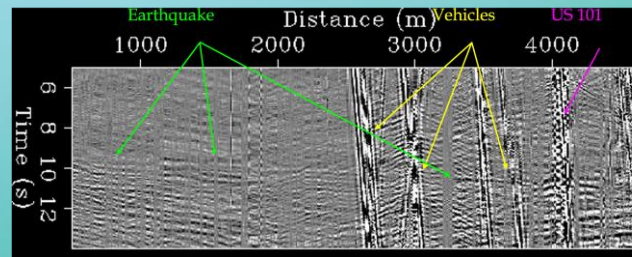
Figure 1: DAS data recorded using a fiber cable owned by the City of San Jose (California) showing many type of events that can be analyzed for monitoring urban environments.