UNIVERSITÀ DEGLI STUDI DI TRIESTE

Stanford Doerr School of Sustainability | Stanford Earth imaging Project

SEG SOCIETY OF EXPLORATION GEOPHYSICISTS

# GEOPHYSICAL MONITORING OF CCS

**Presented by: Prof. BIONDO BIONDI – Stanford University**

**Date: 23.04.2024, 15:00-15:40**

**Classroom: Aula Magna via Weiss 1 (pal.C)**

**Virtual classroom:**

https://teams.microsoft.com/l/meetup-join/19%3ameeting_YWM5YzU5NDEtMWM4My00ZWIxLWE3NjgtNDUyNjRlMDkxNDIz%40thread.v2/0?context=%7b%22Tid%22%3a%22a54b3635-128c-460f-b967-6ded8df82e75%22%2c%22Oid%22%3a%22da00a2aa-4c64-4bcb-a497-1055e4cd2351%22%7d

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# Abstract:


Many contributions from science and technology are required to address climate change that is one of most critical challenges for humanity. Carbon Capture and Sequestration (CCS) is one of the most promising solutions that has the realistic potential of scaling to the necessary level for removing Gigatons of $CO_2$ emissions. Geologic Carbon Sequestration (GCS) is an essential component for many CCS projects, and it requires geosciences innovations to ensure safe and cost-effective storage of large amount of $CO_2$ in the Earth subsurface.

In my seminar, I will present an overview of the geophysical monitoring methods that can be used to monitor $CO_2$ injection projects. Geophysics can be used to track the plume of supercritical $CO_2$ as it expands in the geologic formations designated as containers and verify the integrity of the geologic seal that prevents the injected $CO_2$ from percolating back to the surface. Geophysical monitoring is also essential to manage and mitigate the risk of induced seismicity related to the increase in subsurface fluids pressure. I will focus on seismic methods that can be employed for long term monitoring including some of my students' projects that leverage new technologies such as fiber sensing and machine learning.

# Biography:

**Biondo Biondi**
**Barney and Estelle Morris Professor of Geophysics, Stanford University**

My students and I devise new algorithms to improve the imaging of active and passive seismic data. Images obtained from seismic data are the primary source of information on the structural and stratigraphic complexities in Earth's subsurface and on many subsurface dynamic processes. These images are constructed by processing seismic wavefields recorded at the Earth's surface and generated by either active-source (e.g., vibroseis trucks) experiments or by natural (e.g., ocean waves) and anthropogenic (e.g., vehicle traffic) sources. Because our datasets are enormous, and wavefield propagation needs to be accurately modeled to achieve high-resolution imaging, we need to harness the power of the latest computational hardware to test our methods on field data. Therefore, mapping imaging algorithms into high-performance architecture is an essential component of our research. The amount and quality of information that we can extract from seismic data are directly linked to the temporal and spatial sampling of the sources and the receivers. In the past several years, we have been working on methods to process data recorded by using fiber cables as seismic sensors. Fiber-optic seismic recording promises to enable cost-effective continuous seismic monitoring at a large scale. A particularly exciting possibility is leveraging preexisting telecommunication infrastructure to record seismic data with dense arrays in urban environments continuously. In 2016 we pioneered that idea by recording data under the Stanford campus. Since then, we recorded data in San Jose and on a 48-km array under Stanford and neighboring cities.

**Education**
Ph.D, Stanford University, Geophysics (1990)
M.S., Stanford University, Geophysics (1987)
M.Sc., Politecnico di Milano, Electrical Engineering (1984)