Fault Anatomy and Slip Dynamics along a Continental Plate Boundary: the North Anatolian Fault, Turkey

Professor Francois Renard

Department of Geosciences
University of Oslo

The North Anatolian Fault, the continental boundary between the European and Anatolian plates, shows a variety of slip dynamics. It has been the locus of a sequence of nine major M>7 earthquakes in the 20th century, the last ones being the great Izmit and Dücze earthquakes in 1999. This fault contains several segments where active creep is observed. This creep dissipates around half of the overall tectonic loading. Here, I present the results of geodetic and field studies performed along this plate boundary. Using time-lapse satellite imaging of the fault, bursts of creep, similar to slow earthquakes, could be identified along two fault segments. During these slow events, the fault slips over several millimeters in a couple of weeks from the surface to ~5 km depth, one creep event having an equivalent magnitude of a M > 5 earthquake. To understand the creep behavior more than thirty fault zone outcrops were visited along 400 km of the fault. Fault rocks were sampled to search for minerals and microstructures that could explain the weakness of the fault along the creeping segments. Results demonstrate that the fault is creeping when cross-cutting volcanic rocks that can transform into weak clay minerals. The creep mechanism is also recorded in the microstructures of the weak gouges. These combined geodetic and field studies shed new lights on the dynamics of plate boundaries where both dynamic earthquakes, slow earthquakes and creep are observed and where a strong control of the lithology is correlated to the variety of slip rates.

1 December 2017

11:30 a.m.

Conference Room, 3/F, Mong Man Wai Building

EARTH SYSTEM SCIENCE PROGRAMME

Enquires: 3943 9624 essc@cuhk.edu.hk