BASIN EVOLUTION ALONG CONTINENTAL TRANSFORMS: NESTED HI-RESOLUTION MULTICHANNEL SURVEY IN THE MARMARA SEA, TURKEY

Michael S. Steckler and Marmara Hi-Res Team
Lamont-Doherty Earth Observatory of Columbia University
Palisades, NY 10964 USA
steckler@ldeo.columbia.edu

This project investigates the evolution of the North Anatolian fault (NAF) in the Marmara Sea. This set of continental transform basins offers an ideal setting. It is a fast and young plate boundary whose deformation history is recorded in sediments of syntectonic basins as well as in outcrop on land. Following the devastating 1999 earthquakes, an intense international research effort has been rapidly enriching the pool of available data, offering opportunities for science and risk reduction. Yet, a detailed stratigraphic framework for the 75 x 200 km Marmara Sea is still lacking. High-resolution MCS data in the Marmara Sea can provide images of the stratigraphy of these basins required to decipher their tectonic evolution. This project will contribute to the ongoing international effort with a critical, complementary data set.

Strategy. We propose to acquire a nested grid of high-resolution MCS and gravity data in the Marmara Sea. This project is a collaboration of scientists from the **Lamont-Doherty Earth Observatory** and the **University of California Santa Barbara** in the US, **Istanbul Technical University**, the **Marmara Research Center** and the **MTA** in Turkey, and from the **University of Thessaloniki** in Greece. This project will complement existing and planned data and will be integrated with them. The new data will target syntectonic sediments deposited and deformed during the development of the NAF. Such a synoptic and detailed 4-D view of deposition and deformation will provide powerful new constraints on the development of the Marmara Sea. Existing MTA and older industry MCS data provide the basis for cruise planning and working hypotheses, but have insufficient coverage and resolution to address the evolution of the NAF.

Data Acquisition and Analysis. We will undertake a 35-day leg on using 4 GI guns and a 192-channel 2400-m streamer to obtain MCS images of the strata in the upper 3 km with ~5 m resolution. A 5x7.5 km grid covering the entire Marmara is planned for the first half of the cruise. During the second part of the cruise, we will collect closely spaced (1x2 km) grids in several critical areas. The dense grids will detail the stratigraphic record of deformation and fault motion at crucial bends and junctures in the fault system. Onboard processing will enable us to adjust our track, as needed, based on initial survey results. The results of this cruise will be closely integrated with existing and planned data, which cover complementary spatial scales. The data will also be contributed to the ongoing development of a community database and consensus models for the Marmara region that is the subject of this meeting. We will hold a planning meeting for the cruise at ITU on the Saturday after the workshop.

Scientific Goals. Our acquisition parameters will enable us to collect much higher resolution images of the basin stratigraphy than any previous MCS cruise with a penetration far exceeding single-channel or chirp seismics. The data will have the resolution to image the onlap-offlap sequences that result from fluctuations of sea level and marine/lacustrine transitions in the Marmara Sea. This data set will enable us to map and characterize the strata in the Marmara Sea and reconstruct the tectonics through time. Using these and other available data, we will correlate sequences between basins and develop a Marmara-wide stratigraphic framework based on relative chronology constrained by some absolute ages. Our goal is to use the detailed imagery to examine the role pre-existing structure, the history of strain partitioning, and the evolving plate kinematics of the Marmara Sea.