**TETAM PhD Seminars – 14.12.2018, 10:00-11:35**
**TETAM Roof Conference Hall**

## **Title:** Dynamic Earthquake Rupture Simulations in the Sea of Marmara

**Yasemin Korkusuz Öztürk**

**Abstract:** Locating at the western section of the North Anatolian Fault Zone, Marmara Region is a seismically very active area. The 1912 Mürefte and 1999 Izmit earthquakes are the last devastating events of the western and eastern sections of the region, respectively. The Center of the Sea of Marmara, the region between the epicentral locations of these two earthquakes, is prone to a large earthquake. Therefore, the analysis of the Marmara Sea is significant. The main objective of our study is to determine 3D dynamic earthquake rupture scenarios, concerning non-planar and heterogeneous stress structures in the Sea of Marmara. A Finite Element Model (FEM) is used via PyLith Program. Besides, tetragonal unstructured meshing is used to reduce inaccuracies at the fault bends. Due to the fact that the calculation of the direct stress measurements is not possible, the radiation patterns of seismic waves are used to achieve earthquake characteristics and stress deformations (Kostrov and Das, 2005). Observations of first motion polarities and amplitudes of P-waves provide the information in the direction of radiation of an earthquake. Also, horizontal and vertical motions of the ground surface generally derived from GPS and InSAR data, respectively. They give important knowledge about ground movements during an earthquake. In addition, paleoseismological and historical records present information about previous earthquakes and helps to predict earthquake recurrence intervals, locations and characteristics. Therefore, combinations of results from all above-mentioned methods are used in this study in order to achieve the most reliable possible earthquake scenarios in the Sea of Marmara. In spite of the low number of earthquakes in the Central Marmara Sea, seismic analyses have been restricted, especially until the installation of 15 new OBSs in 2015 as a part of the MarDiM Project. Thus, in addition to our previous five cluster analyses in the Marmara Sea (Korkusuz Öztürk et al., 2015), a new earthquake cluster is analyzed in the Central Marmara Basin by the extension of the time interval of our data set from five to eight years (Korkusuz Öztürk and Meral Özel, 2018) before starting to prepare our initial fault models for the dynamic rupture simulations. Besides, relative locations of the six clustered earthquakes are re-identified via hypodd technique with the aim of the definition of fault dipping angles and seismically active zones. Although fault vertical angles are still not clear, important information is gained about the seismogenic zones. Next, a two-dimensional dynamic earthquake rupture simulation code based on the general BIEM, in C programming language, is written using the technique of Cochard and Madariaga (1994), in order to have a better understanding on the physical and numerical parameters of the dynamic earthquake fracture simulations. Furthermore, a three-dimensional Fast Domain Partitioning Method for Dynamic Boundary Integral Equations is modified for a master test case to work on the MMF in the future. On the other hand, despite of the decrease of time dependent equations in this method, kernels (jacobians) of the equations are still very large and require very high computational demand, and the code has some stability problems in the ground surface. As a result, a general Finite Element Method (PyLith) is selected to derive three-dimensional dynamic earthquake rupture simulations, after a lot of iterations for some SCEC test cases. Studies on three-dimensional dynamic earthquake models for the non-planar and heterogeneous Main Marmara Fault are still continuing.

**Bio: She is a geophysicist with a background of physics. She has been recently involved in TRIDEC, CTBTO, MARSITE, ASTARTE FP7 European Union and MarDIM (Satreps), Turk-Japan projects. She has expertise on "3D and 2D Dynamic earthquake rupture simulations based on FEM and BIEM" and "analysis of seismotectonics of the Marmara Region, via sensitive individual and relative earthquake locations, focal mechanism solutions and stress tensor analyses". She also has experience on kinematic earthquake rupture modeling. She currently works for the achievement of 3D dynamic earthquake rupture simulations in the Marmara Sea concerning non-planar and heterogeneous fault structures through the MarDIM project. She also works as a researcher in the department of Geophysics and basic disaster awareness educator (as a volunteer) in the Basic Disaster Awareness Unit, in Kandilli Observatory and Earthquake Research Institute, Boğaziçi University.**

## **Title:** Analysis of the Repeating Earthquakes in the Marmara Sea

**Nilay Başarır Baştürk**

**Abstract:** The high seismicity of the Marmara region is mostly controlled by the North Anatolian Fault, which runs from East to West of the Turkey, for over 1500 kilometers. It is expected that approximately 80-120 km long part of the North Anatolian Fault, passing through the Marmara Sea, will be broken due to the increasing stress accumulation after the 1999 Izmit Earthquake. Observations of the small earthquakes with the sensitive seismographs and associating these earthquakes with the fault motions are important to investigate the fault zone in detail. Furthermore, the search of the small repeating events will enable us to find out if there is a slow slip in this area. This knowledge is cruical to understand whether the rupture will occur in one segment of the fault or not, and how much displacement this rupture will produce. The objective of this study is to analyze the seismic signals received from the ocean-bottom seismographs and detect the small events to comprehend the properties of the fault and the slip occurred on the western portion of the North Anatolian Fault in the Marmara Sea.

**Bio: Nilay Başarır Baştürk is a Phd student in the Department of Geophysics at the Kandilli Observatory & Earthquake Research Institute (KOERI), Bogazici University. She obtained a B.S.degree (2007) in Geophysical Engineering from Çanakkale 18 Mart University,Turkey. She got MSc degree (2011) from Boğaziçi University. She participated in BAP (Scientific Research Project) from 2009 to 2011, named as "Digitizing the Seismic Traces Using Vectorization Method". She has been also involved in NESAP 2012-2023 (National Earthquake Strategy and Action Plan), to create a digital database containing historical earthquakes in Turkey. She has also worked in Marsite and Mardim Projects. Her scientific research areas are historical seismology, seismic waveform analysis and calculation of the seismic parameters.**

## **Title:** Developing a Complete Framework for Sentiment Analysis in Turkish

**Cem Rıfkı Aydın**

**Abstract:** Sentiment analysis has attracted a lot of research recently, especially due to the massive increase in the use of social media. Although many studies have been conducted in this field for many widely-spoken languages, this topic is still immature for Turkish. The works carried out in this language mostly leverage supervised methods, relying on annotated datasets of large sizes. On the other hand, the unsupervised methods utilized for this language depend on the use of lexicons which are not well-established and not adaptable to different domains. To overcome this issue, we propose an approach which is domain-specific and which has not been implemented for Turkish so far. We combine the supervised and the unsupervised techniques, and hereby achieve higher accuracies than when we use only either of them. Also, we combine contextual and supervised information with the general semantic representations of words, occurring in the official Turkish dictionary to generate word embeddings. Using these approaches along with several novel feature engineering techniques, we have achieved state-of-the-art success rates for the movie and Twitter datasets in Turkish. In this term, we have been building a comprehensive sentiment analysis framework for Turkish, including aspect-based analysis, which has not been realised thus far.

**Bio: Cem Rıfkı Aydın is a Ph.D. candidate in Computer Engineering at Boğaziçi University. He earned his B.Sc. degree from Bahçeşehir University in Computer Engineering and M.Sc. degree from Boğaziçi University in Computer Engineering. He has been supported by the TAM Project and TÜBİTAK BIDEB 2210 during his Ph.D. studies. His research interests include natural language processing, machine learning, and sentiment analysis.**