Geophysical Research Abstracts
Vol. 13, EGU2011-1744-1, 2011
EGU General Assembly 2011

Seismic Hazard Assessment for Southern Caucasus-Eastern Turkey Energy Corridor

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The Southern Caucasus-Eastern Turkey energy corridors are formed by several critical pipelines carrying crude oil and natural gas. Among them, the Baku-Tbilisi-Ceyhan (BTC) Crude Oil Pipeline and Baku-Tbilisi-Erzurum Natural Gas Pipeline (BTE) have been constructed to transport oil and gas from Azerbaijan, via Georgia, to Turkey and world markets. BTC and BTE Pipelines cross several active tectonic entities that have experienced large earthquakes in the past. To our knowledge, none of these pipelines has ever been evaluated comprehensively (other than the standard code-based design studies) for their seismic safety and risk. None of the pipelines has any type of seismic monitoring system.
Past earthquakes have clearly shown that earthquakes cause major damage to pipelines, not only direct damage (such as the interruption of flow due to breakage, huge repair and restoration costs, widespread fires, environmental pollution), but also indirect economic losses due to business interruptions and disruptions on other lifelines (e.g., power, water, and communication lines).

One of the aims of the current NATO SfP Project that has been carried on with Turkish, Georgian and Azerbaijan researchers is to conduct deterministic and probabilistic seismic hazard maps for Azerbaijan, Georgia and North Eastern Turkey. The seismicity database is gathered from numerous sources, and the tectonic setting of regions has been studied in detail by each country. Seismic source zones and seismicity parameters prepared individually by each country were combined to obtain homogeneous probabilistic hazard maps through the 20 km wide pipeline route. Resultant probabilistic and deterministic seismic hazard were calculated for 10% and 2% probability of exceedance in 50 year return period in terms of PGA, PGV, PGD and SA contour maps. Those maps will be utilized to identify the vulnerable segments of the pipelines to earthquakes, and provide mitigation strategies by performing a comprehensive seismic risk study.