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Seismic Capacity-Building to Enhance Event Location and Regional Tectonic Understanding

Lawrence Livermore National Laboratory works through the National Nuclear Security Administration's Seismic Cooperation Program to train and pursue joint studies with seismologists in the Middle East and Southeast Asia. These activities offer a model for capacity-building that strengthens regional scientific communities and monitoring of the Comprehensive Nuclear-Test-Ban Treaty (CTBT). Collaborative projects include operating high-quality seismic instrumentation, sharing data using seismological tools (e.g., Seisan and SeisComp3), developing regional lithospheric models, and producing seismic hazard maps. While these projects are only beginning in Southeast Asia, in the Middle East they already show important findings. For example, studies reveal fundamental differences in the velocity structure of the uppermost mantle of the Arabian Shield and Arabian Platform. The earth's crust is relatively thicker in the Mesopotamian Foredeep, characterized by thick sediments. Further, coda magnitude calibration of small- and moderate-size events is conducted on a local/regional scale. The knowledge and analytical techniques gained by National Data Center staff and affiliated scientists are used in earthquake hazard mitigation, tsunami warning, and CTBT monitoring. Data from national seismic networks and derived measurements are integrated into lithospheric velocity, attenuation, and source models to increase resolution, improve event location accuracy and source parameter determination, and advance regional tectonic understanding.

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