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ABSTRACT

Saudi Arabia is an area, which is characterized very poorly seismically and for which little existing data is available. While for the most parts, particularly, Arabian Shield and Arabian Platform are aseismic, the area is ringed with regional seismic sources in the tectonically active areas of Iran and Turkey to the northeast, the Red Sea Rift bordering the Shield to the southwest, and the Dead Sea Transform fault zone to the north. Therefore, this paper aims to improve the level of seismic hazard parameters by improving earthquake location and magnitude estimates with the Saudi Arabian National Digital Seismic Network (SANDSN).

We analyzed earthquake data, travel times and seismic waveform data from the SANDSN. KACST operates the 38 station SANDSN, consisting of 27 broadband and 11 short-period stations. The SANDSN has good signal detection capabilities because the sites are relatively quiet. Noise surveys at a few stations indicate that seismic noise levels at SANDSN stations are quite low for frequencies between 0.1 and 1.0 Hz, however cultural noise appears to affect some stations at frequencies above 1.0 Hz.

Locations of regional earthquakes estimated by KACST were compared with locations from global bulletins. Large differences between KACST and global catalog locations are likely the result of inadequacies of the global average earth model (iasp91) used by the KACST system. While this model is probably adequate for locating distant (teleseismic) events in continental regions, it leads to large location errors, as much as 50-100 km, for regional events.

The paper presents detailed analysis of some events and Dead Sea explosions where we found gross errors in estimated locations. Velocity models are presented that should improve estimated locations of regional events in three specific regions: 1. Gulf of Aqabah - Dead Sea region 2. Arabian Shield and 3. Arabian Platform. Recently, these models are applied to the SANDSN to improve local and teleseismic event locations and to develop an accurate magnitude scale for Saudi Arabia.