STUDIES RELATED TO THE CHARLESTON, SOUTH CAROLINA, EARTHQUAKE OF 1886 – TECTONICS AND SEISMICITY. Edited by Dallas L. Peck (1983). U. S. Geological Survey Professional paper No. 1313, 375 pages and 8 plates (Available from the Distribution Branch, U. S. Geological Survey, 604 South Pickett Street, Alexandria, VA 22304, U. S. A.).

The interplate Charleston earthquake of 1886, with an estimated magnitude of 7, is the most significant event in the seismicity record of the southeastern United States. Beginning from 1973, the U. S. Geological Survey, with support from Nuclear Regulatory Commission, has carried out detailed investigations in and around the 1886 Charleston earthquake zone to discover its cause and evaluate the potential for additional large earthquakes in this region. Whether the Charleston area differs tectonically, in any significant manner, from the rest of the Southeastern United States, is also being evaluated. The investigations in 1973 began with the installation of a seismic network. Geological and geophysical field investigations began in 1975. Preliminary results of these investigations were published in 1977 in USGS Professional Paper 1028.

This volume, under review, includes twenty papers. The first section, 'Studies of the Clubhouse Crossroads Test Holes', deals with multidisciplinary studies of the material recovered from the three test holes. There are five papers in this section. The first paper by Gottfried *et al* investigates the geochemistry and tectonic significance of subsurface basalts. It is concluded that the spatial distribution of olivine – normative magma types in the province is not related to any significant change in tectonic environment. The second paper by Lanphere deals with $^{40}Ar/^{39}Ar$ total fusion ages of basalt. Only three samples have been examined and the ages have been found to be consistent with emplacement of the intrusions about 190 m.y. ago, soon after the initiation of Central Atlantic rifting. The third article by Phillips deals with paleomagnetic investigations of basalts. The age of basalts is estimated to have a 95% chance of being in the range of 110 – 196 m.y. The last two papers of this section by Gohn *et al* and Gohn deal with the geology of the Lower Mesozoic sedimentary rocks and basement rocks in the Charleston area.

In the second section, 'Geophysical Surveys', results of a variety of seismic experiments are reported in five papers. The first paper by Ackermann gives results of 35 seismic refraction surveys enclosing the zone of intensity X of the Charleston earthquake. A 6.0 to 6.4 km/sec velocity layer, with depths varying from 700 to 2400 m, is interpreted to represent the pre-Mesozoic crystalline basement complex. Refraction arrivals could also be identified from a shallower, gently seaward sloping horizon, marking the base of the Cretaceous section. On the basis of these refraction studies, certain faults are inferred and a causal relationship between these faults and the 1886 Charleston earhquake is suggested. Yantis *et al* describe results of three seismic reflection lines. No faults were detected on any of these lines. Schlit *et al* describe the results of COCORP surveys along four lines totalling 72 km where details of sub-surface structure are further delineated. Hamilton *et al* report the results of land multichannel seismic reflection profiles where certain tectonic features, which may have causal relationship with Charleston earthquake, have been identified. In the last paper of this section, Behrendt *et al* report on the evidence for Cenozoic faulting and deep crustal structure near Charleston based on multichannel seismic reflection data combined with single channel,

high resolution reflection profiles collected offshore from Charleston. Certain geological features have been identified and Charleston seismicity is suggested to have been caused primarily due to movements along the décollement and high angle reverse fault.

The third section, 'Regional Studies', has six papers dealing with subsurface distribution of rocks (Daniels *et al*, and Chowns and Williams), K-Ar relations in diabase dikes of Georgia (Dooley and Wampler), structure of the continental margin (Dillon *et al*) and basement (Dillon and McGinnis) offshore South Carolina, and Mesozoic tectonics of the Southeastern United States coastal plain and continental margin (Klitgord *et al*).

The last section, 'Seismological Studies', has four papers. Dewey has relocated instrumentally recorded pre-1974 earthquakes in the South Carolina region using a regional velocity model and station travel time adjustments. All the nine pre-1974 earthquakes, within 100 km of Charleston, are consistent with their occurrence in the Middleton Place—Summerville zone. Tarr and Rhea discuss the seismicity for the period 1973 through 1979 near Charleston and suggest that the current activity in the Middleton Place—Summerville seismic zone is in the fault zone of the 1886 Charleston earthquake. Wentworth and Mergner-Keefer present a concept of 'Atlantic Coast Domain' and infer that earthquakes, at least as large as the 1886 Charleston earthquake, could occur in most parts of the domain. In the last paper of this volume, Bollinger speculates on the nature of seismicity at Charleston. A single source zone localized by intersecting structures is suggested as the cause of both the current Charleston area seismicity and the 1886 earthquake. A paper on 'Fossil Seismicity' should have been included.

This volume has 8 very useful plates where detailed information on seismic record sections, magnetic anomalies, and regional geology has been provided. All the papers are well written and documented. Significant progress has been made towards the understanding of Charleston seismicity. However, it has not yet been possible to relate young structures unequivocally to seismicity and for this, investigations need to continue.

I recommend this volume to all concerned without any reservation.

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