available. Thus, possible causes of stress must be examined both theoretically and in light of the available data to determine if the major causes of the observed stress field can be explained.

Potential causes of stress in the eastern United States can be classified into four groups:

- o Large-scale mantle processes
- o Small-scale mantle processes
- o Crustal-scale generators
- o Local generators

Large-scale mantle processes are those that drive the lithospheric plates. These processes are expected to affect the stress field over very large regions, and to produce stresses that vary gradually in average magnitude. "Ridge-push" results from gravitational effects on oceanic crust as it cools, contracts and moves away from oceanic ridges. "Slab-pull" describes the force produced by the negative bouyancy of a sinking plate that is cooler than the surrounding mantle. In addition, shear stresses at transforms boundaries, basal shear stresses, and resistive stresses at subduction zones also can contribute to the stress state in the plate (Richardson et al., 1979; Richardson, 1984). Finite element models of the forces that drive the plates worldwide (Richardson et al., 1979; Richardson, 1984), suggest that "ridge-push" is the most important force affecting the state of stress in the eastern United States. Basal drag also could produce the pattern of observed stress directions, but would produce a different pattern of stress magnitude variations. Basal drag is less likely, however, on the basis of global considerations (Richardson, 1984).

Small-scale mantle derived stresses could be associated with upwelling mantle plumes. The thermal anomaly produced by a plume would likely cause uplift and induce a radial pattern of stress directions. Thus heat flow, stress, crustal uplift and gravity data might be useful in identifying any regions where such processes are active.

Crustal generators of stress involve variations in crustal thickness and density, and crustal loading that produces flexure (Richardson, 1984; Artyushkov, 1973; Fleitout and Froidevaux, 1983; Karner and Watts, 1983; McNutt, 1984; Turcotte, 1984). Gravity, seismic refraction, seismic travel-time residuals, P_n velocity data, and geologic data can be used to identify areas in the eastern United

Table 4-1

GENERIC MATRIX OF PHYSICAL CHARACTERISTICS
AND ASSOCIATED PROBABILITIES OF SEISMIC POTENTIAL

GEOMETRY RELATIVE TO STRESS/SENSE OF SLIP	ASSOCIATION WITH SEISMICITY					
	Moderate-to-Large Earthquakes		Small Earthquakes Only		No Seismicity	
	Favor-able	Unfavor-able	Favor-able	Unfavor-able	Favor-able	Unfavor-able
DEEP CRUSTAL EXPRESSION						
Deep Crustal Expression (> 10 to 20 km) and Proximity Intersections Crustal Structs	0.99	0.90	0.60	0.51	0.02	0.015
Deep Crustal Expression Without Proximity to Crustal Intersections	0.94	0.86	0.53	0.44	0.015	0.010
No Deep Crustal Expression	0.80	0.68	0.28	0.17	0.010	0.005