NEOTECTONICS AND INTRAPLATE SEISMICITY, A GLOBAL PERSPECTIVE

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ABSTRACT: Defining intraplate seismicity and active tectonics is problematic because it is difficult to agree on how far active faulting must be from a plate boundary to be considered intraplate. When we agree on this, we are then faced with the problem of what is driving intraplate tectonics. Many Earth Scientists believe that plate margin stresses are transmitted into the interior of plates and that plate interiors are near failure. If correct, then Quaternary intraplate fault zones are due to local stress concentration, local low rock strength, or a combination of both. Explanations for a local stress concentration or local decrease in rock strength include, plutons, high heat flow, ice sheet unloading, optimally oriented basement rifts, hotspot tracks, erosional unloading, and migration of fault activity by stress transfer. The most often cited requirement for Quaternary faulting is pre-existing basement faults that are favorably oriented for high shear stress in the contemporary stress field. This approach is applied to the eastern United States where seven fault domains are identified. Internally, the fault domains have dominant fault orientations that are subject to activation in the contemporary stress field. These fault domains are separated by sealing boundaries, which are zones of metamorphism that have no through-going brittle fault zones. Favorably oriented pre-existing strike-slip and normal faults are apparently necessary, but may not be sufficient for Quaternary faulting to occur. For example, segments of the Proterozoic Mid-Continent Rift of the north-central United States are well oriented for reactivation within the regional stress field yet show no evidence of Quaternary faulting. However, the Reelfoot Rift of the south-central United States has earthquakes (New Madrid seismic zone) occurring along basement faults that formed during the Proterozoic and Cambrian. A major difference between these rifts is their histories. The Reelfoot Rift faults were reactivated during the Paleozoic and Mesozoic and since the Late Cretaceous underlie the Mississippi Embayment and Mississippi River. Quaternary erosion of the Mississippi River Valley above the New Madrid seismic zone has apparently altered the local stress field and reactivated these basement faults. In this presentation I will summarize our understanding of one of the more intensely studied intraplate seismic zones – the New Madrid seismic zone. By comparing the New Madrid seismic zone to other intraplate seismic zones from around the world we should be able to ascertain if there are common themes that shed light on Quaternary intraplate faulting.