

THE PARADOX OF LOW-ANGLE CRUSTAL FAULTING AND RUPTURING OF CONTINENTS

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The rupturing apart, or rifting, of continental crust is an important yet poorly understood geological process. Scientists seek a better understanding of how the crust and lithospheric mantle thin and deform during rifting, which is often followed by seafloor spreading. Field evidence from the Basin-and-Range province, the Aegean, New Guinea and elsewhere suggests that slip on low-angle (5° - 20°) normal faults plays a fundamental role in thinning of the continental crust during rifting. However, the very existence of active, low-angle normal faults has been strongly contested on both experimental and theoretical grounds. Theory suggests that normal faults form at dips greater than 45° and lock at less than 30° . Based on this, intraplate earthquake studies, and on laboratory results, some geologists think that intra-continental detachments were originally formed as high-angle features that subsequently rotated into their present low-dipping geometry. Such formation would require that the fault be extremely weak to allow horizontal stresses to cause failure on low-angle fractures. The nature of this weakness may be caused by fluids or by fluid-rock reactions within the fault zone. Dr. Karner will address this controversy that has arisen in the Geological Sciences and will discuss the relevant results from recent ODP drilling. Dr. Karner was a shore-based collaborator for ODP Leg 121 and a Physical Properties Specialist on Leg 180.