



Variation in Extension Style with Change in Extensional Velocity: Tectonics of the Northern Volcanic Zone, Iceland

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In both continental and mid-ocean extensional regimes, deformation is accommodated in a variety of manners ranging from local focused extension (typically with high angle extensional structures) to broader zones of extension characterized by low-angle detachments and the exposure of extensional allochthons often termed core complexes. In the region of intersection between the Northern Volcanic zone and the Tjornes Fracture zone in north-central Iceland we have an ideal location to study the interplay between extensional style and extension rate. Across the Husavik-Flatey Fault (HFF; a transform fault linking a segment of the rift zone to the offshore mid-ocean ridge) the extensional rate changes from approximately 20 mm/yr (south of HFF) to 10 mm/yr (north of HFF). This change in extension rate is accompanied by a fundamental change in style of extension. In the 20 mm/yr region, extension is more localized to discrete well-developed normal faulted rift, with dominantly block motion away from the rift. North of the HFF where extension rates are approximately $\frac{1}{2}$, extension is regionally distributed topographic features analogous to core-complex structures have formed. Because the landscape has been resurfaced post-glacially by a series of lava flows, we are able to observe the detailed kinematics of this change in extensional style as preserved in the landscape. Our preliminary analyses lead us to propose that the development of detachment fault style extension requires low extension rates in the 10 mm/yr or slower range. This region of the Northern Volcanic zone is relatively amagmatic implying that a limited magma supply may also help to drive the detachment style of extension.