ment and thus fracture propagation was dominantly mode I-III. In addition, during major fault development, subsidiary fracture propagation can significantly alter stress trajectories around the parent fault and introduce local dilatant zones that are misaligned with far-field $\sigma^3$. As such, the combination of a far-field transpressive stress regime and local stress perturbations are considered feasible mechanisms for controlling dyke orientation around major displacement surfaces.

## Controlling mechanisms for dyke emplacement and fluid flow around strike-slip faults in the Campbellton region, northern New Brunswick

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In a strike-slip regime, the bulk compressive stresses are near horizontal, and as such there has been much debate about the space generating mechanism required for magma emplacement. In the Campbellton region of New Brunswick numerous intermediate, fine- to medium-grained sheets intrude Late Ordovician to Late Silurian, sedimentary rocks and Early Devonian, subvolcanic to subaerial igneous rocks. Intrusions are most prevalent proximal to regional-scale, strike-slip faults where cross-cutting relationships indicate coeval magma emplacement and fault displacement. In sedimentary rocks, intrusions are typically oriented along a pre-existing fabric (bedding) along which abundant bedding-parallel slip has occurred.

Analysis of fault orientation and movement history allows for an approximation of the far-field stress directions, with $\sigma^1$ oriented WNW-ESE. Traditional theories on magma emplacement in strike-slip regimes suggest that magma should orient itself perpendicular to the maximum tensile stress. However, in the study area, this is uniformly not apparent with all intrusions oriented oblique to, or parallel with, far-field $\sigma^3$.

It is very difficult for a dyke to intrude a pre-existing fracture that is misaligned with $\sigma^3$ unless the resolved shear stress on the plane is small relative to excess magma pressure, or the effective dyke-normal stress is small relative to the rock tensile strength. Without these conditions the magma will propagate into a self-generated crack perpendicular to $\sigma^3$. During mode I-II fracture propagation, maximum tensile stress occurs at the dyke tip and parallel to the dyke; thus, if the tensile stress exceeds the tensile strength of the rock, the dyke cannot propagate into the pre-existing plane. However, for mode I-III fractures effective tension at a dyke tip is significantly lower and may allow propagation along the pre-existing front. The Campbellton region experienced a transpressive stress regime during dyke emplace-




Atlantic Geology, 2011, Volume 47, Number 1