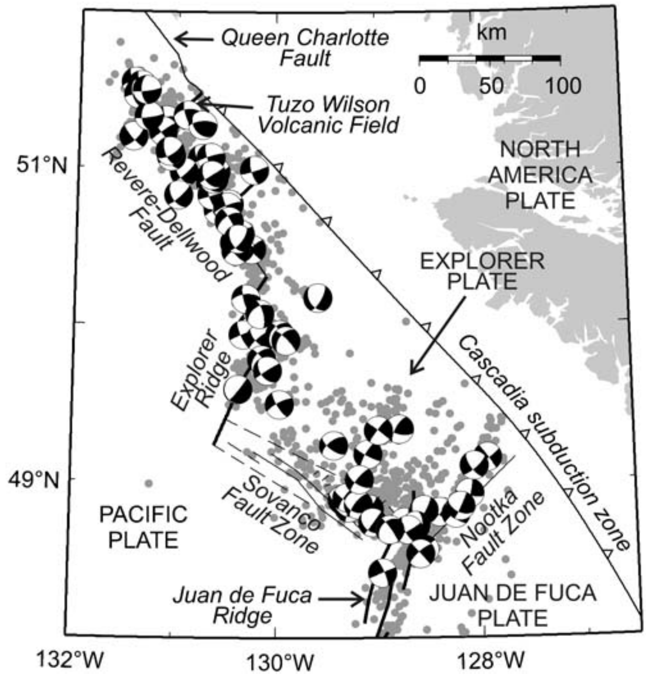

Figure 9. Earthquakes in the Nootka fault zone and Explorer plate area. Beach balls are moment-tensor solutions for earthquakes greater than magnitude 4.5 during 1995–2008 (see the Data and Resources section). Gray dots are other earthquakes ($M > 3$) during the same period.

at least 20 mm/yr of left-lateral shear (Riddihough, 1984). The orientation of the NFZ is highly oblique to the spreading ridge, and due to its unstable configuration, new faults must be created as the spreading at the ridge continues. Therefore, unlike transform faults such as the Mendocino fault that are weak in shear, the NFZ accommodates a large shear force. This NFZ shear can induce a counterclockwise torque on the JDF plate to balance the clockwise torque discussed previously. Wang *et al.* (1997) have shown that other forces such as ridge slide (also known as ridge push) and basal drag (viscous resistance on the base of the JDF plate) are less important in controlling stresses in the JDF plate.

The NFZ shear also affects the deformation of the Explorer plate northwest of the NFZ. Focal mechanisms of earthquakes within the Explorer plate are similar to those along the NFZ (Fig. 9). These earthquakes appear to represent right-lateral motion of strike-slip faults that are oriented almost perpendicular to the NFZ. These faults are probably modern or reactivated transform faults offsetting the Explorer ridge that forms the northwestern boundary of the Explorer plate. Different from the Gorda region, the Explorer plate mechanically is no longer a part of the JDF plate. Its kinematics are still under debate. According to a widely accepted model (Riddihough, 1984; Riddihough and Hyndman, 1989), it is moving more or less coherently with respect to North America at about half of the rate of the JDF plate. According to a later proposed model (Rohr and Furlong, 1995), the Explorer plate no longer exists, with a part of it captured by the North America plate and the rest by the Pacific plate. Rohr and Furlong (1995) proposed that a north-northwest trending right-lateral fault dividing the Pacific and North America plates has formed from the intersect of the NFZ and JDF ridge to the Tuzo Wilson volcanic field. The modern seismicity and focal mechanisms (Fig. 9) appear to be more consistent with the widely accepted model (see also Braunmiller and Nábělek, 2002), but the ongoing debate certainly reflects the complexity of this area.

Transform Push and North–South Compression Near the MTJ

Near the MTJ, the JDF plate prior to and just after subduction (subregions D1 and D2) is under north–south compression. The compression is obviously caused by the northward-moving Pacific plate pushing against the JDF plate, balancing mainly the margin-parallel slab resistance acting on the slab (Fig. 10). This push by the Pacific plate across the Mendocino transform fault is referred to as the transform push (Wang *et al.*, 1997). The margin-parallel mantle resistance integrates along-strike, such that the north–south compression is the greatest at the southern end of the JDF plate (Wang *et al.*, 1997). However, as suggested by Wang and Rogers (1994), strong compression is present only before and right after the plate starts to subduct. The deeper part of the slab is free of this effect because there is no longer a plate to provide transform push from the south. The absence of the transform push to balance the southerly mantle resistance to slab motion has important implications to slab deformation beneath northern California, impacting the debate on whether there is a stretched slab or a slab gap in the wake of the northward motion of the southern edge of the JDF plate (ten Brink *et al.*, 1999). According to the results shown in Figure 7c, the deeper part of the slab is similar to most of the northern Cascadia, in a slab-pull-dominated state of downdip-tension and slab-normal compression.

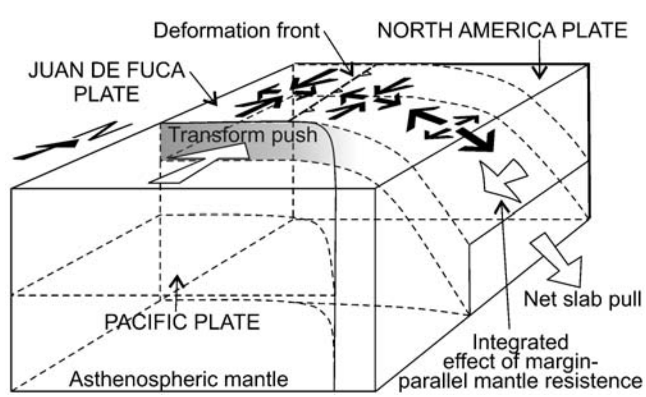

Figure 10. Diagram showing the tectonic structure of the Mendocino triple junction area and in-plate deviatoric stresses (thick black arrows) in the southernmost JDF plate. White arrows are forces acting on the plate.