Plate rates

Fracture zones

North Atlantic Spreading Jumped to Iceland Hotspot
Driving forces

No strong relationship between plate size and rate. Suggests asthenospheric push/drag is not very important.

Plate rates

No strong relationship between ridge length and rate. Suggests Ridge Push is not very important.
Strong positive relationship between circumference of plate as subduction zone and rate. Negative buoyancy is important.

Pacific fast. Lots of trench
India fast. Still responding to subducted ocean

Strong negative relationship between continental area of plate and rate.
Continents are slow. Why Deep keels (drag) or lack of trenches?

Summary

85% of the driving force of plate tectonics is slab subduction (negative buoyancy).

10% of the driving force is trench pull (coming up).

5% other forces

The cooling effect associated with ridge systems is the **key factor** responsible for plate tectonics.

Subduction Angle
Subduction Angle

Trench suction

Ridge hits trench

Fig. 8. The oblique consumption of the Nazca and Juan Fernandez Ridges in the eastern South Pacific and the Mariana Trench, and Louisville Rises in the western Pacific is associated with subduction generation. These gaps, possibly due to divergent plate motion, may transiently behave behind the moving contact between the ridge and the overlying plate [Nor and Ben-Avraham, 1985].
San Andreas Evolution

- 38 million years ago
- 25 million years ago
- 10 million years ago
- Present

**EXPLANATION**
- Spreading center (divergent boundary)
- Subduction zone (convergent boundary)
- Transform fault, arrows
- Other relevant information

**Legend**
- Triple plate junction
- M. Mendocino
- R. Rivera

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Slab Window

Fig. 3-14: Sketch map illustrating inferred growth of nodal regions along transform plate boundaries in subduction zone of the western United States, and relationships to timing of northeast retreat of southern termination of Colorado magmatic arc and to onset of Basin and Range province of widespread extensional deformation. Adapted from Dickinson and Snyder (1978).