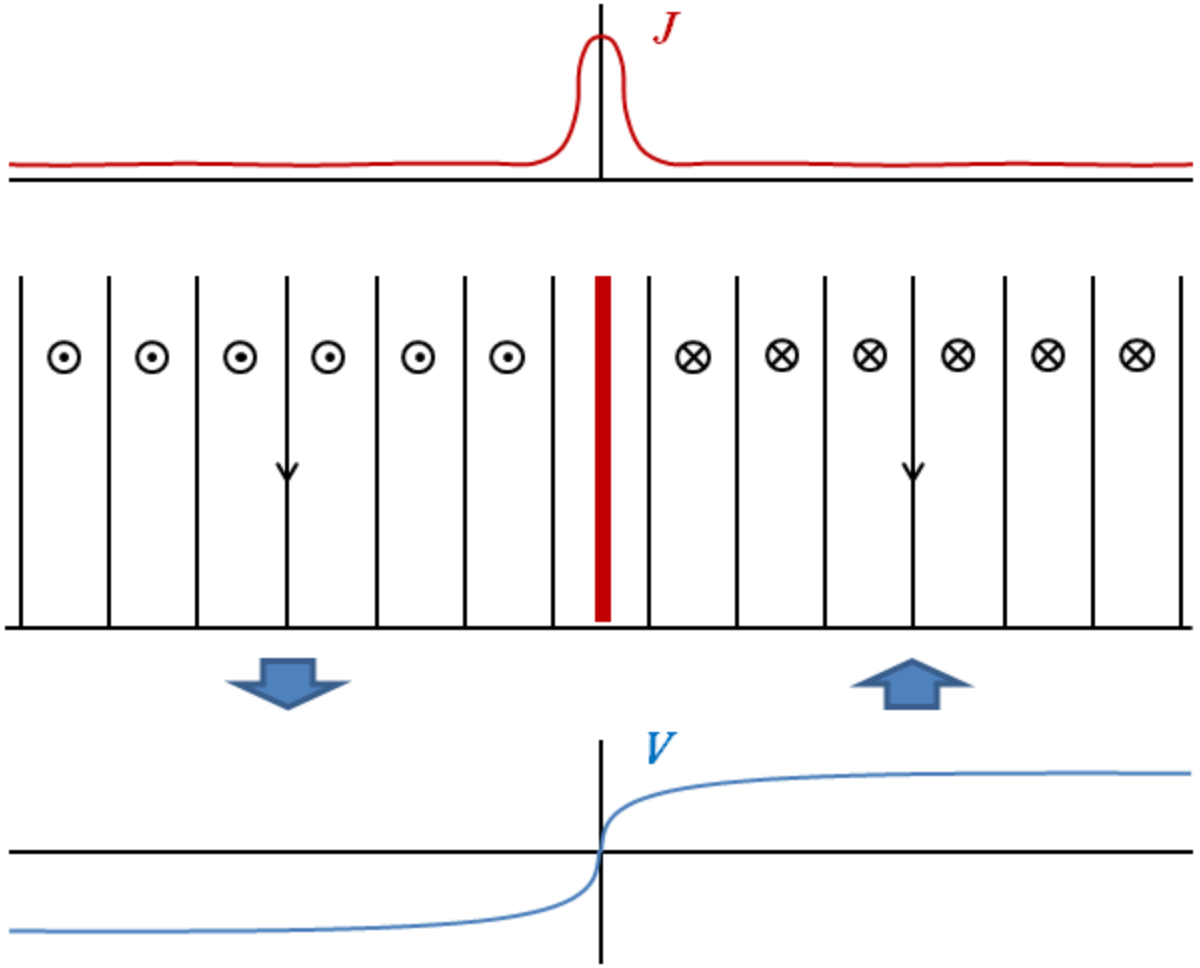
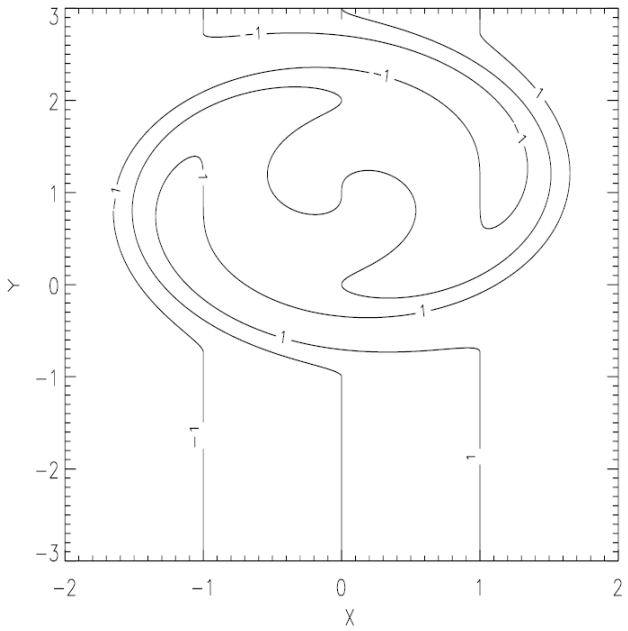
Uniform Field, Highly Structured Flows

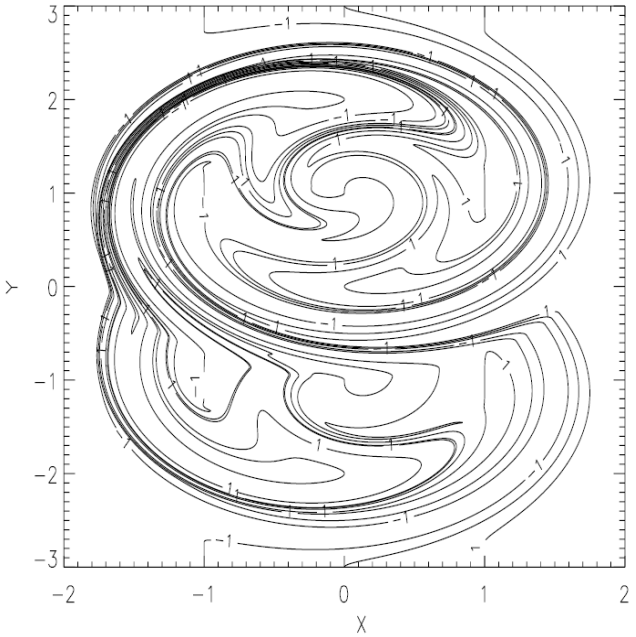


Uniform Field, Time Variable “Smooth” Flows

One Half Turn



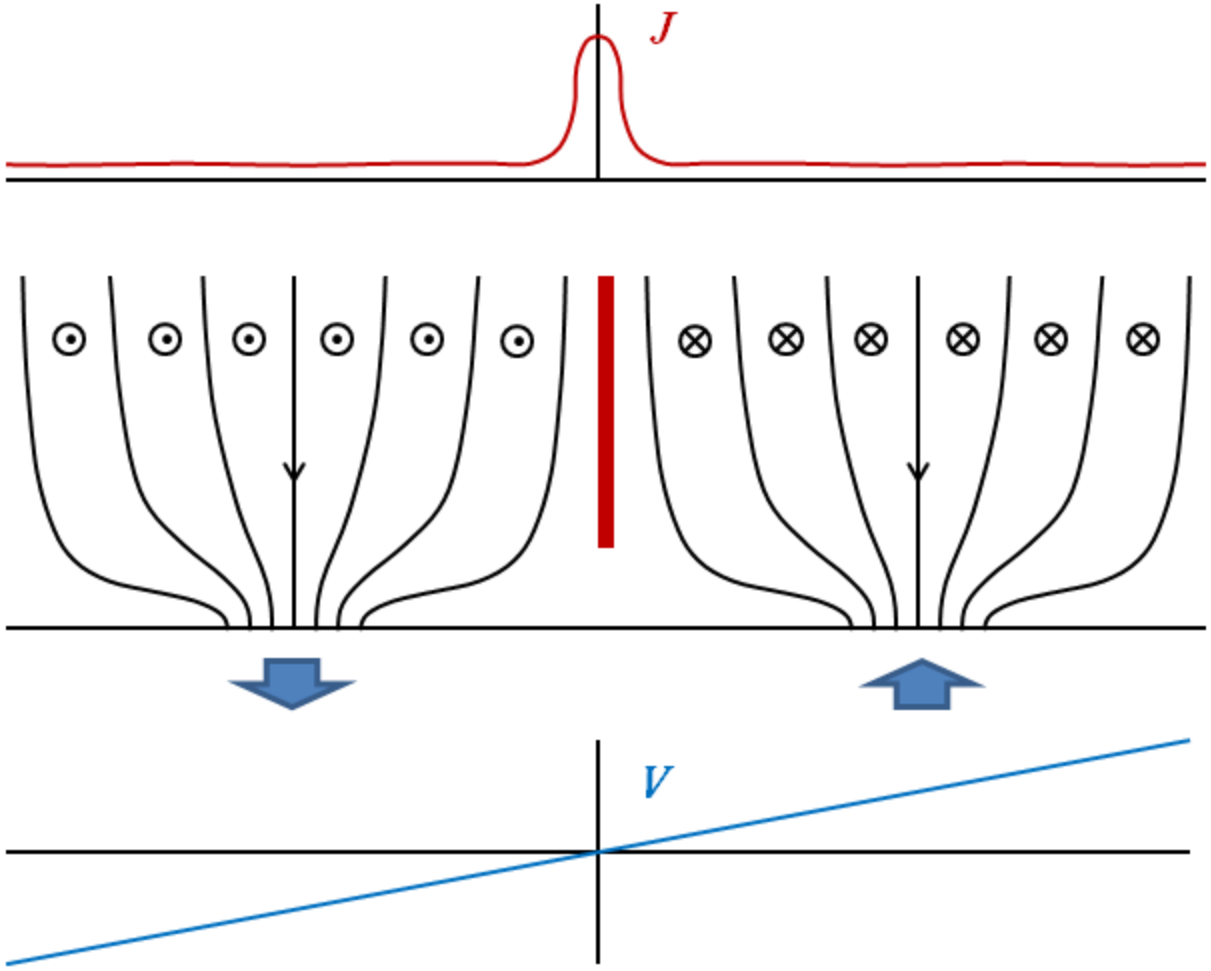
Four Half Turns



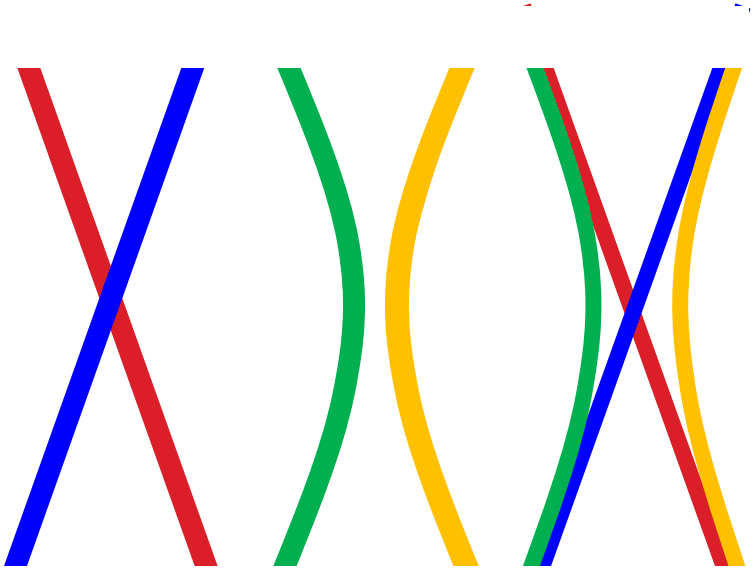
Antiochos & Dahlburg (1997)

Current density grows at an exponential rate (van Ballegooijen 1986)

Clumpy Field, Time Variable “Smooth” Flows



Partial Flux Tube Reconnection



Partial reconnection doubles the number of topologically distinct flux tubes from 2 to 4.

Doubles the number of separatrix surfaces that become current sheets.

Each flux tube can reconnect with multiple neighbors, so we expect a proliferation of current sheets.

Many Different Causes of Current Sheets

1. Highly fragmented photospheric field (elemental kG flux tubes)
2. Complex photospheric flows (steep gradients, stagnation points)
3. Partial reconnection of elemental flux tubes
4. Ideal and quasi-ideal instabilities (e.g., kink instability)
5. Reconnection driven current filamentation (patchy reconnection)

We expect a proliferation of current sheets, with far more than 100,000 in a single active region.