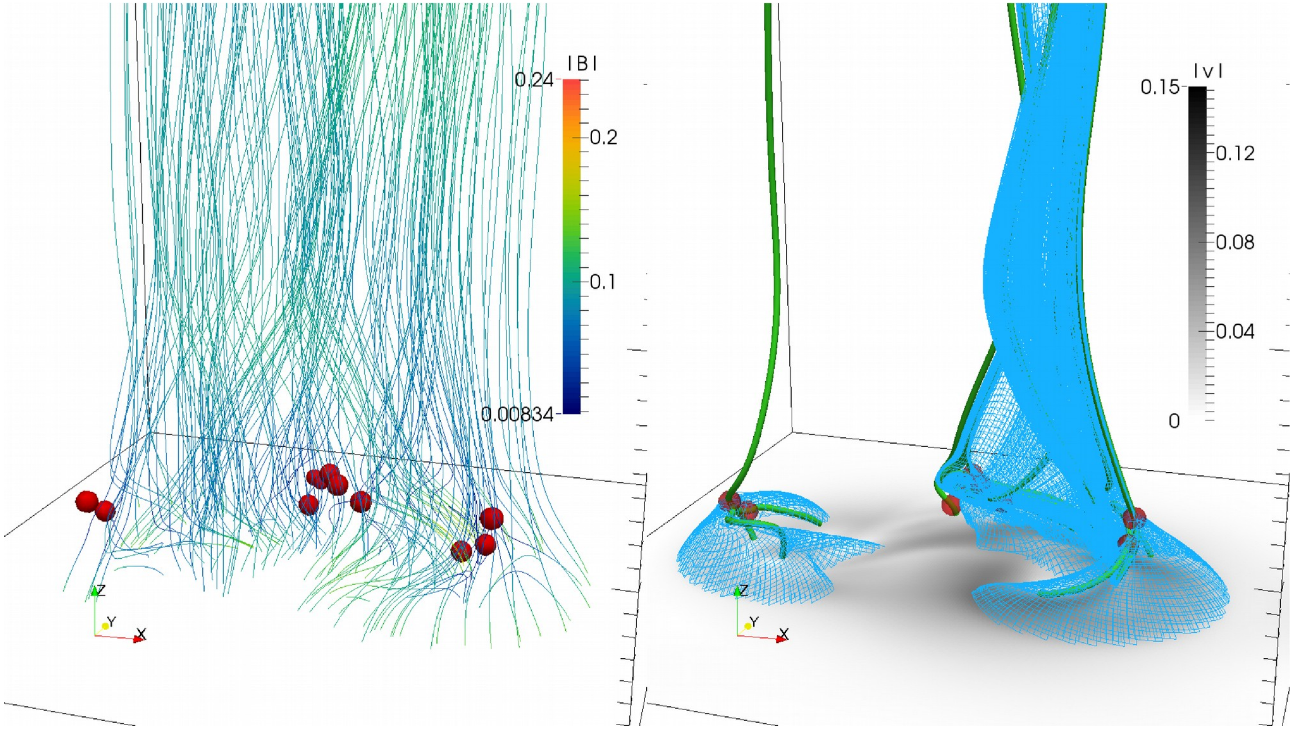
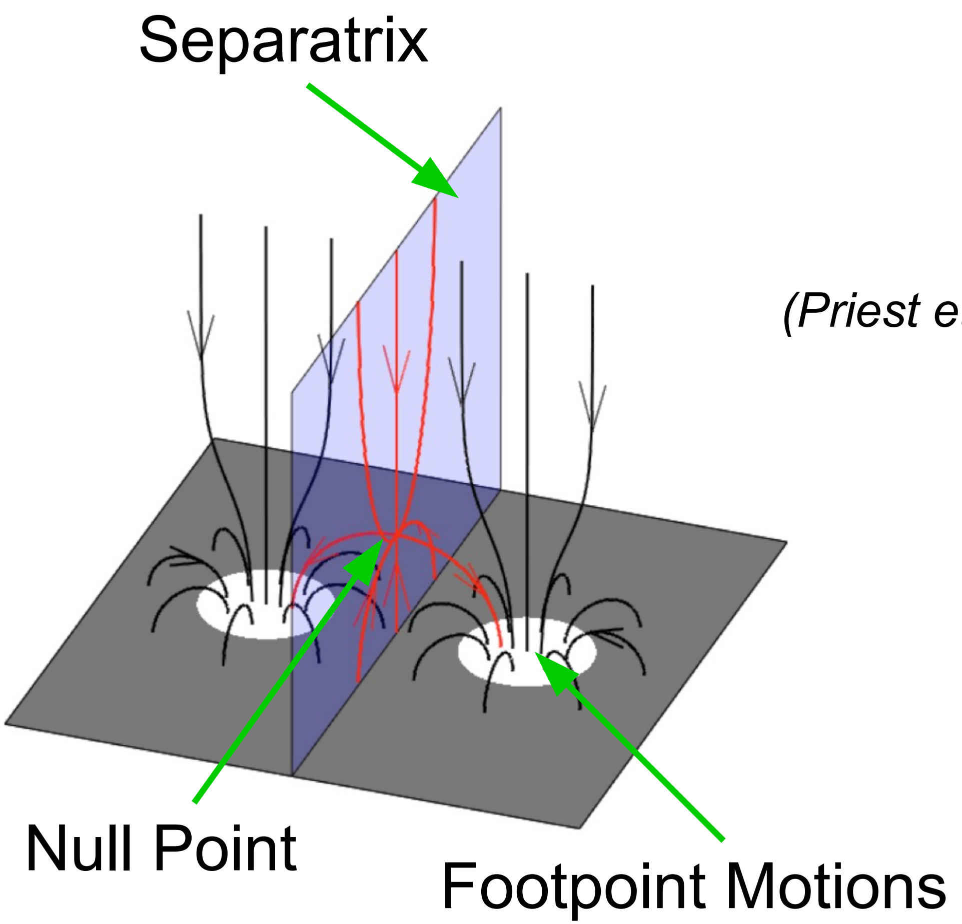
Magnetic Field Line Topology and Energy Propagation in the Corona.

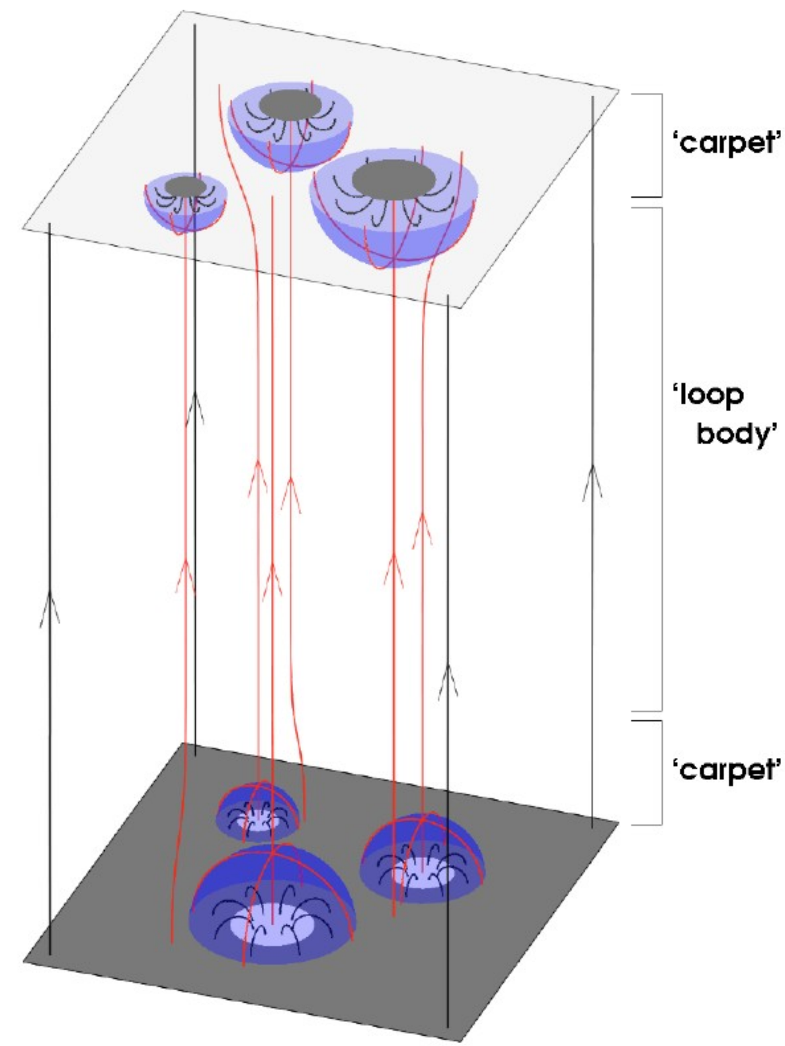
Simon Candelaresi, David Pontin, Gunnar Hornig



Magnetic Carpet



(Priest et al. 2002)

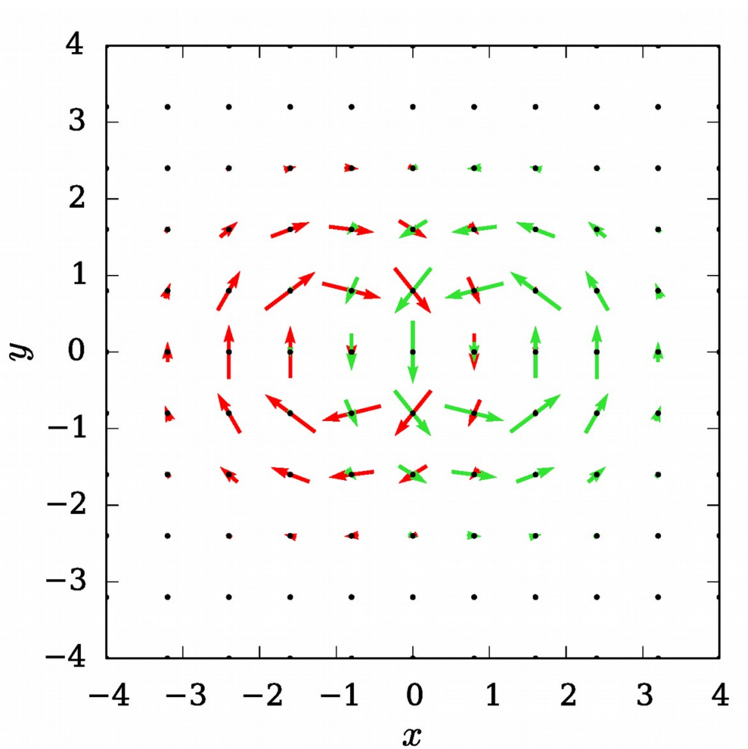


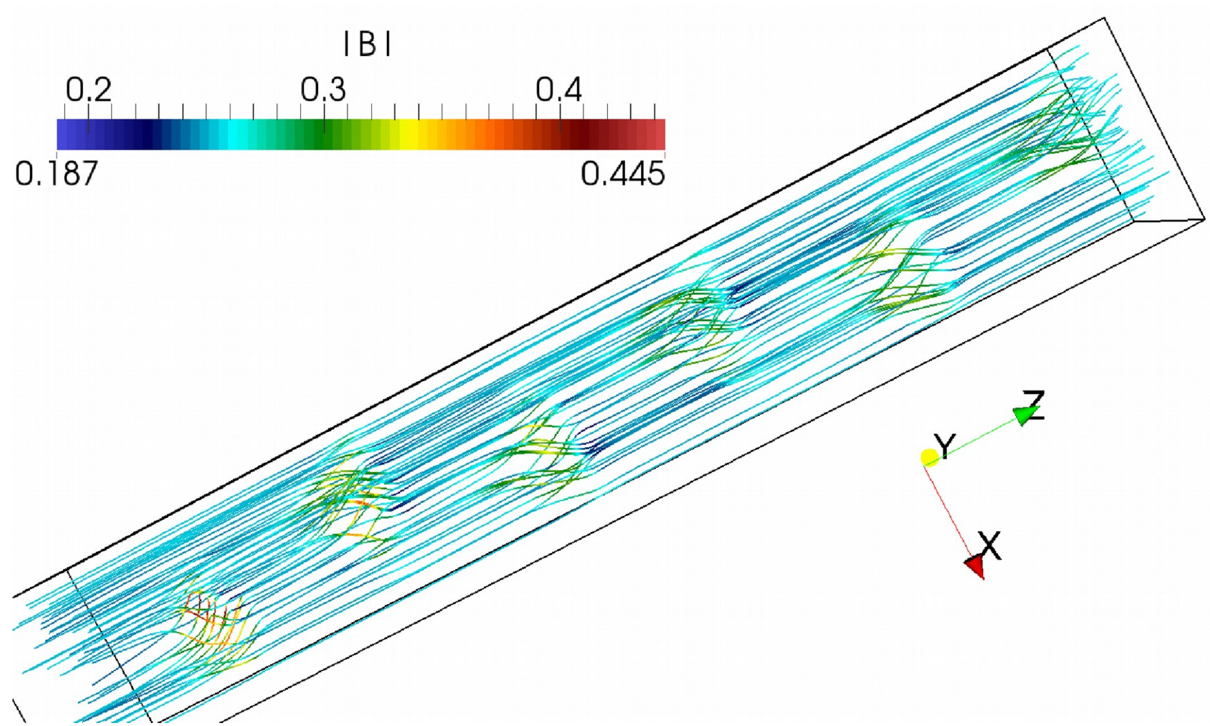
Questions: How do disturbances travel into the domain?
Reconnection at null point?
Propagation in presence of nulls?

E3 Experiments

Full resistive MHD simulations with the PencilCode.

Initially homogeneous field, E3 type boundary driving.



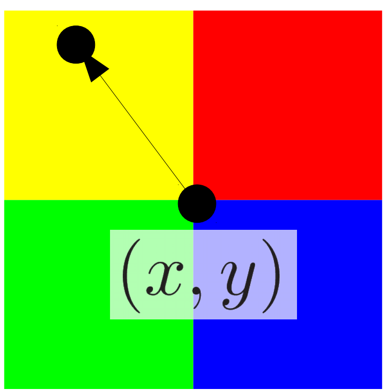


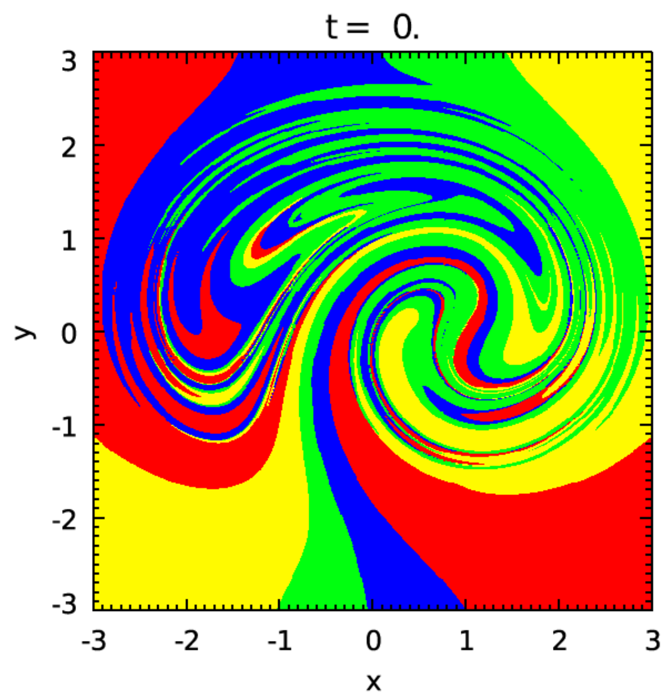
Blinking Vortex Footpoint Driving

Braid propagates into domain.

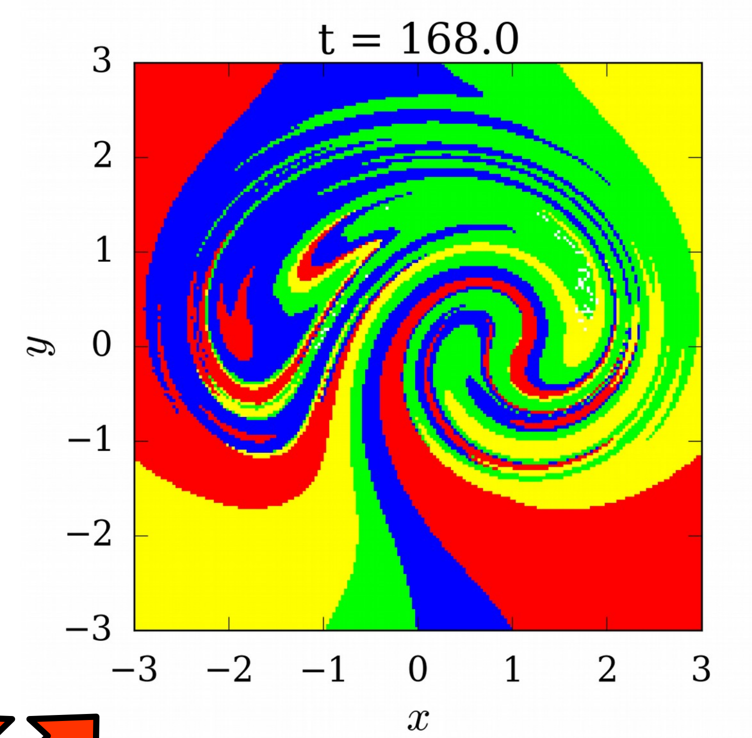
E3 Experiments

Field Line Mapping





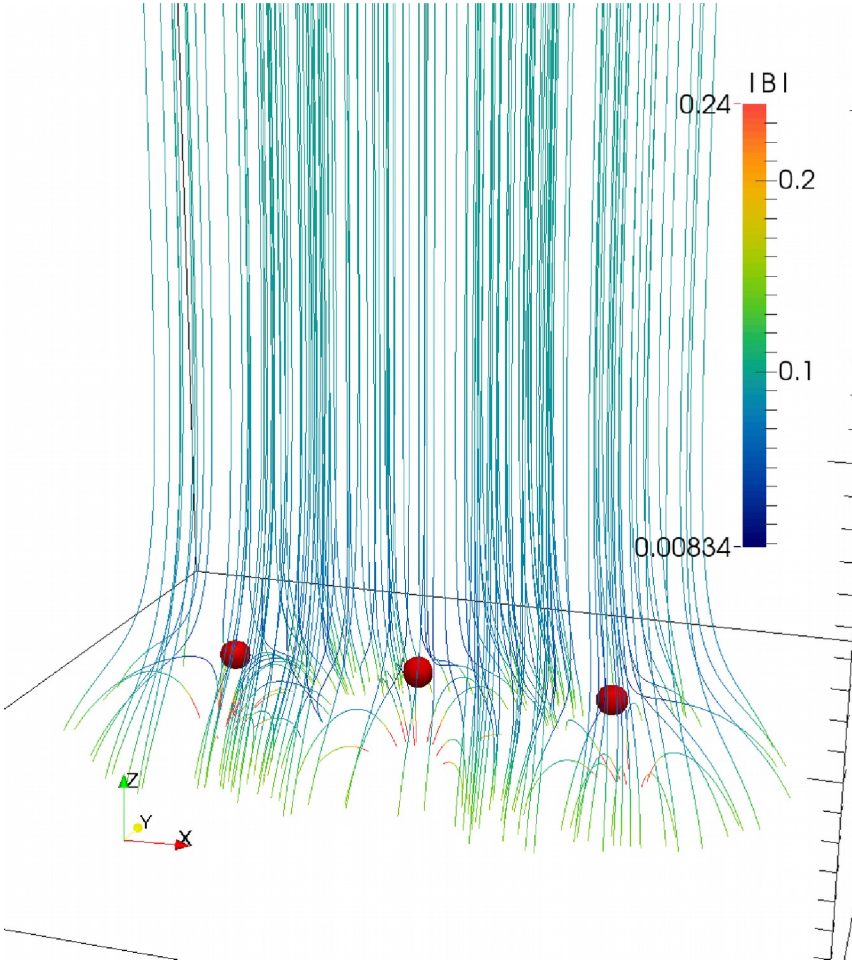
(Yeates et al. 2010)

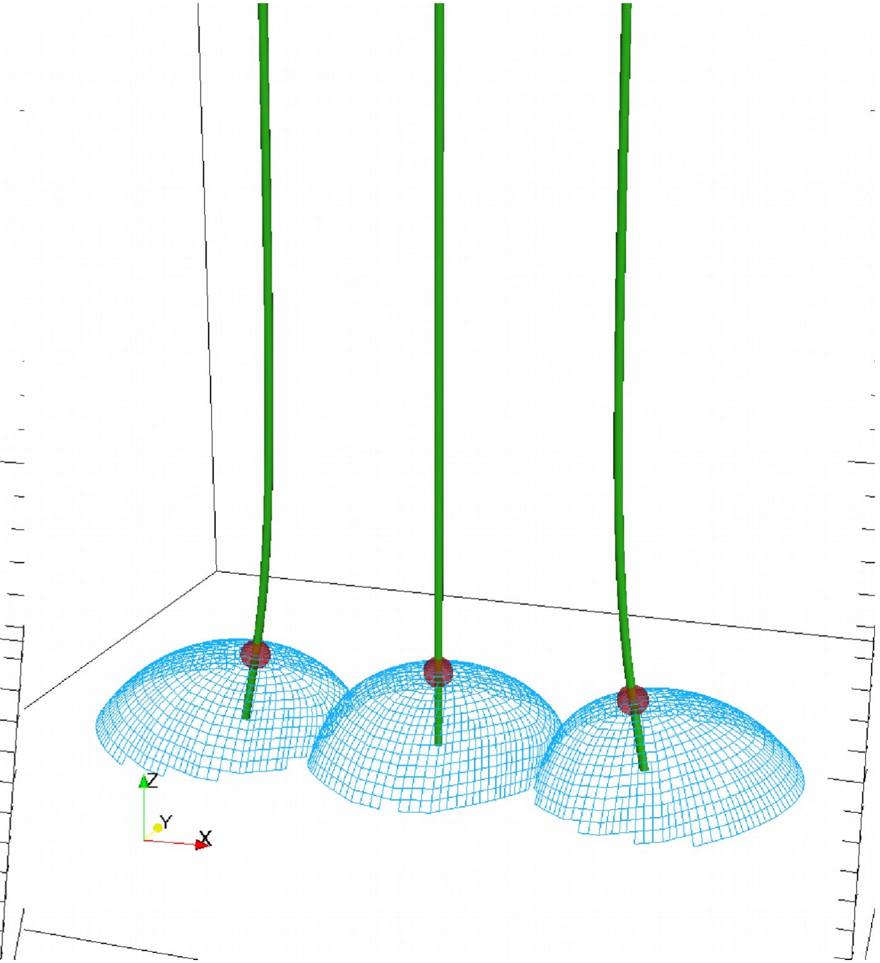


vs.

- Controlled change of field line connectivity can be achieved through footpoint motions.

Null Points

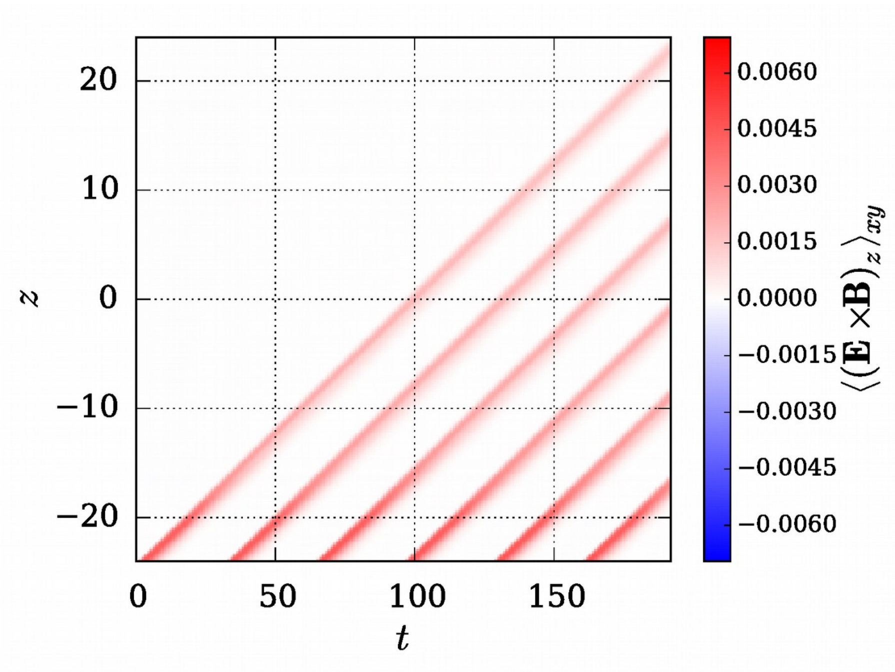




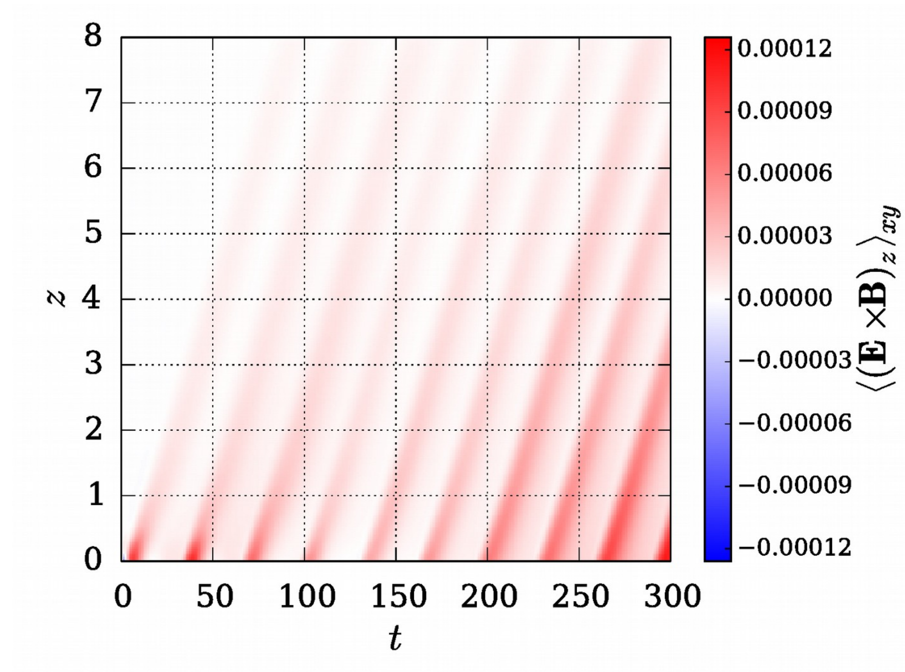
- Null pair creation/annihilation.
- Footpoint motion can alter the field line topology.

Energy Propagation

Homogeneous $\mathbf{B}_0$

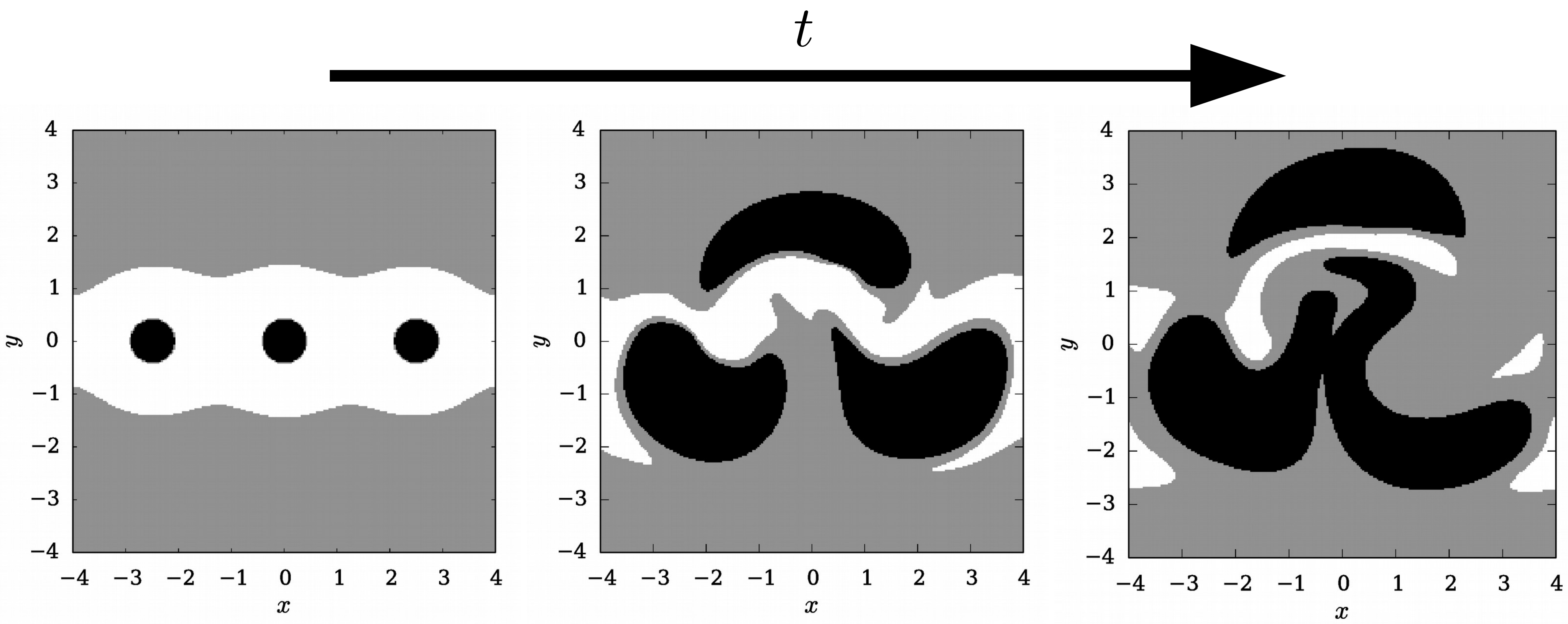


Magnetic Carpet $\mathbf{B}_0$



- Topology efficiently inhibits energy propagation.
- After change of topology → efficient energy transport.

Polarity Mixing



White: $B < 0$

Gray: $B \approx 0$

Black: $B > 0$

Magnetic field polarities are efficiently mixed through footpoint motions.

Conclusions

- Braiding through photospheric footpoint motion.
- Null point disruption through boundary motions.
- Energy propagation inhibited due to carpet structure.
- Efficient energy transport into corona after topology change.
- Polarity mixing on the photosphere.

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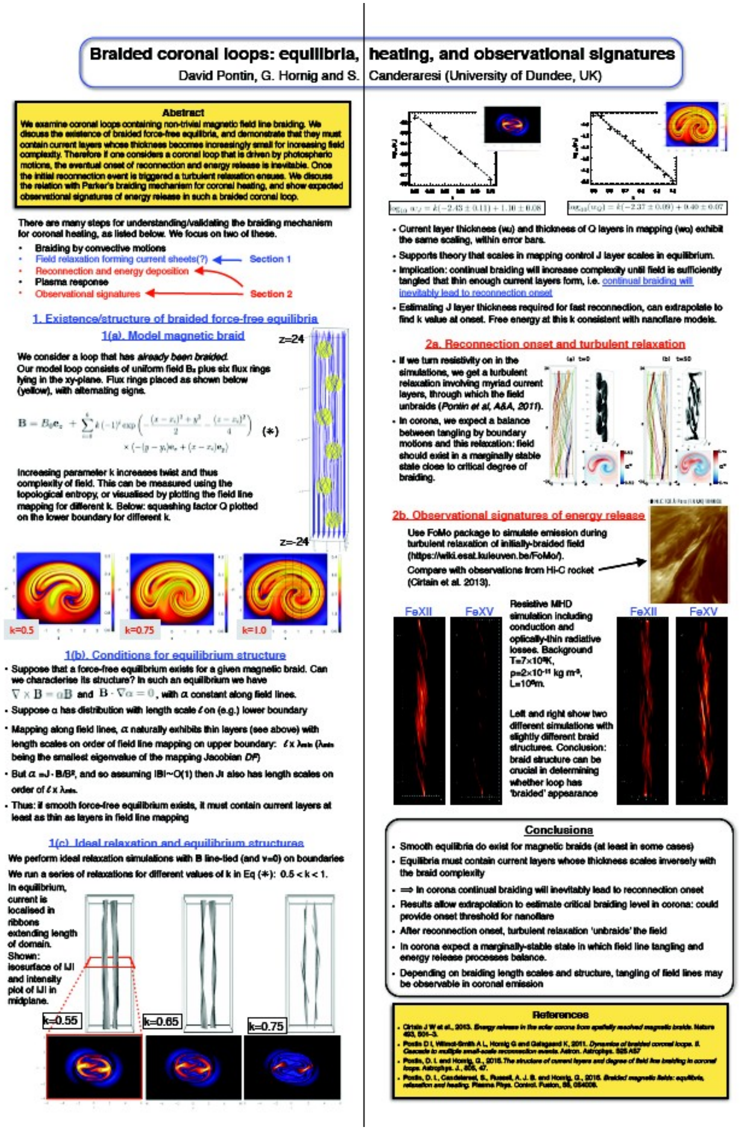
Recommendations



David Pontin (P 10.10)

Postdoctoral research position available in Solar Magnetohydrodynamics at the University of Dundee (UK)

3 years

Closing date: 5th June.

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