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Coherent Reconnection from a Tangled Mess

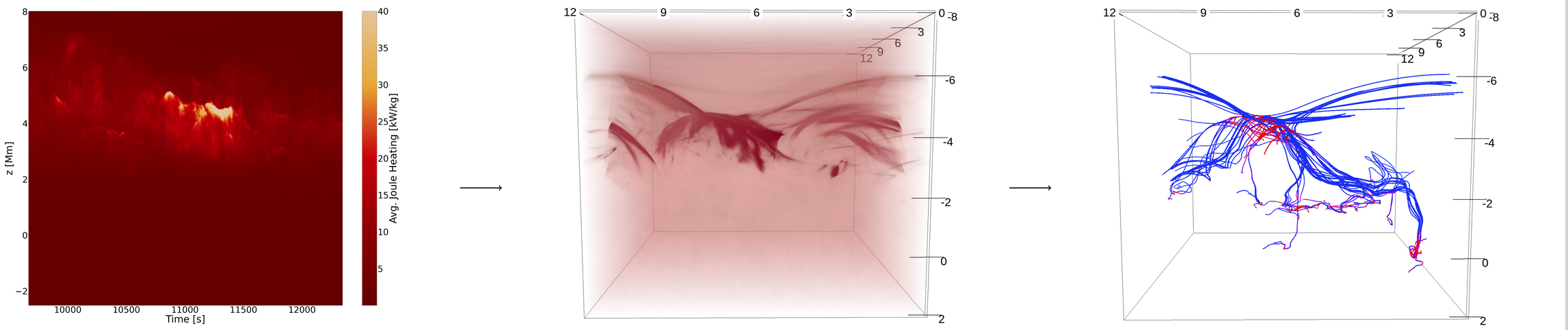
Rebecca Robinson [1,2] **Mats Carlsson** [1,2] **Guillaume Aulanier** [3,1]

[1]Rosseland Centre for Solar Physics, UiO [2]Institute of Theoretical Astrophysics, UiO [3]Sorbonne Université, Observatoire de Paris PSL, CRNS, LPP

Simulating the Quiet Sun with *Bifrost*

Starting from an initially balanced vertical magnetic field, simulated **self-consistent convection** generates magnetic features that eventually **order into flux ropes**. These flux ropes **reconnect** with a nearly anti-parallel horizontal field in the corona, resulting in **coronal temperatures up to 1.47 MK**. The magnetic field ordering and reconnection are **driven entirely by convective motion**, which demonstrates that **flux ropes do not need to rise coherently in order to reconnect coherently.**

Heating as a Reconnection Proxy



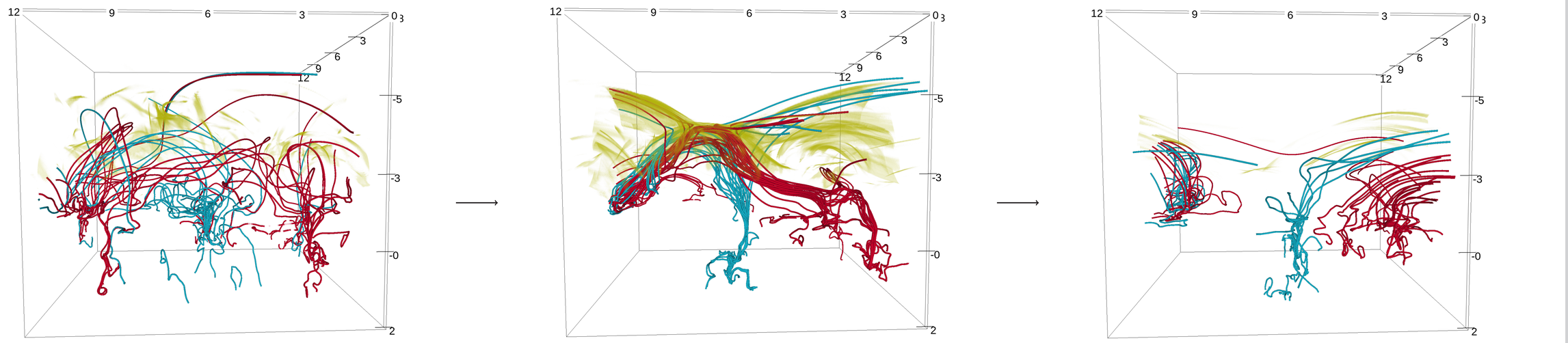
(a) Time series of avg. Joule heating

(b) Joule heating at t = 11 360 s

(c) Reconnecting field lines at t = 11 360 s

Figures a-c illustrate the relationship between a) impulsive heating events, b) current sheet dissipation, and c) reconnecting field lines

Field Ordering and Reconnection: from Incoherent to Coherent



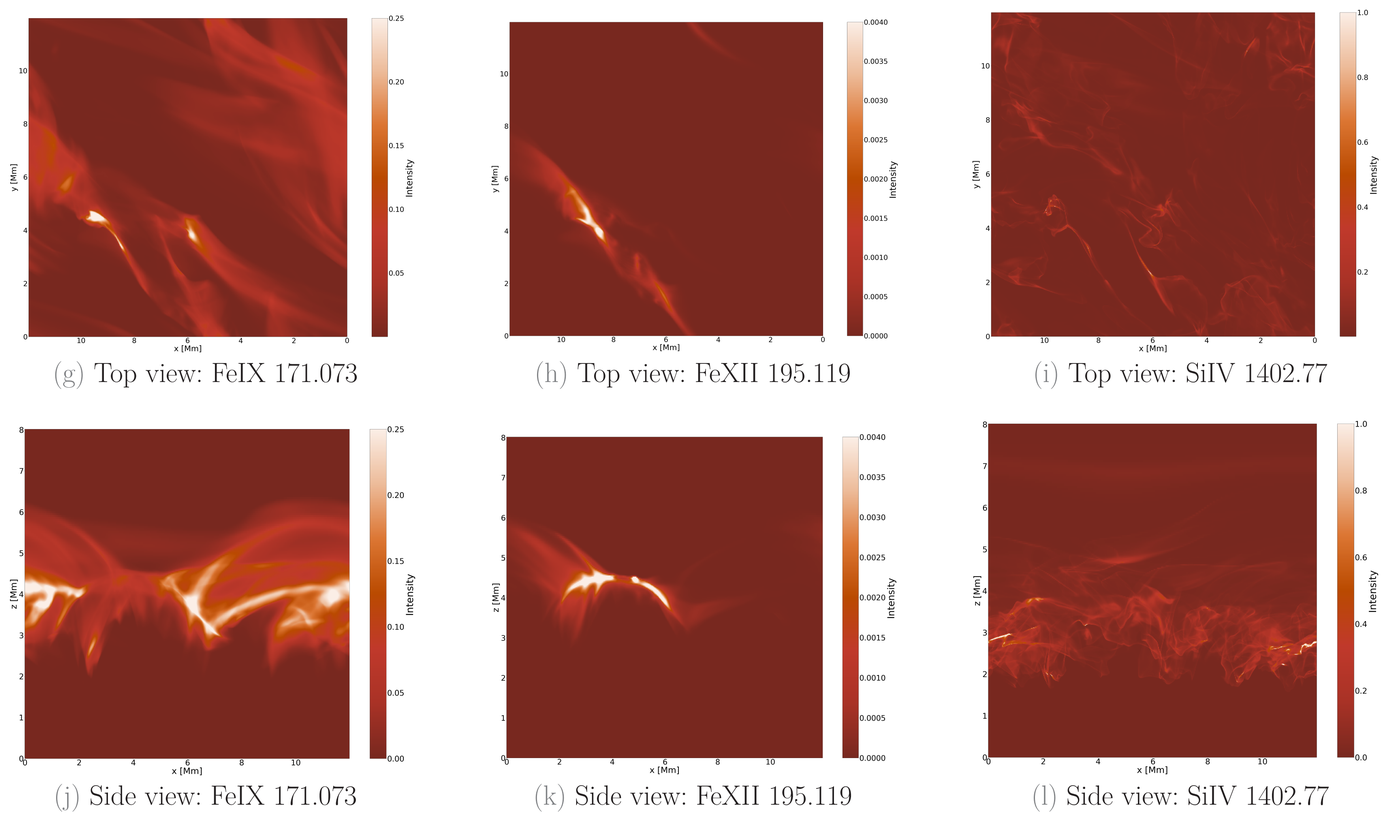
(d) t = 9 669 s

(e) t = 11 360 s

(f) t = 12 070 s

Figures d-f: Ordering of selected field lines into a flux rope (red) and arcade (cyan) before, during, and after the main reconnection event. Joule heating (current sheet dissipation) is shown in yellow.

NEXT: What would this look like in observations?



(g) Top view: FeIX 171.073

(h) Top view: FeXII 195.119

(i) Top view: SiIV 1402.77

(j) Side view: FeIX 171.073

(k) Side view: FeXII 195.119

(l) Side view: SiIV 1402.77

Up next: we're computing **synthetic observables** from this simulation, aiming to compare with **IRIS, Hinode, and AIA** observations. Comparing these with real observations could help us understand how magnetic fields **order, develop, and reconnect** in the quiet Sun.

- **Figures g-i:** Top view of synthetic EUV lines at t = 11 360 s
- **Figures j-l:** Side view of synthetic EUV lines at t = 11 360 s

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Rosseland Centre for Solar Physics