

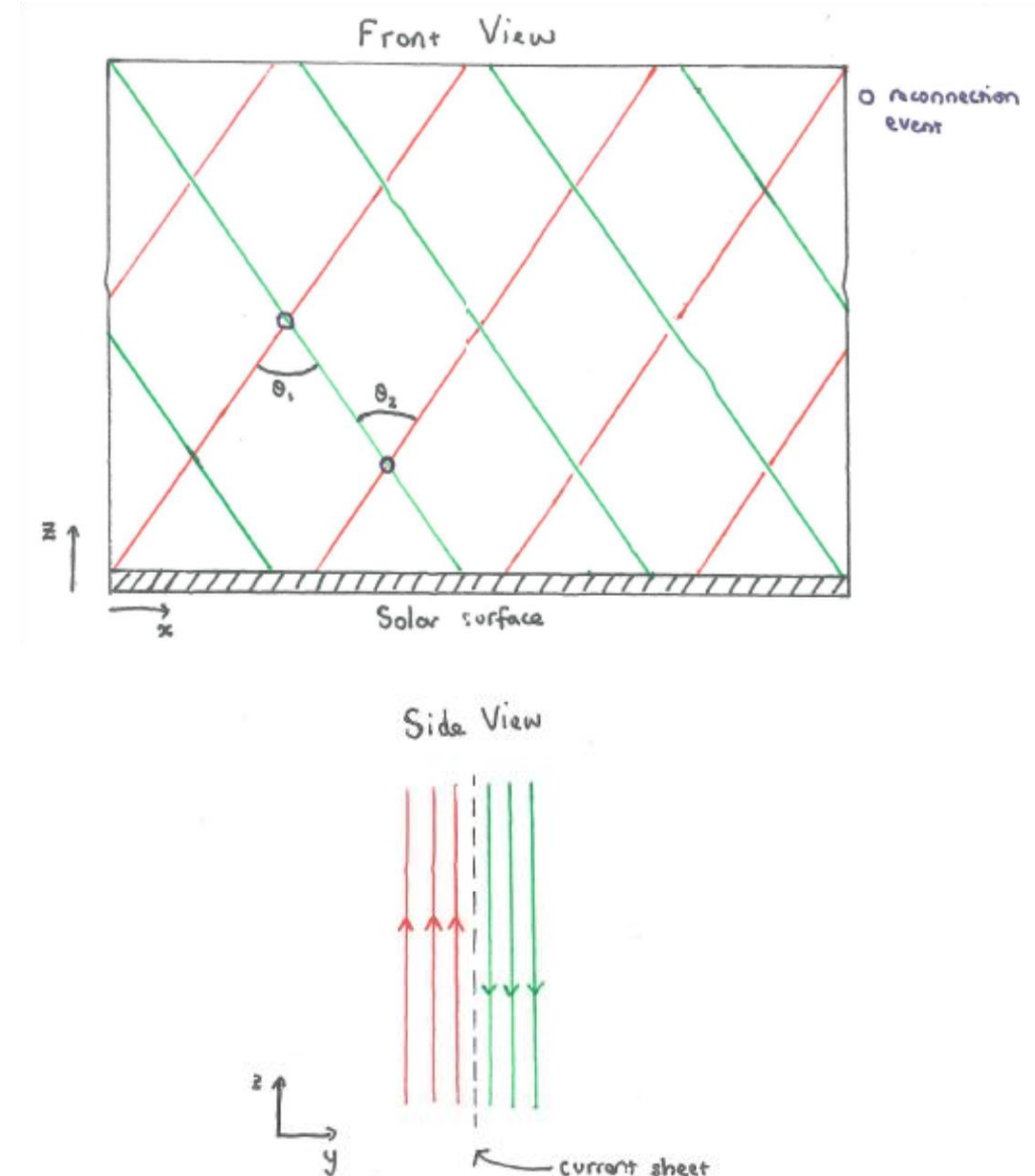
# Simulating Shocks in Solar Flares

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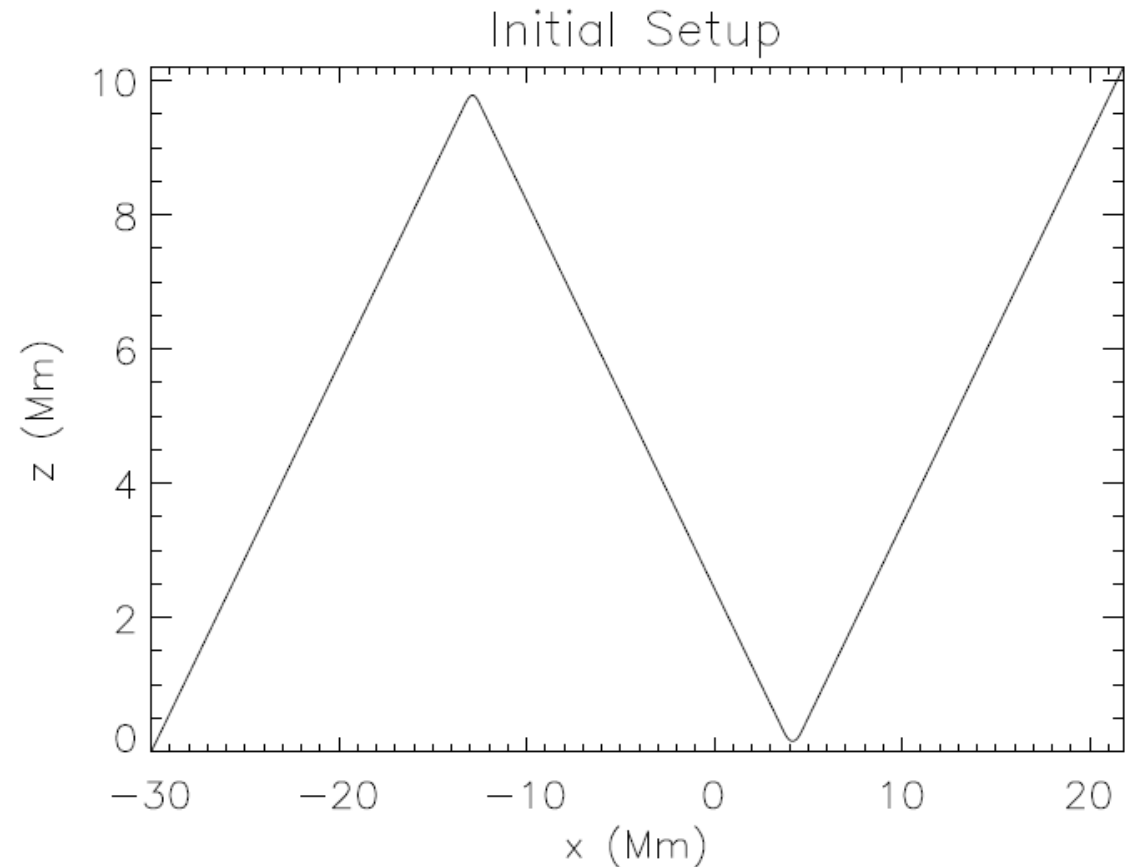
# Introduction

- Magnetic reconnection is a significant mechanism for phenomenon involving high energy release such as solar flares.
- Post-reconnection field lines act like elastic bands under tension.
- Aim to investigate case where magnetic reconnection occurs at two points simultaneously.



# Method

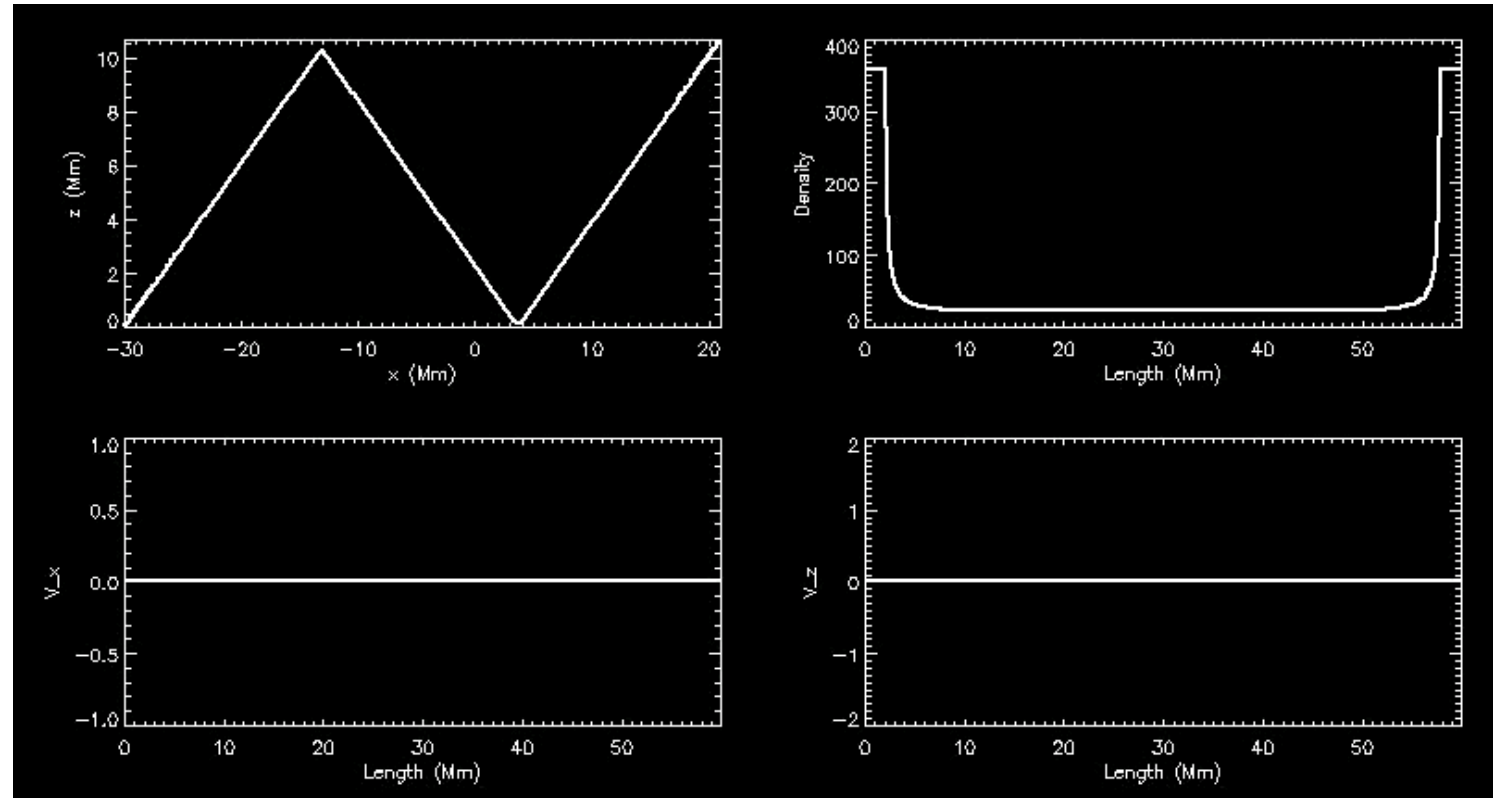
- Tube dynamics well approximated by thin flux tube equations.
- Equations solved on 1D Lagrangian grid (1000 points) with head conduction, diffusion, viscosity.
- My task was to design code to make the initial setup (right).



- Typical scales: 60 Mm tube length, constant 60 G magnetic field, retraction observed up to 6.0s after reconnection event.

# General Features & Evolution

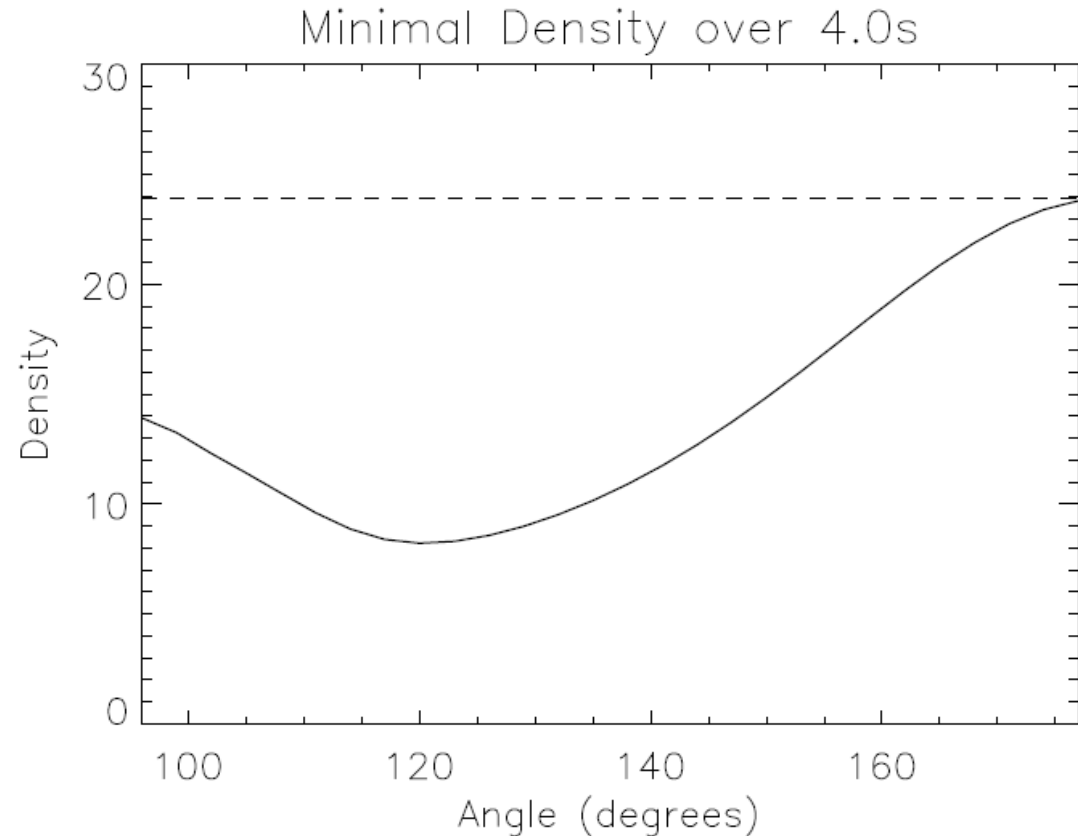
- Tube bend retracts at Alfvén speed.
- Tube length decreases with retraction causing plasma compression, density build-ups, due to supersonic flows either side of retracting regions which push plasma in to bends.



- Interesting behaviour when flows collide.

# Investigating the Density Drop-off

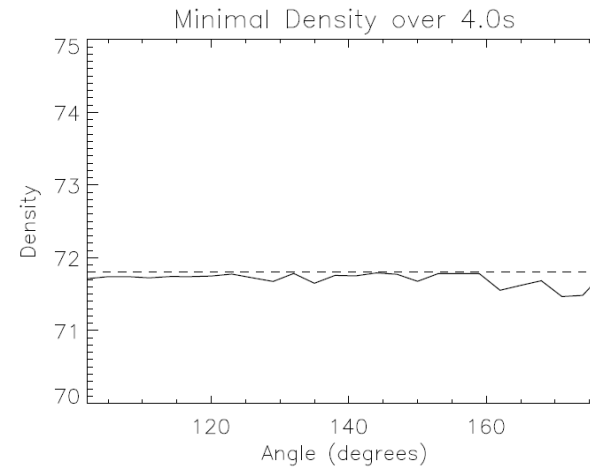
- Interaction in  $v_x$  causes density evacuation at midpoint between bends.
- Looking at the minimum density reached over 4.0s in the density/angle phase plane reveals a minimum.
- Why this angle?



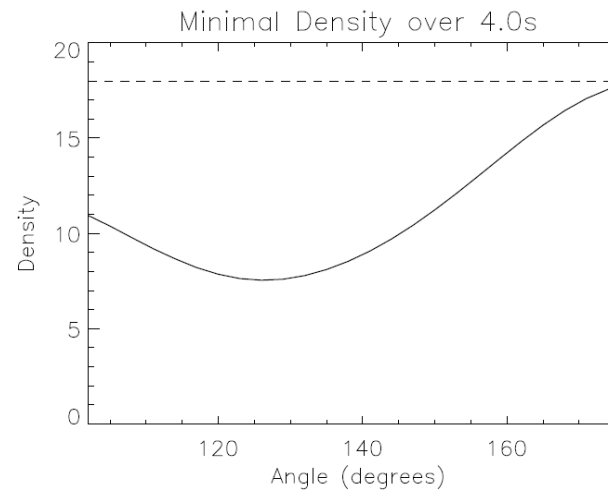
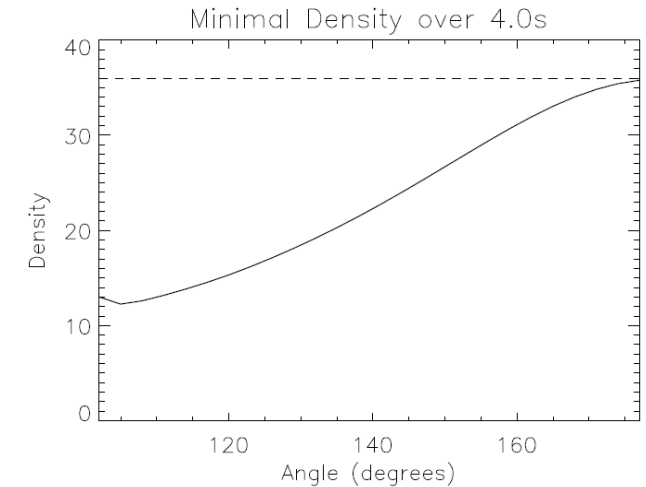
# Deeper Investigation: Varying Temperature

- $T=1.0\text{Mm}$  gives rise to odd behaviour.
- Minimal density achieved at 4.0s has relationship with temperature.
- More work needed here to find this relationship more explicitly.

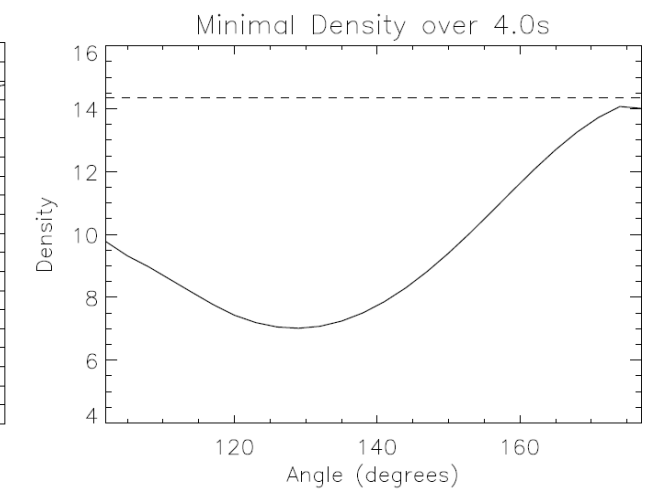
$T=1.0\text{Mm}$



$T=2.0\text{Mm}$



$T=4.0\text{Mm}$



$T=5.0\text{Mm}$