

SECCHI Observations Constraining The Initiation of Polar Coronal Jets

Spiros Patsourakos, NRL

SHOW HOW SECCHI CAN CONSTRAIN JET INITIATION

with:

E. Pariat

A. Vourlidas

S. Antiochos

R. Howard

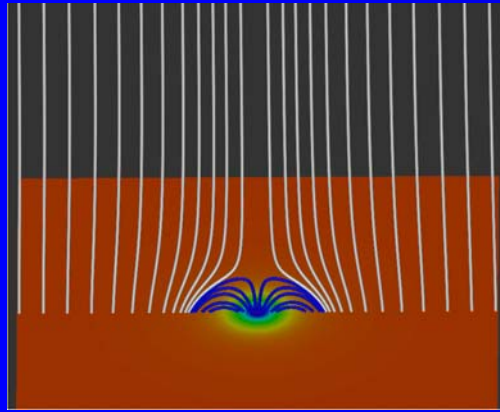
Why Care About Jets ?

Very possibly driven by magnetic reconnection

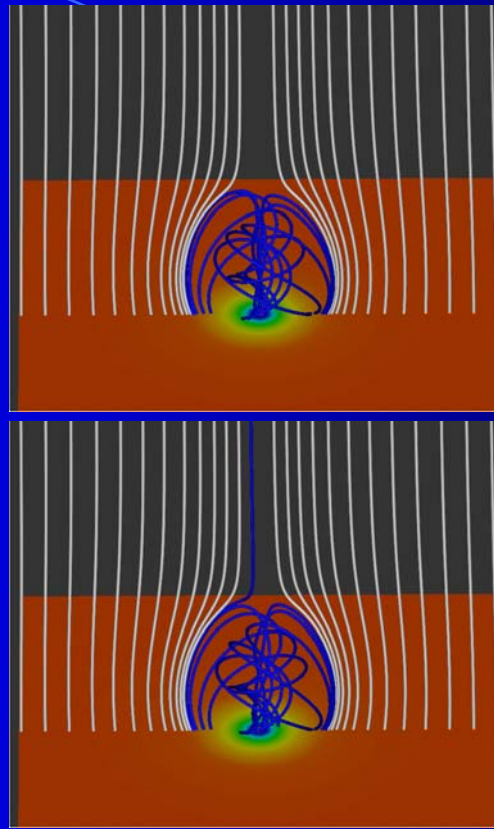
Ideal prototype to study reconnection in simple magnetic setups

Could be an important contributor to solar wind mass

Magnetic Twist as a Driver of Polar Jets



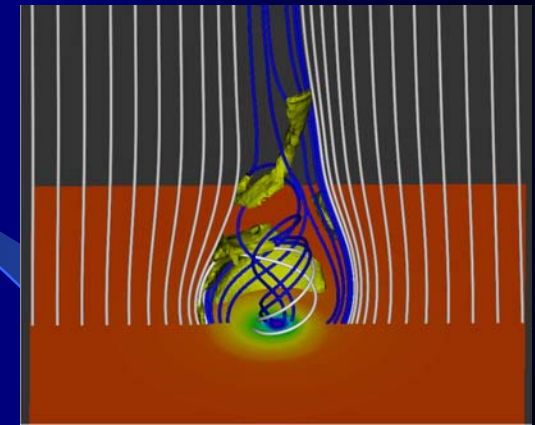
Axisymmetric configuration
3D MHD simulations



Apply twist



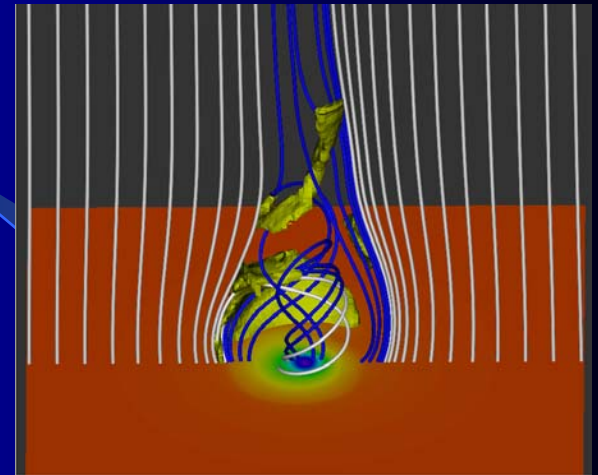
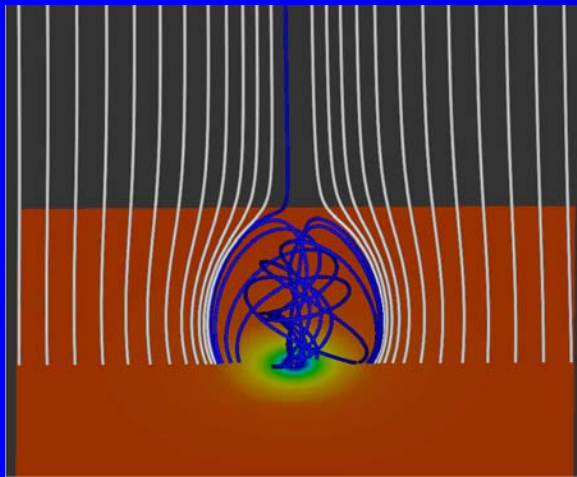
kink



A high speed $\sim V_A$ forms
with helical structure

**a fraction of observed jets
exhibit similar properties**

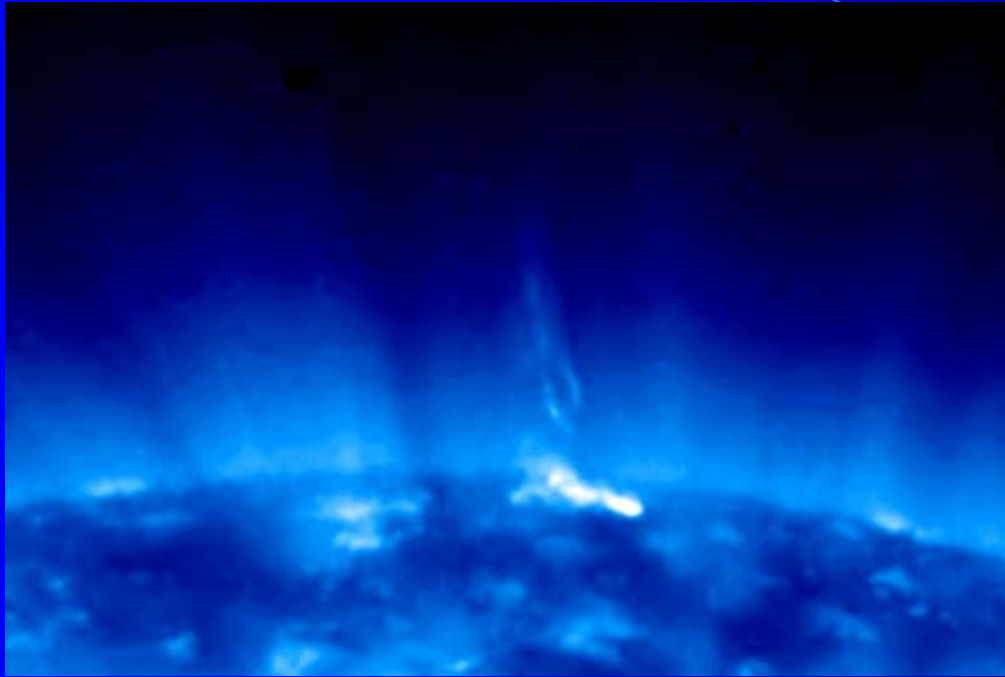
Critical Elements of The Twist Model



Kink instability - High Speed Outflow - Helical structure

Can SECCHI 3D Observations constrain those elements ?

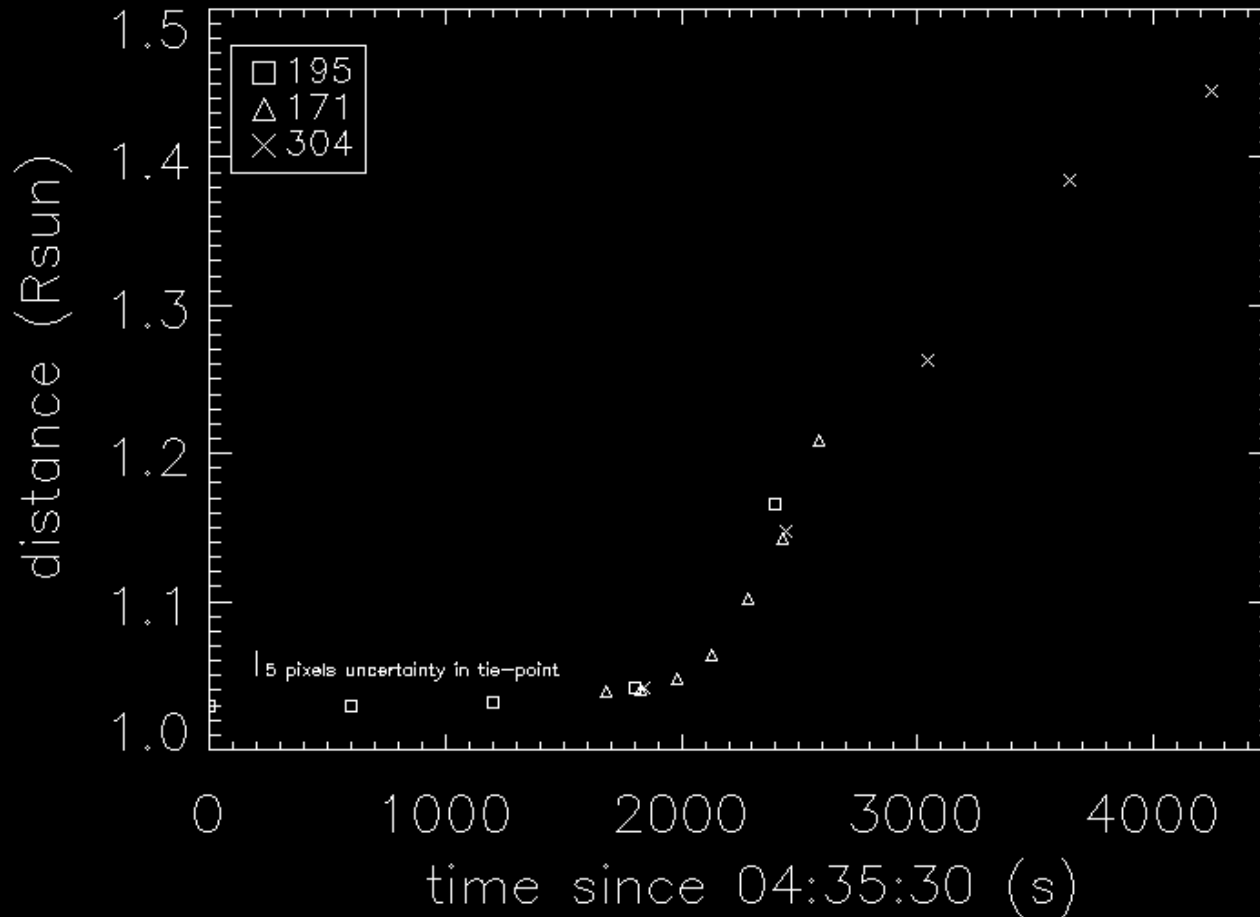
Recap of the Observations



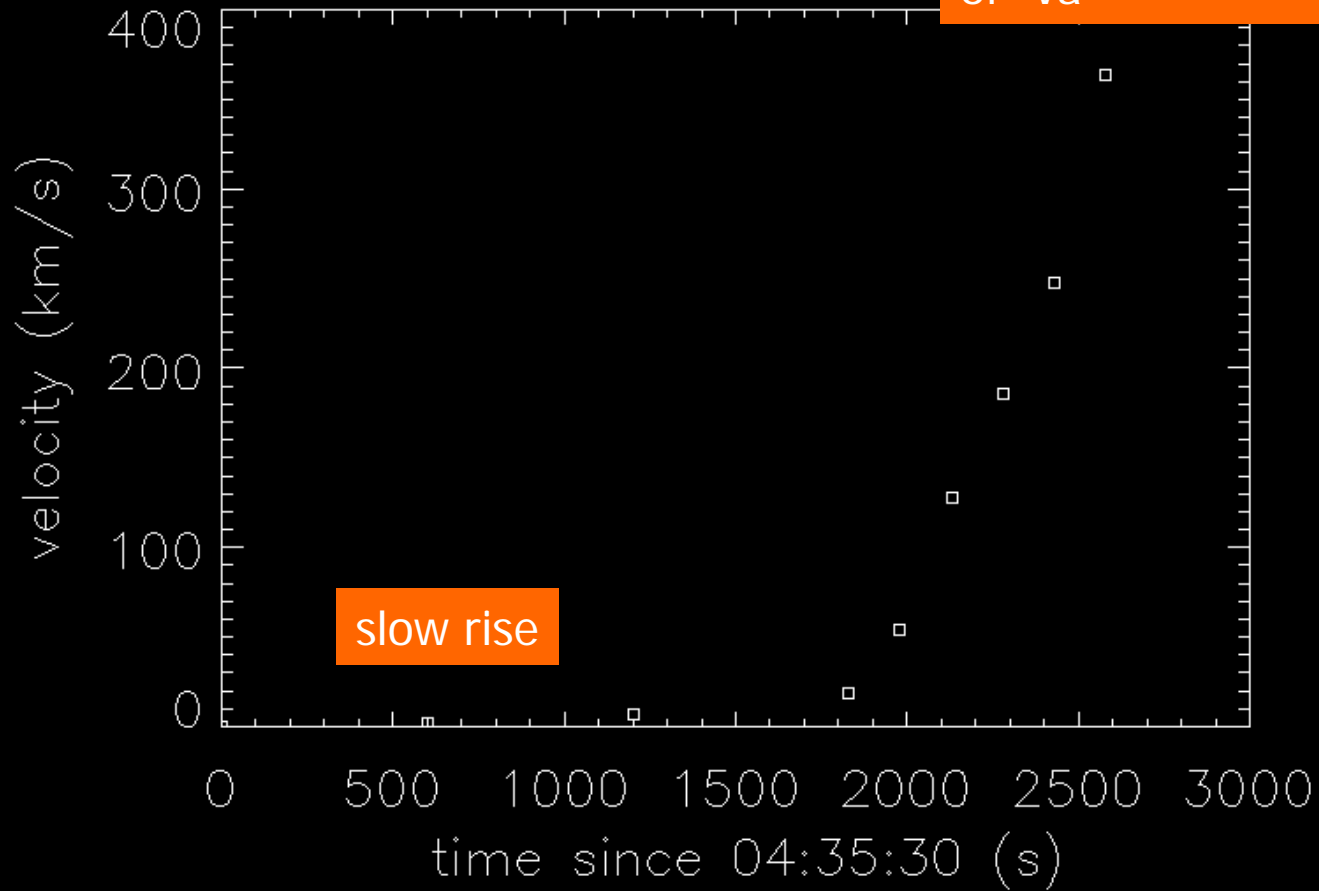
7 June 2007 ~ 05:00 UT
North Polar Coronal Hole
A-B ~ 11 degrees
Observed by EUVI, COR1, COR2

multipolar topology → slow rise → kink → rapid acceleration & helical structure

Height-time plot of the Jet



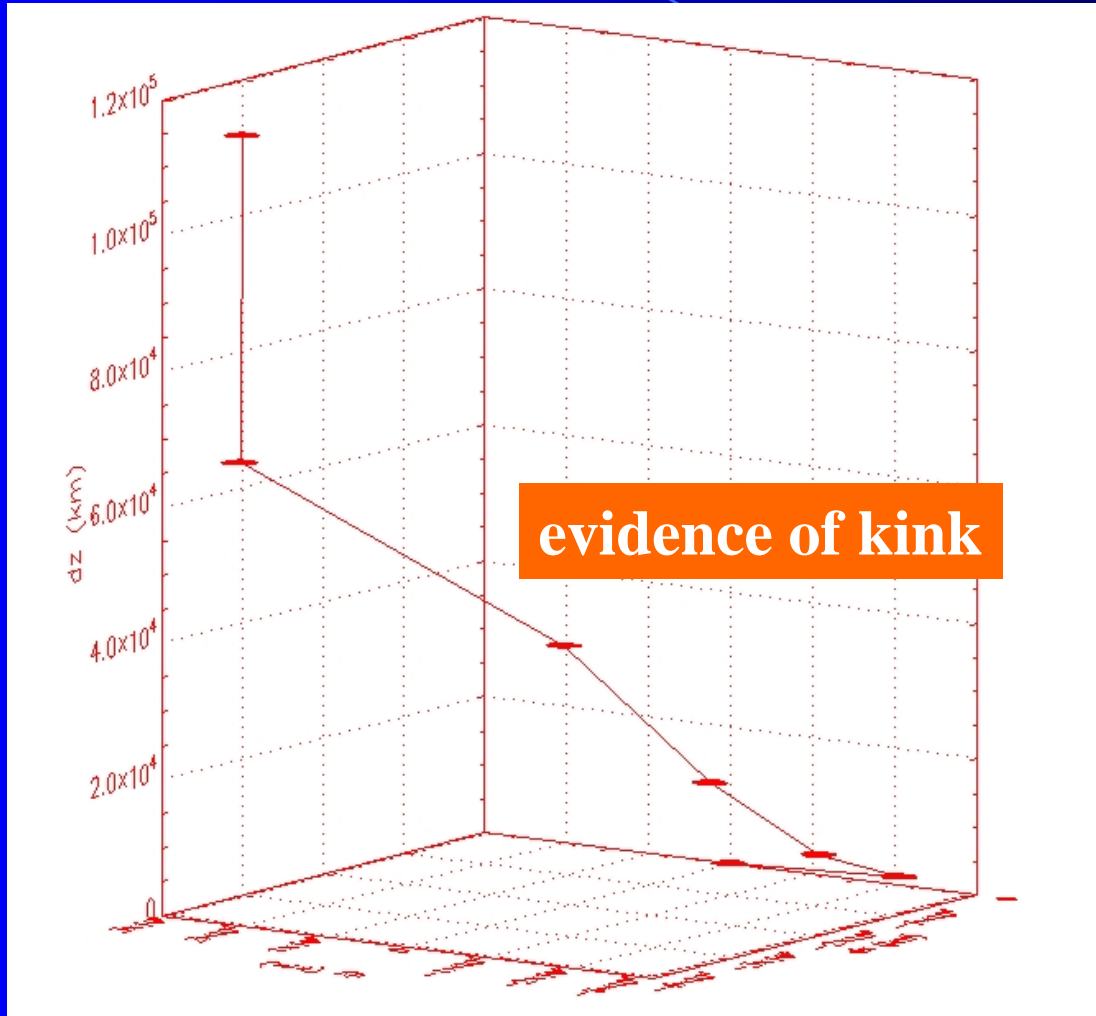
'Real' Velocity of the Jet



Rapid acceleration @ fraction of V_a

slow rise

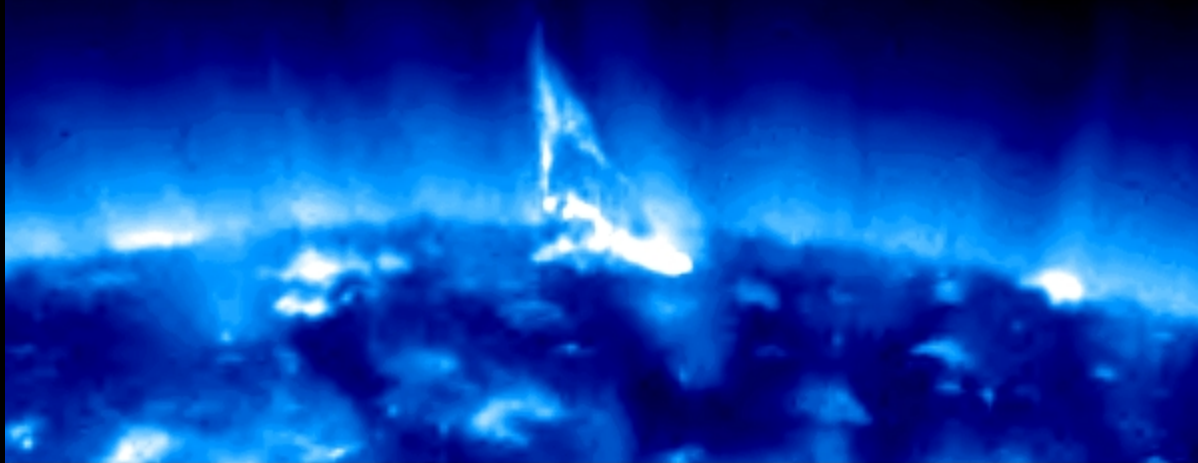
3D Trajectory of the Jet



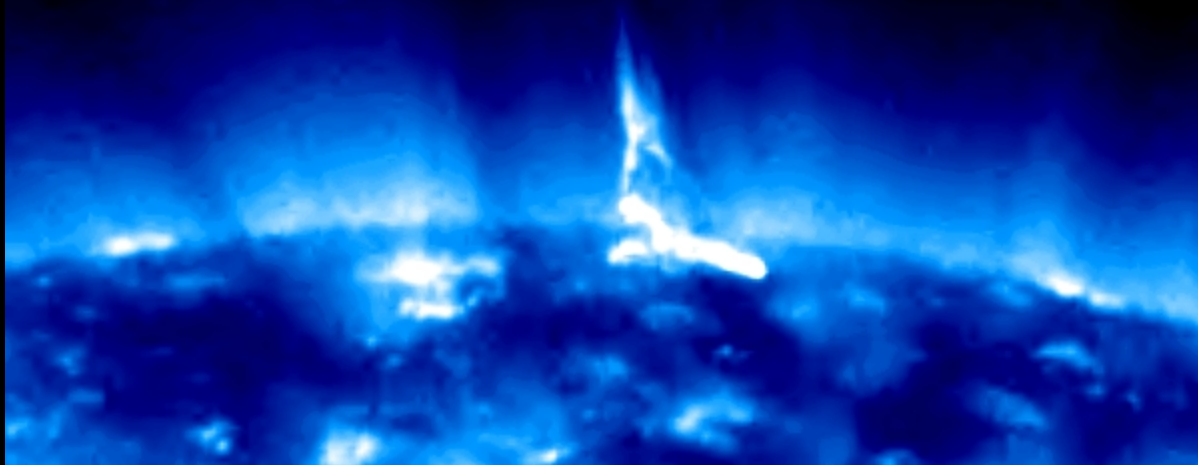
Helical Structure of the Jet I

STEREO A

051330



STEREO B



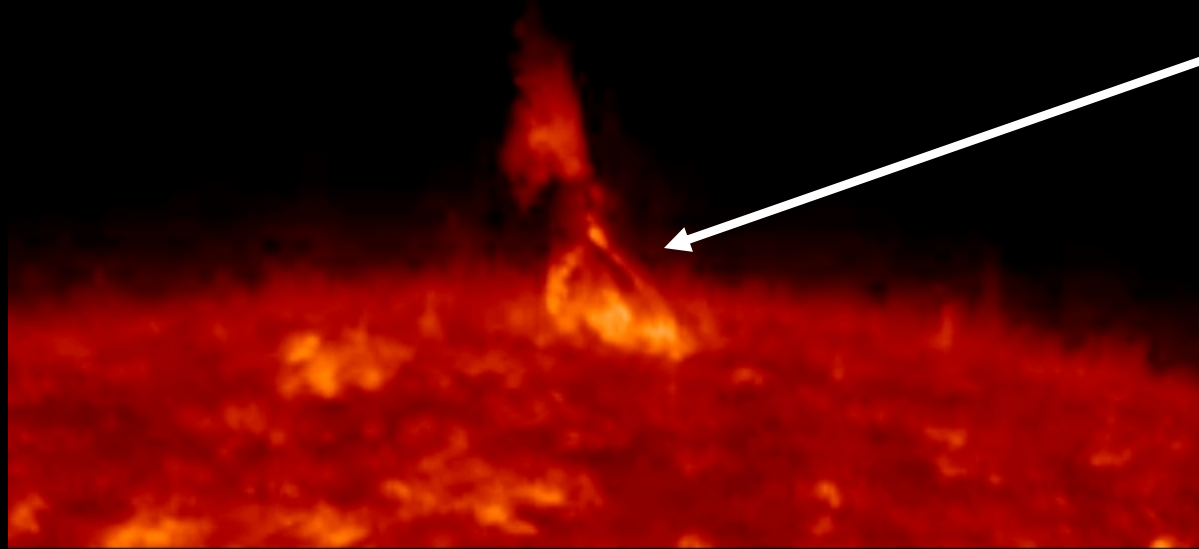
Small but noticeable differences between A & B which increase with time

Helical Structure of the Jet II

STEREO A

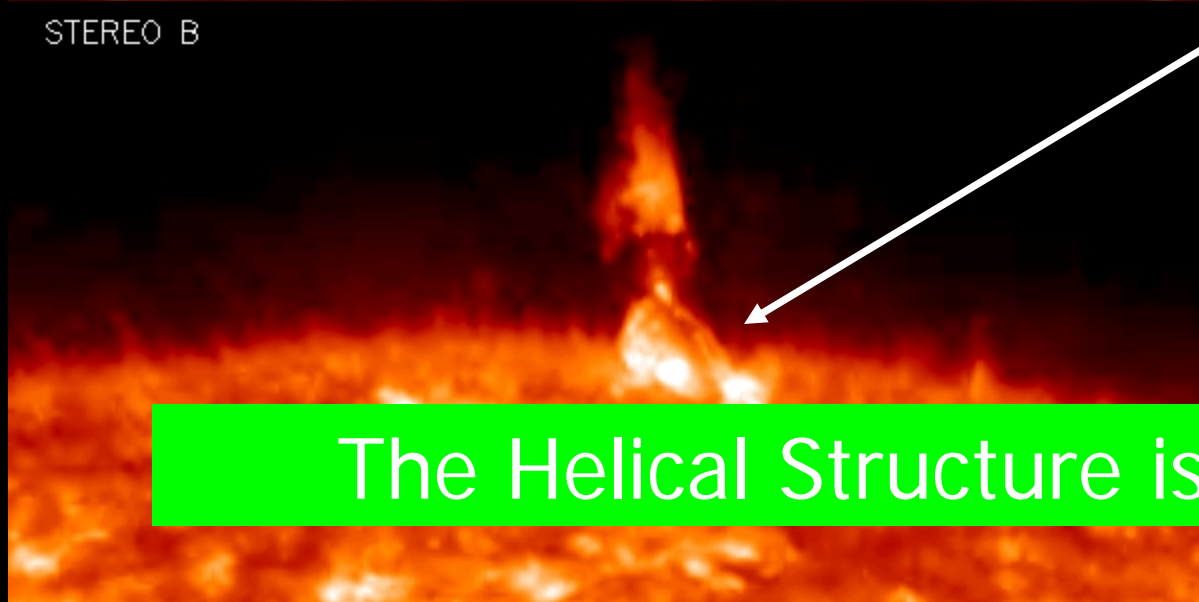
051615

Edge-on



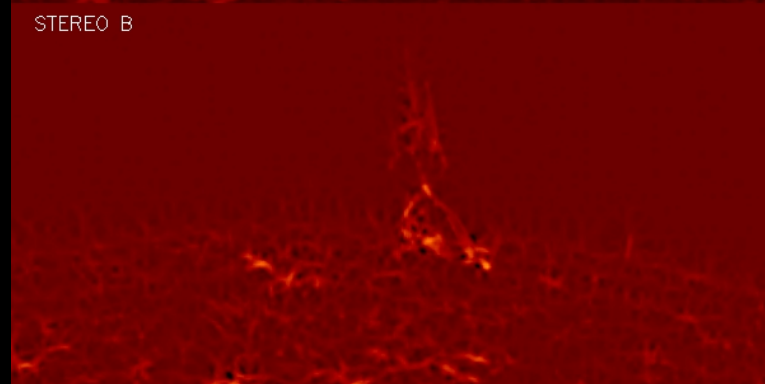
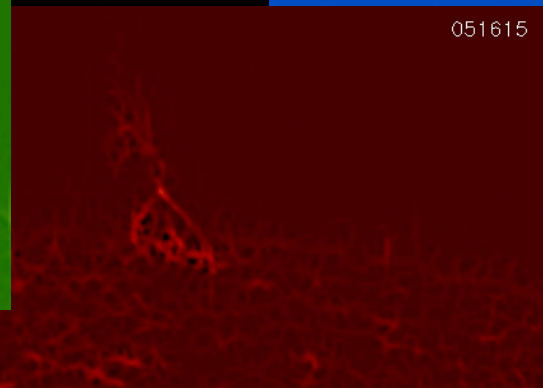
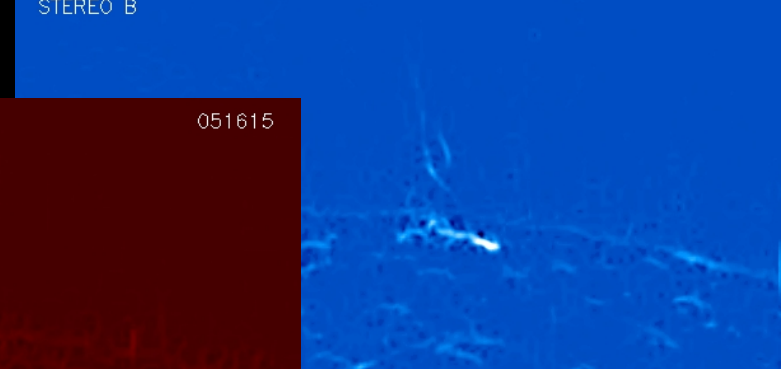
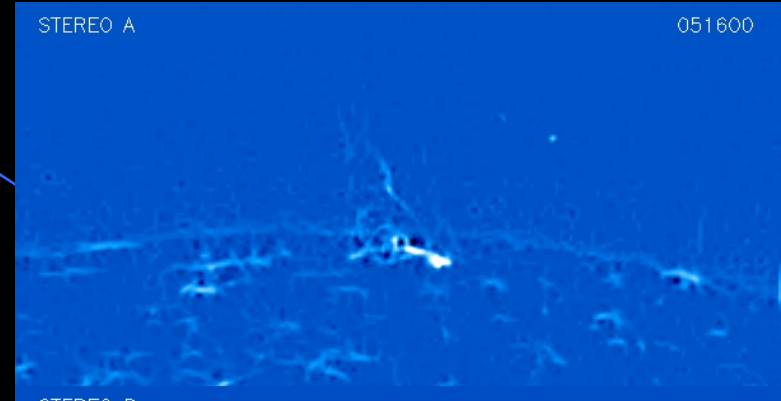
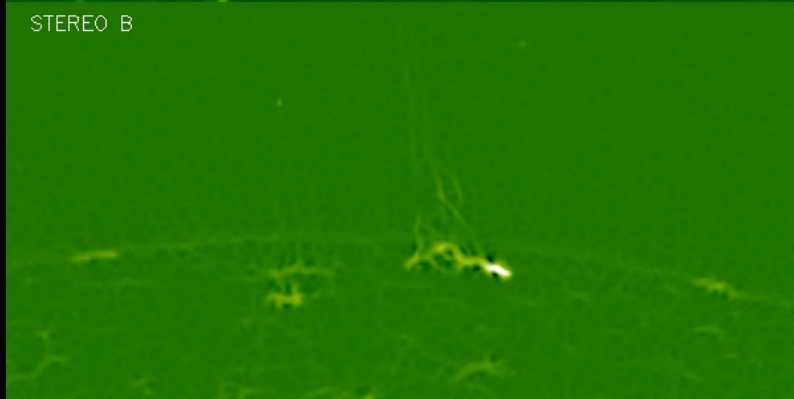
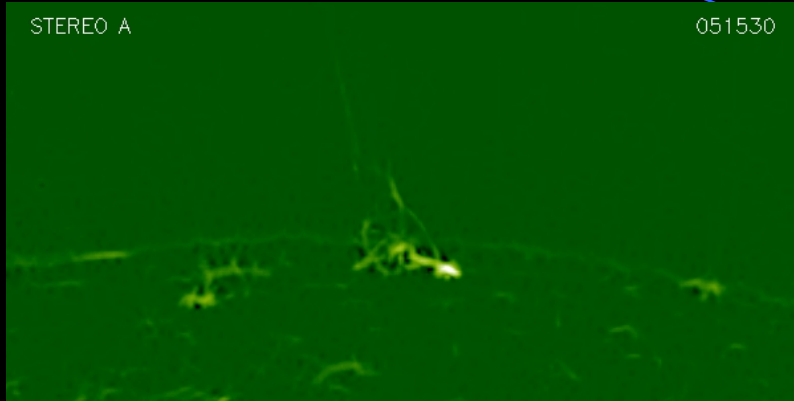
STEREO B

Face-on



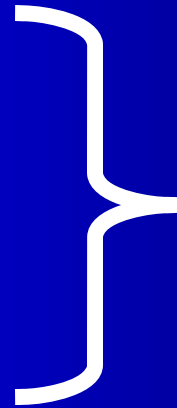
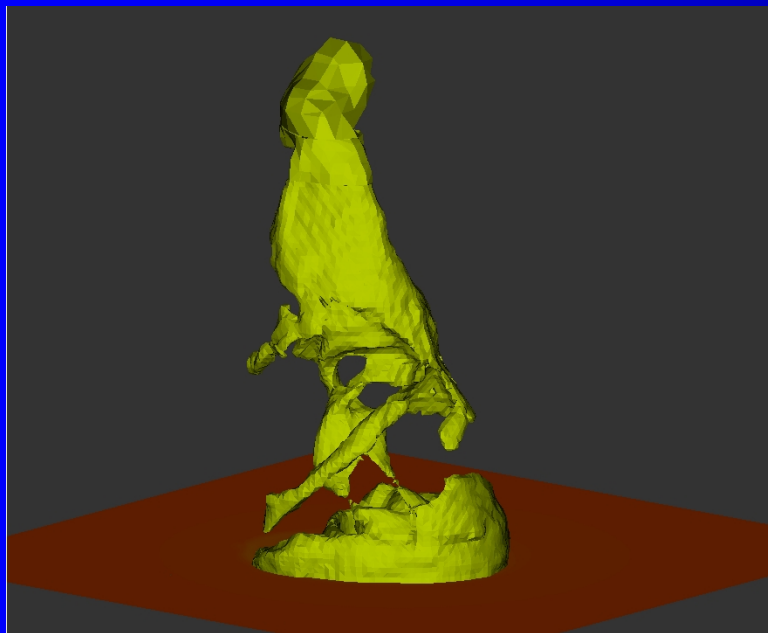
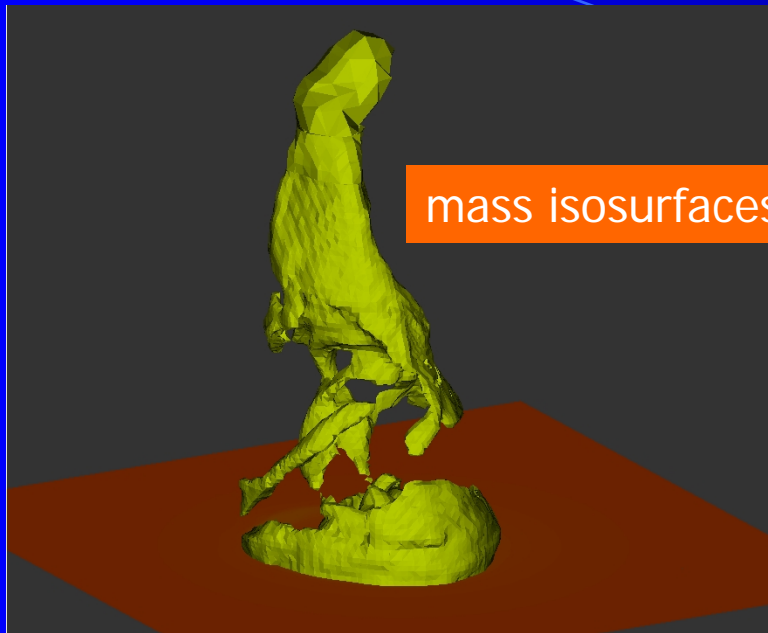
The Helical Structure is REAL !

Helical Structure of the Jet III



Edge-enhanced Images

Emulating SECCHI Observations

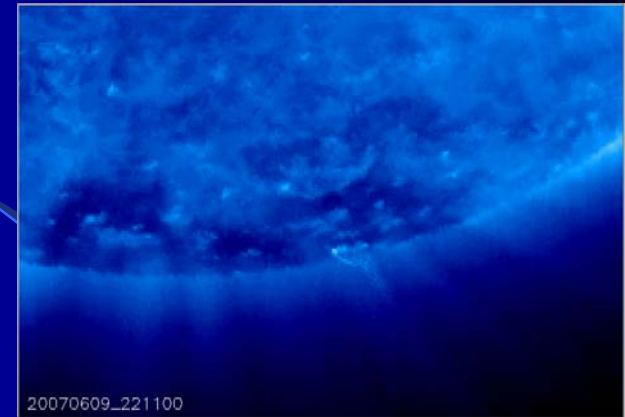


~ 10 degrees

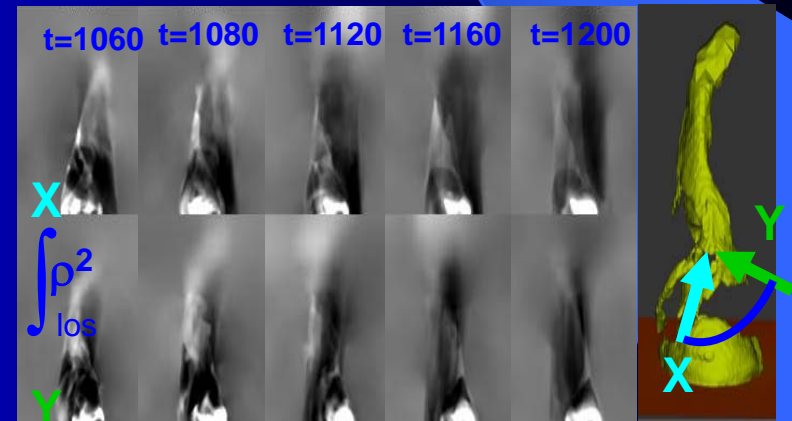
evident differences

Work in Progress

Assemble a database of jets



More realistic comparisons between obs-modeling



Establish a firm link between jets observations from EUVI & CORs

Summary

Performed the first 3D observations of polar jets

Taking advantage of the unique characteristics of STEREO to:

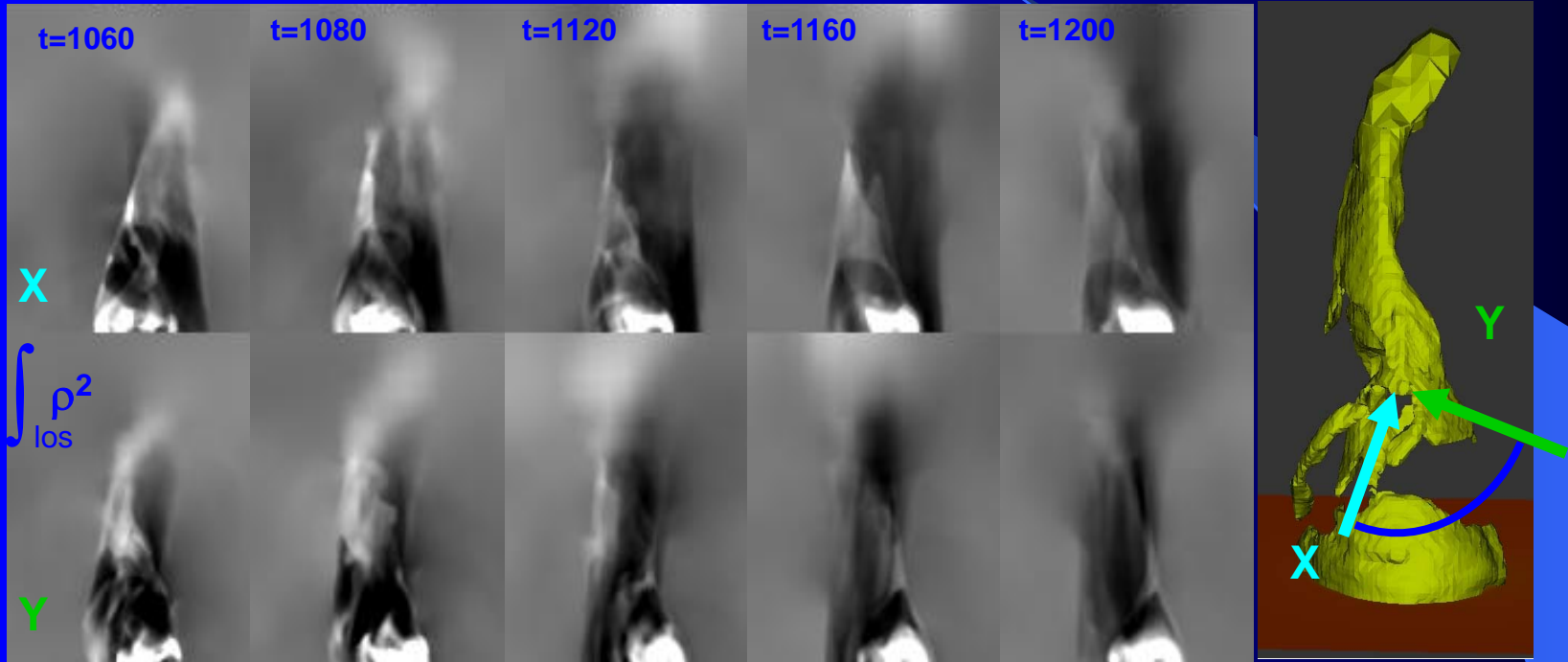
- (1) Calculate 'real' v
- (2) Demonstrate kink in action
- (3) Demonstrate evidence of helical structure



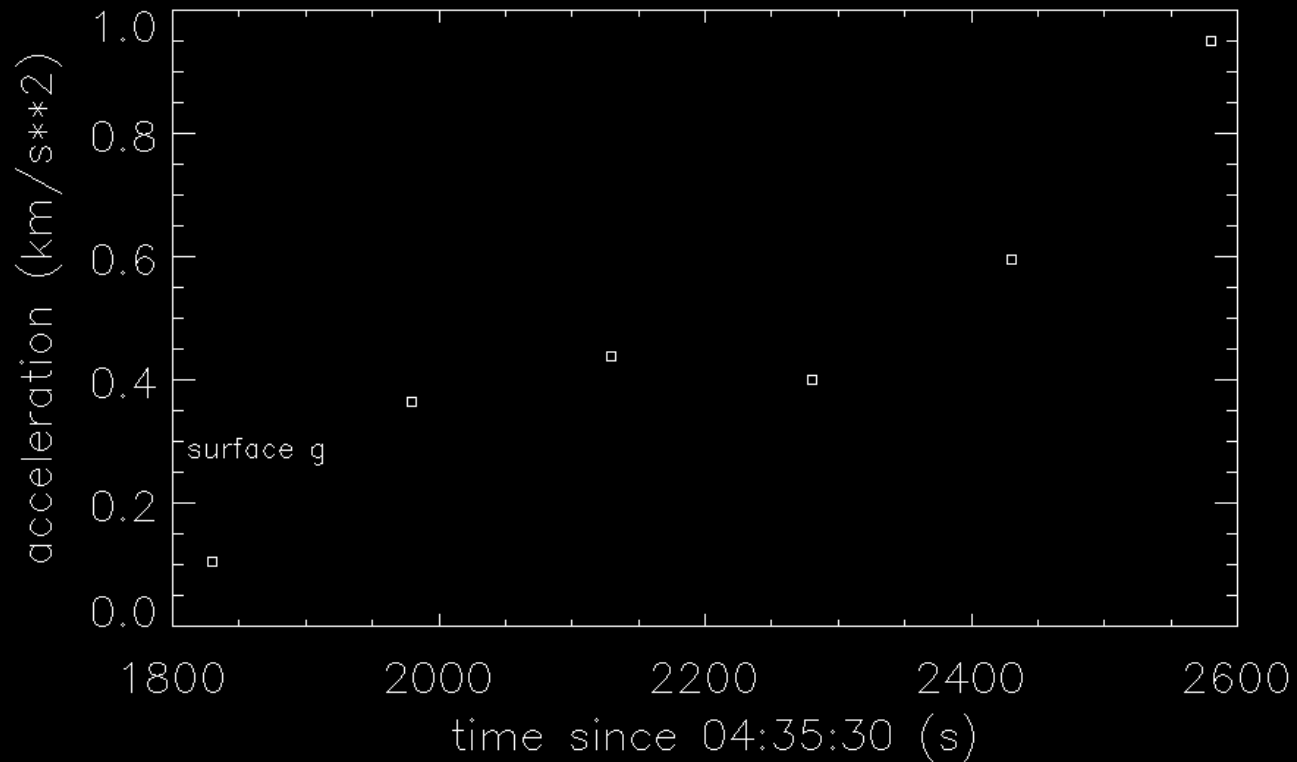
twist can drive polar jets

SECCHI CAN STRONGLY CONSTRAIN JET INITIATION

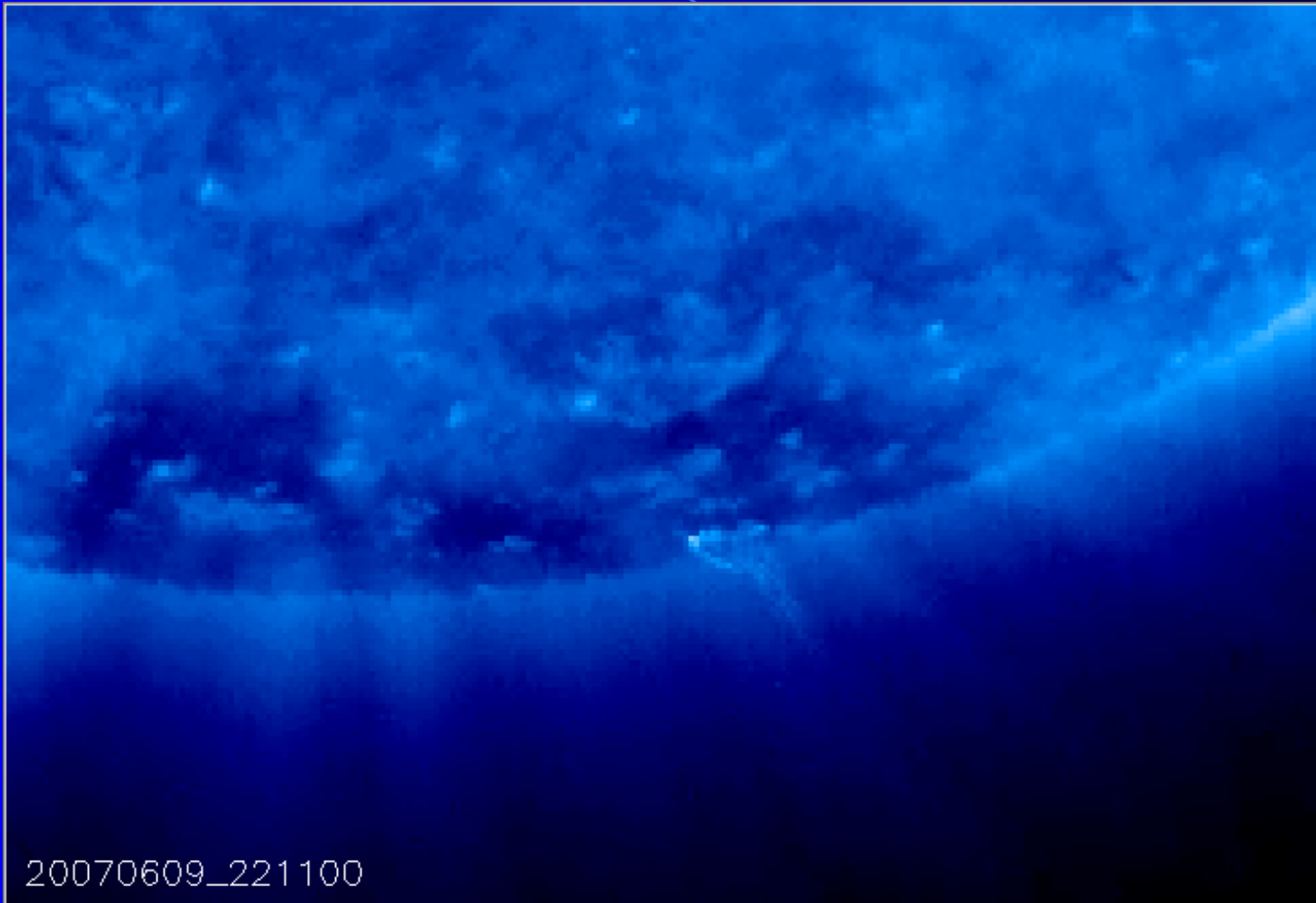
Work In Progress: More Realistic Model-Obs Comparisons



Acceleration of the Jet



Other Examples of Helical Jets



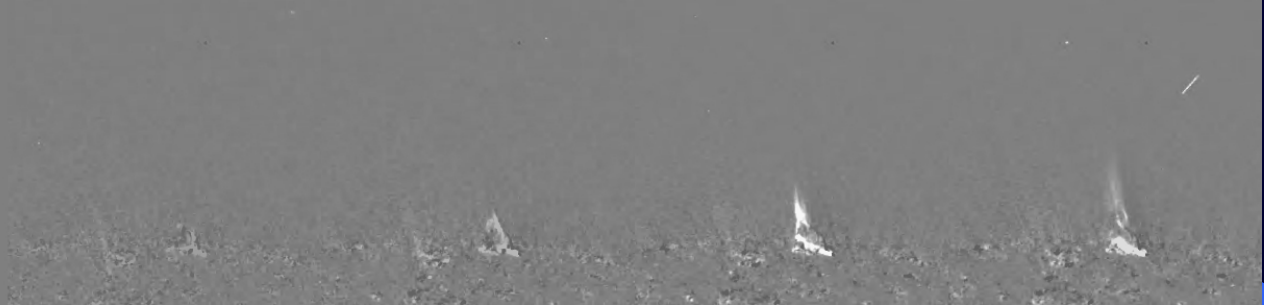
20070609_221100

Difference Images

STEREO A



STEREO B



base diff

STEREO A



STEREO B



run diff

Observing Strategies with SECCHI

Probably focus on 195 & 304 : higher contrast

Synop cadence in 171 probably OK.

But

higher cadence (~30 s) is required in order to see in 3D the jet oscillations that XRT sees. PFIs ?

Deeper exposures with CORs ? Anything in HIs ?

Run a pilot program soon. The SC separation gets too big

Coordinate with Hinode

171, 195, 304 Movies

