Quiet Sun mini-CMEs
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The Region

EUVI/STEREO 171 Å - cadence 2.5 min, pixel size 1.59"
Rotated to SoHO view (6 degrees). MDI HR marked as black box

11 June 2007
STEREO-A

176 events in 24 hours
(1400 per day on Sun)
Event Characteristics

- Darkening (1, 2, 3, 5, 6, 7, 9, 10, 11)
- Brightening (3, 6, 7, 8)
- Faint diagonal feature (3, 4, 7, 10, 11) in space time images

**Average velocity:**
- Dark: 15 km/s
- Bright: 45 km/s

**Average lifetime:**
- Dark: 35 min
- Bright: 35 min
Close-up of events

Space (100 arcsec) – time (125 min)

Dotted lines follow wave front
Trigger – coupling to photosphere

- **Reconnection**: Eruption at sites where opposite polarity fields are driven together
- **Instability**: Eruption brought about by footpoint motion
- **Flux emergence**
Photospheric Flows

Computed using Balltrack (Potts, Barrett & Driver, 2004, AA, 424,253)

Average of running difference images over 8 hours period, divided by the average intensity.

Brightenings mostly at cell junctions. Sites of downdrafts and vortex flows. Flux emergence least likely trigger
Cloud eruption

Greyscale - EUVI 171 Å  FOV 150"x180"
Blue/Red – Positive/negative magnetic field greater than 40 G
Yellow arrows – photospheric flows
Cadence 2.5 min. Duration 3 hours 45 min
Flare eruption

13:23:30 15:26:00 15:51:00

Greyscale - EUVI 171 Å  FOV 125”x125”
Blue/Red – Positive/negative magnetic field greater than 40 G
Yellow arrows – photospheric flows
Cadence 2.5 min. Duration 3 hour 45 min
X-ray flashes
Conclusions

X-ray flashes and ensuing explosive events most probably due to reconnection.

Flux emergence unlikely cause of mini-CMEs

Explosive events are also seen at sites of twisting predominantly unipolar magnetic field and occasionally seen above regions of diverging supergranulation flow – flux emergence
Questions

Can the waves heat the corona?
We found at any one time 1/50 of disk covered by waves.
Expect SDO will find more events, faster events.

Is the cold cloud an erupting filament?

How is it formed? Formation time? Filament size?