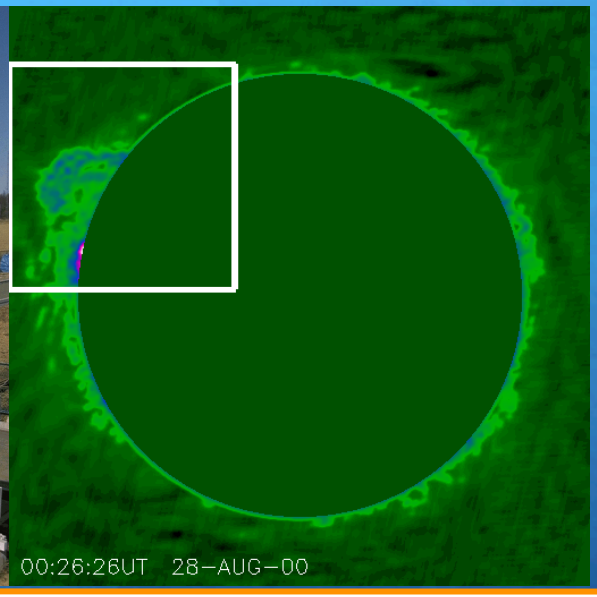


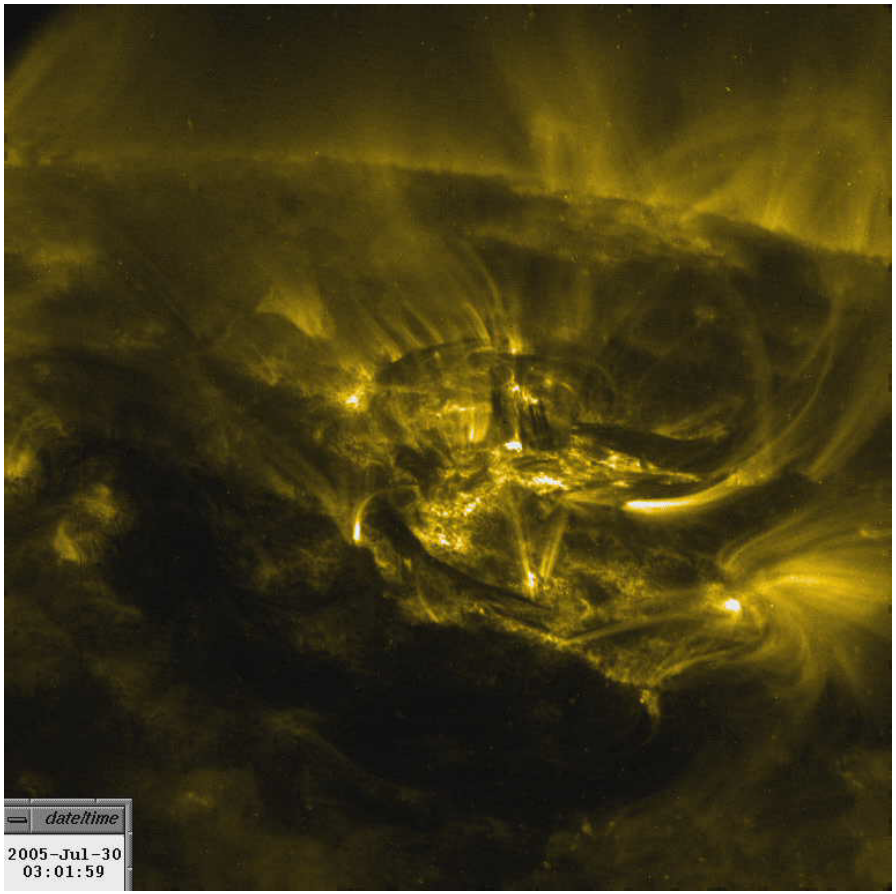
NSRO-CDAW11 Group2
第２４太陽周期のプロミネンス放出現象の多波長解析

下条 圭美(しもじょう ますみ)
Nobeyama Solar Radio Observatory/NAOJ/NINS

国立天文台 NAOJ National Astronomical Observatory of Japan

Brightening (Heating) in filaments/prominences before the main phase of eruptions

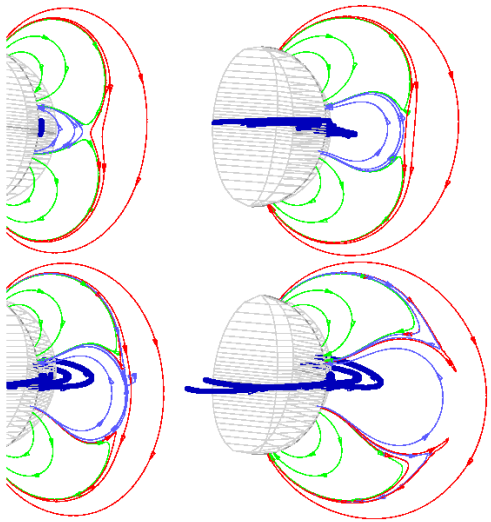
TRACE 171Å / 30-Jul-2005 X1.3 flare



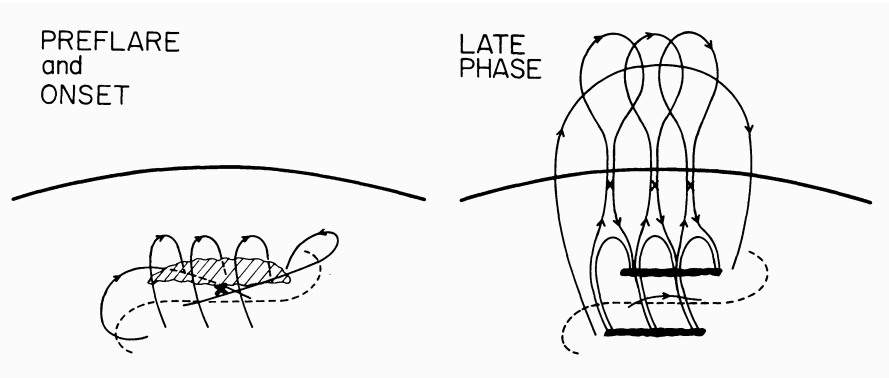
- Some parts of the filaments brightened before the main phase of the eruption and the flare.
  - The brightenings do not directly relate to the main energy release of the flare.
- The brightenings indicate the process of the magnetic field destabilization?

From Theoretical View…

Break-Out Model (Antiochos, 1999)



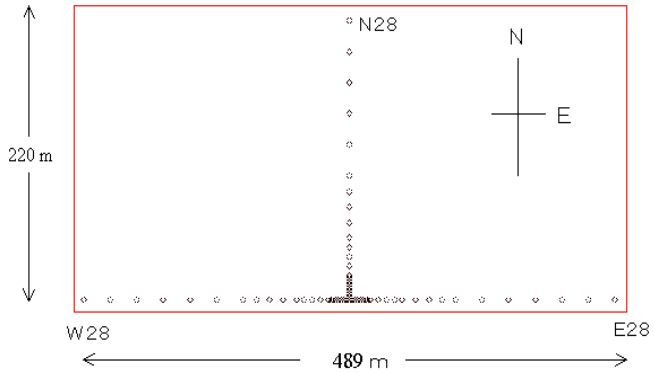
Tether-Cutting Model (Moore et al. 1973)



- Both models suggest that the tiny reconnection reduces the magnetic drag force (magnetic pressure & tension) and then the magnetic energy converts to the kinetic energy.
  - The difference of the models is only the site of the tiny reconnection.

Most important thing for understanding the acceleration of prominences is the relationship between the tiny reconnection and the variation of velocity.

Nobeyama Radioheliograph (NoRH)

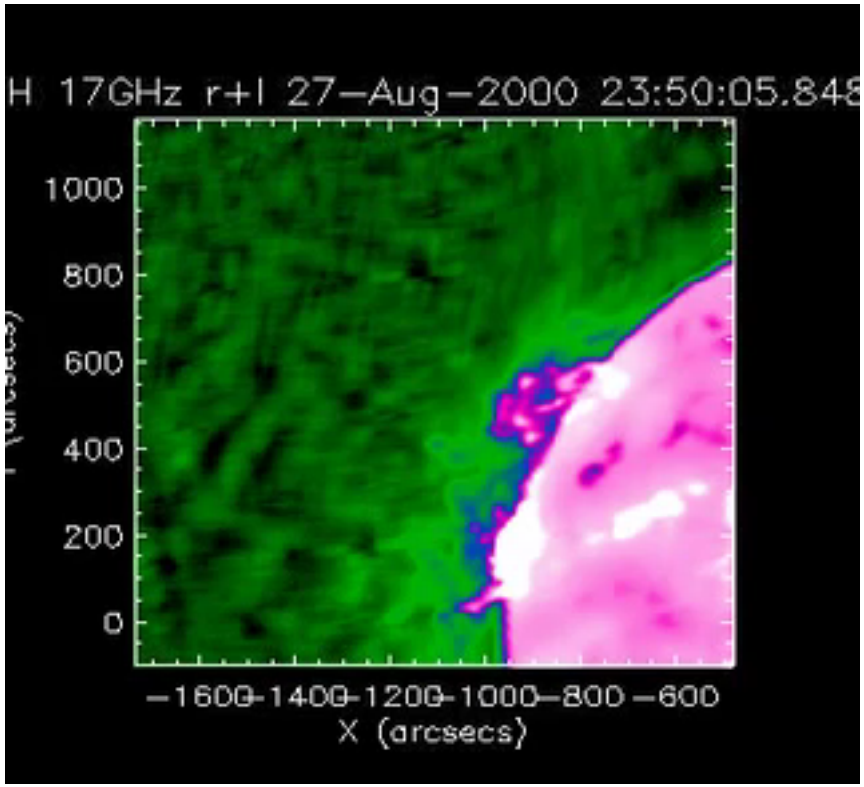


- 84 Antennas (Φ=80cm)
- Freq. : 17 and 34 GHz
- The length of longest baselines
  - North-South 220m
  - Ease-West 489m
- Spatial Resolution
  - 10 arcse@17GHz
  - 5 arcsec@34GHz
- Time Resolution
  - 50 msec (Maximum)
  - 1 sec (non-flare observation)
- Observation Time : 23:00~06:30UT

http://solar.nro.nao.ac.jp/

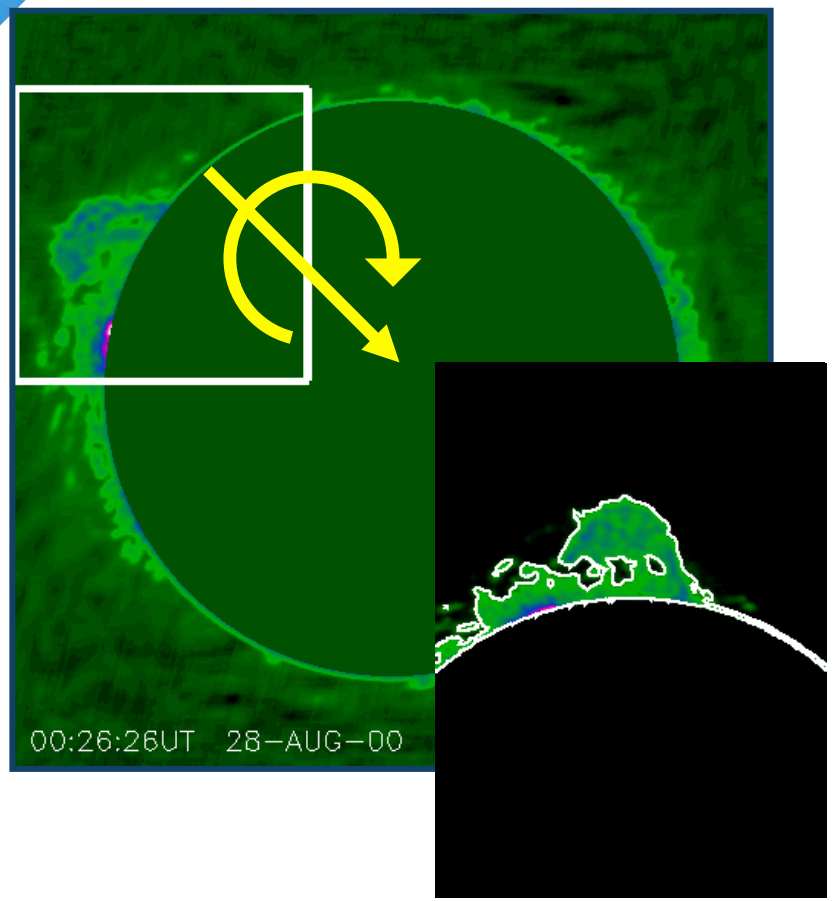
Advantages of NoRH for the Observation of Prominence Eruptions

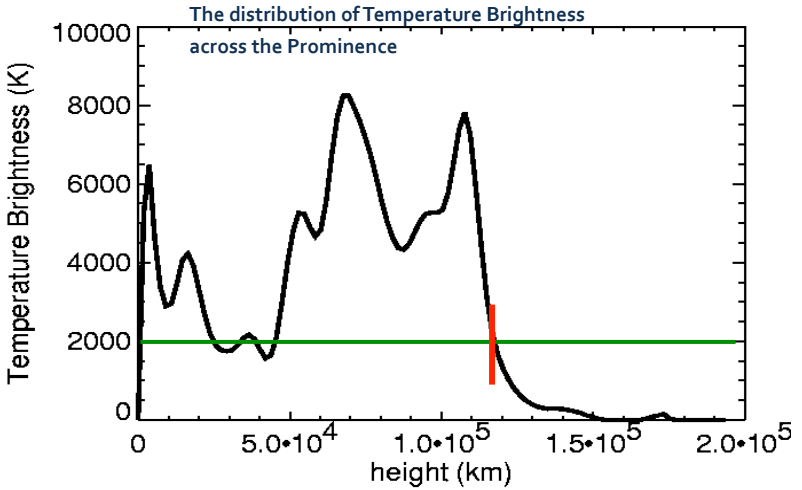
NoRH 17GHz Movie / 27~28-Aug-2000

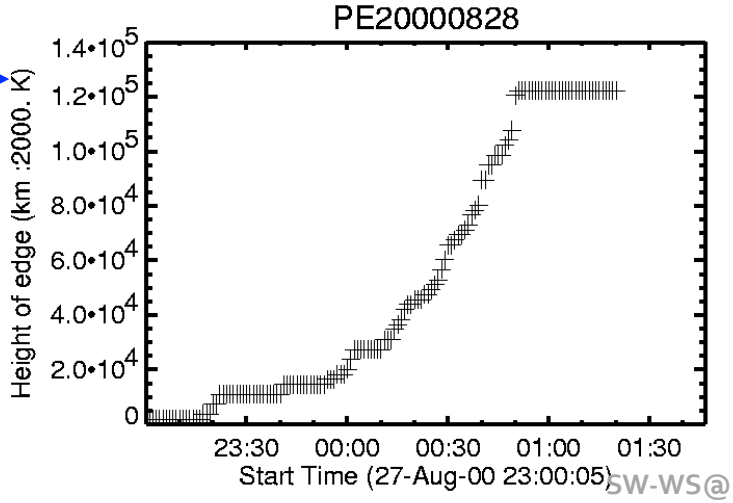


- Advantages of NoRH
  - We can observe the Sun on cloudy and rainy days.
  - Not sensitive about the velocity of plasma
    - Hα observation has the limitation on the velocity range.
    - The dark feature in EUV images show only optically thick (dense) region in EUV range.
  - Good time resolution
    - ~1 sec @ Normal Obs.
  - Large Field of View (~1.3 R_{sun})
- Disadvantage of NoRH
  - Dirty Point Spread Function.
    - Most of the inner fine structures in the prominence are not real.

How to measure the height of Prominence Eruption

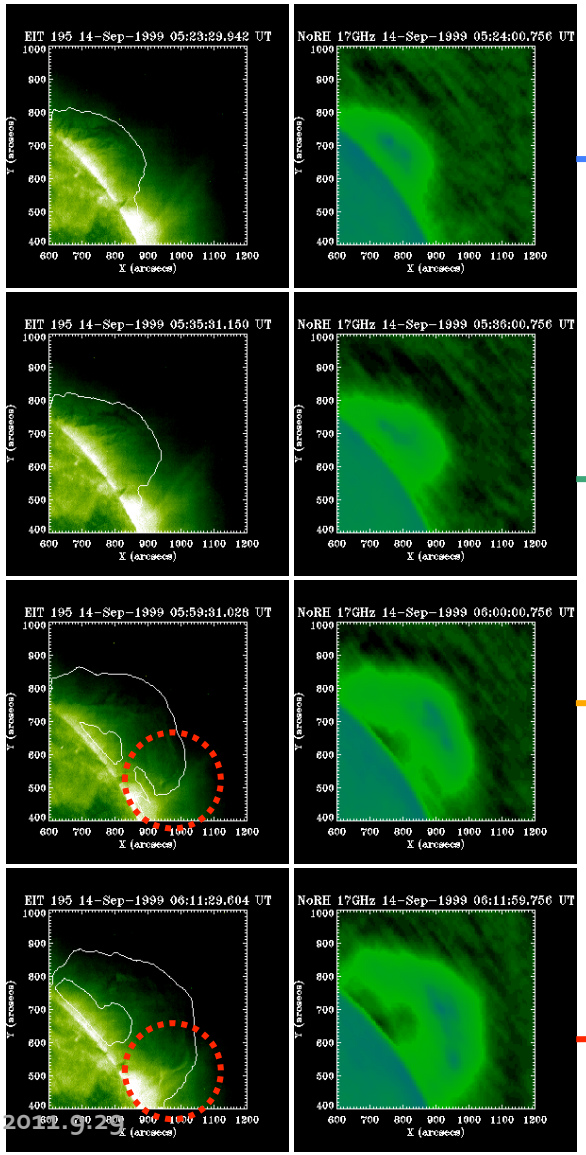


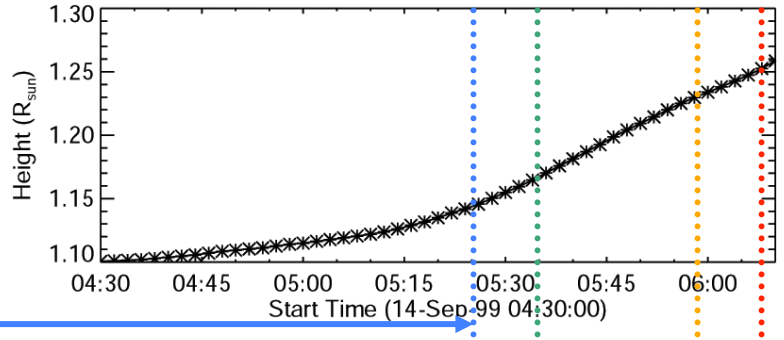




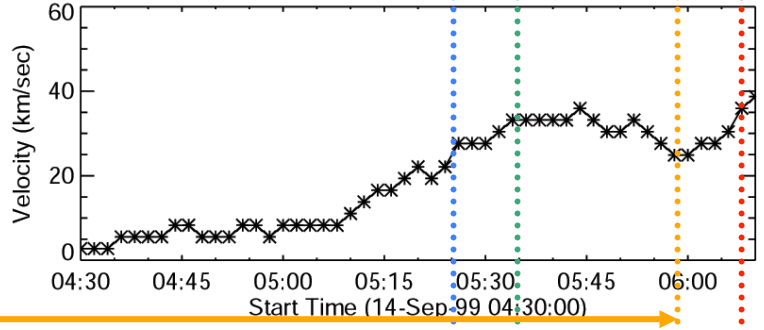
Event1: 1999-09-14

195 Å 17GHz

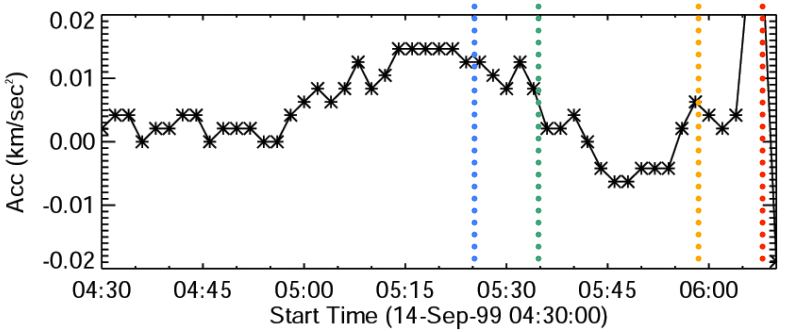




Height (R_{sun})



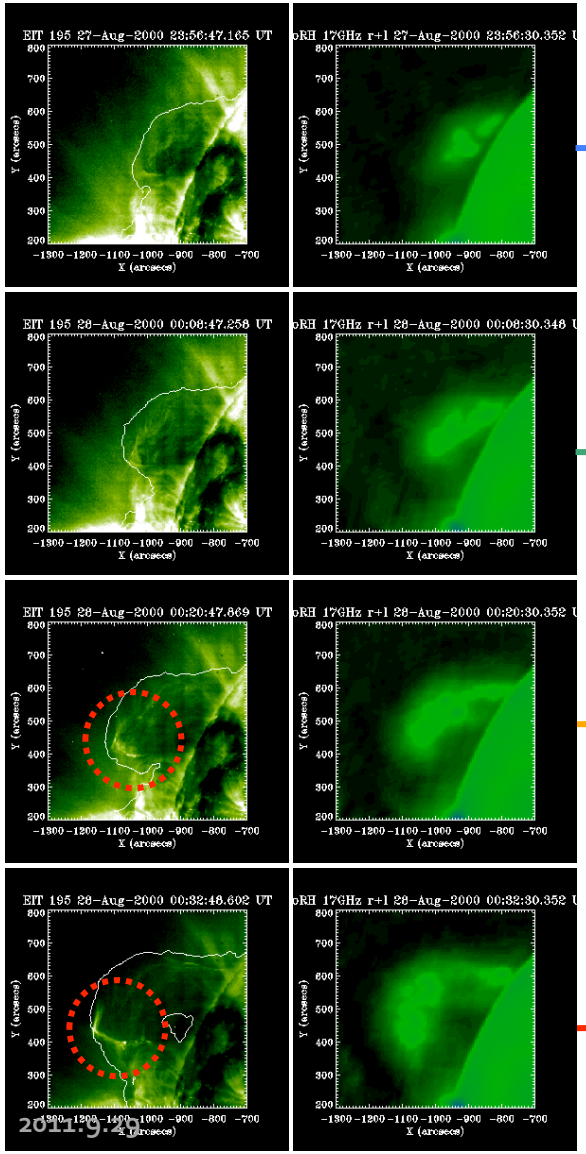
Velocity (km/sec)

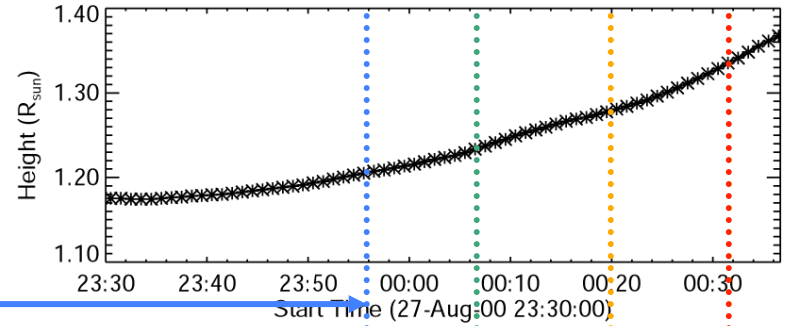


Acceleration (km/sec²)

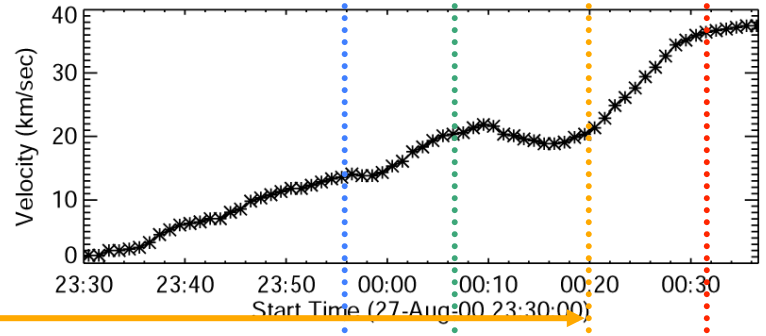
Event 2: 2000-08-27

195 Å 17GHz

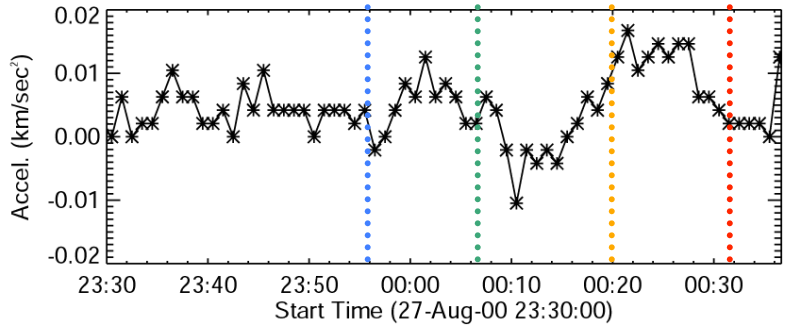




Height (R_{sun})



Velocity (km/sec)

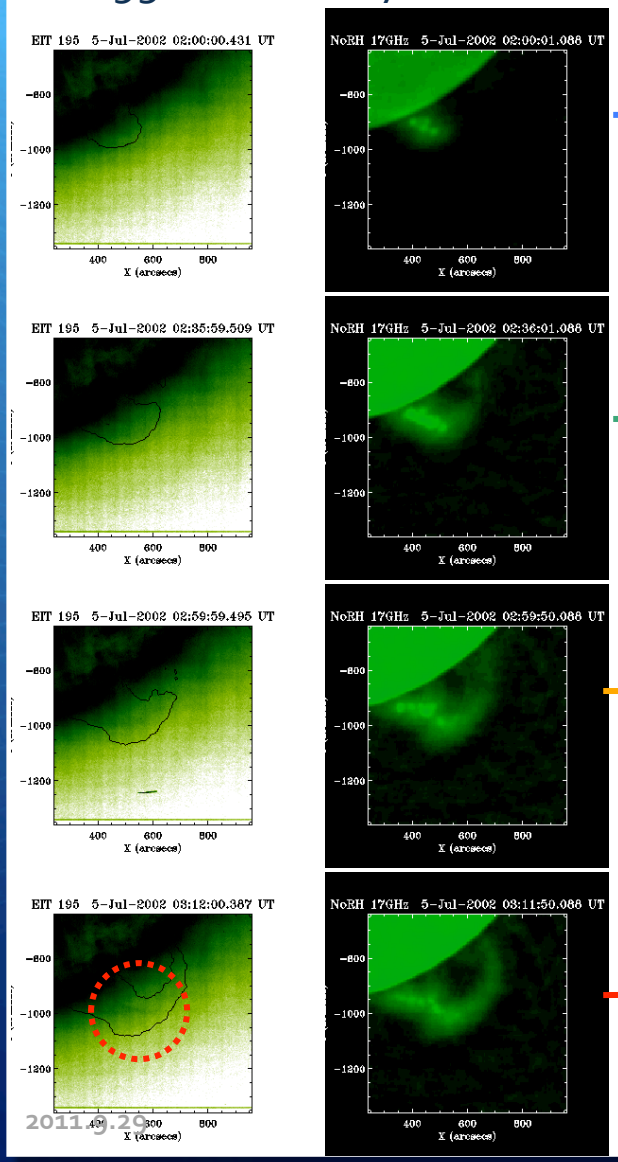


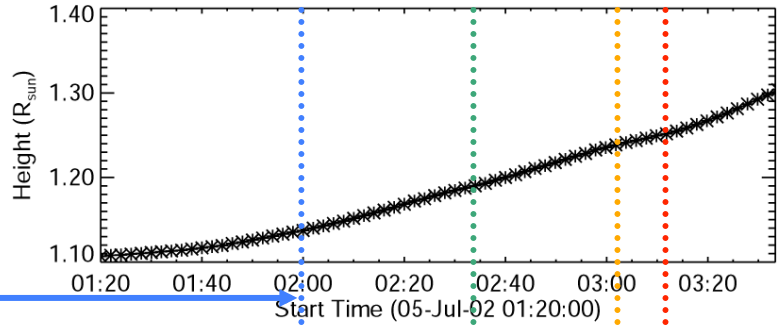
Acceleration (km/sec²)

Event 3: 2002-07-05

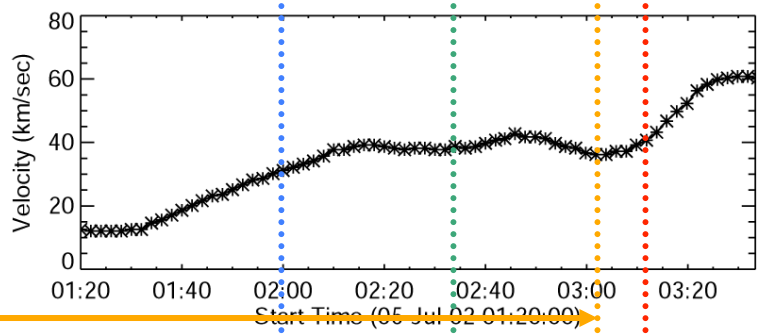
195 Å

17GHz

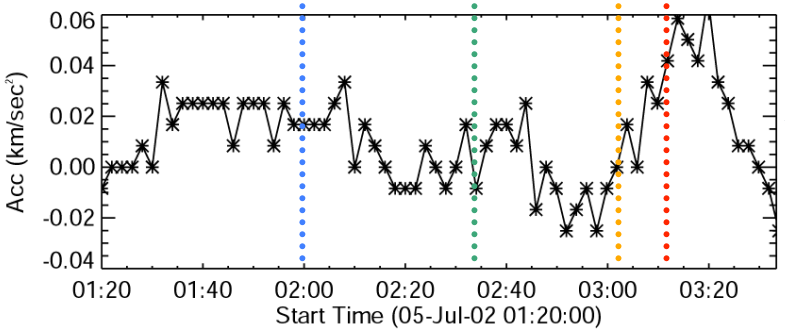




Height (R_{sun})



Velocity (km/sec)

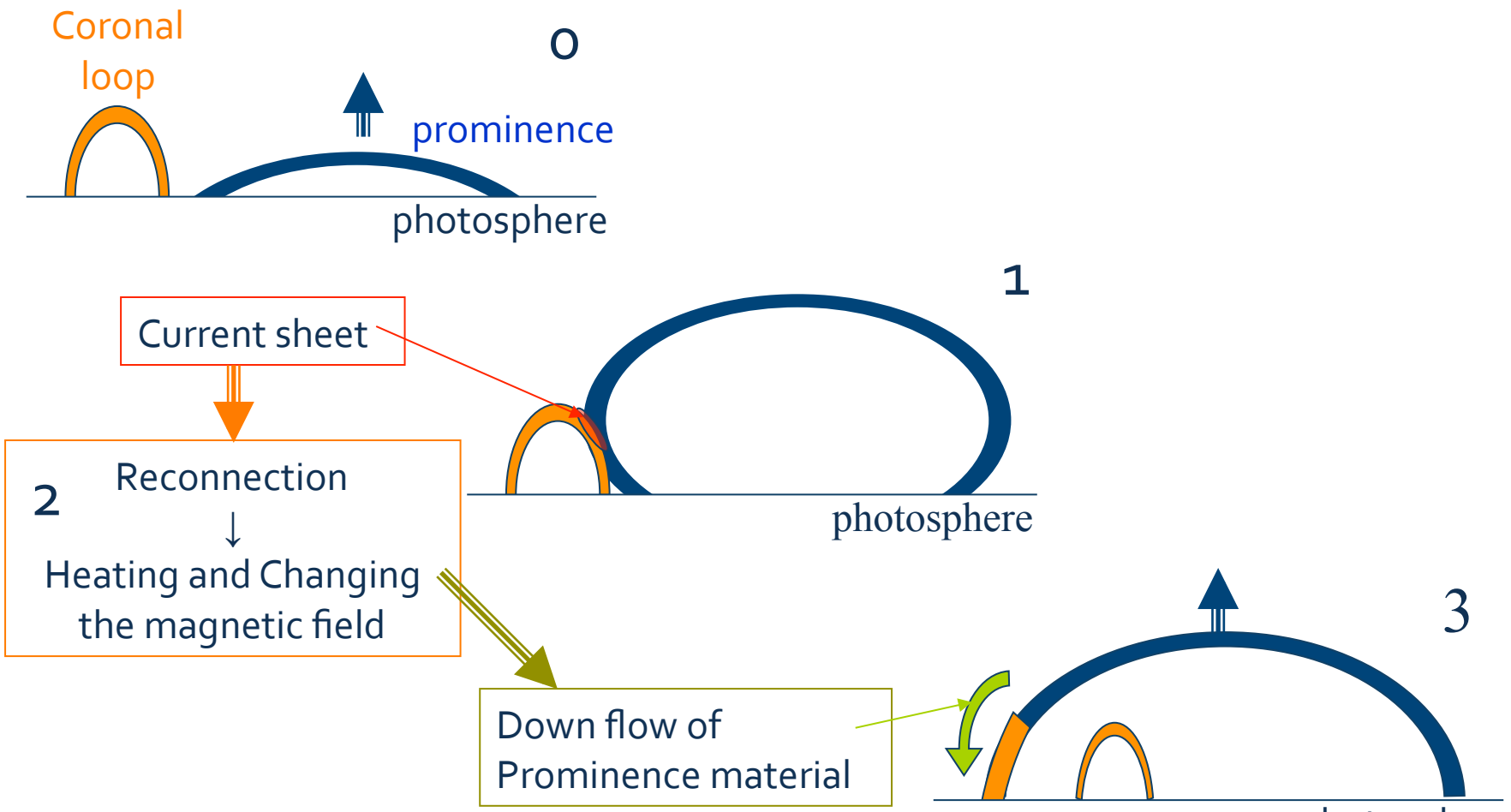


Acceleration (km/sec²)

Summary of the Observations

- Before the brightening of the prominence material in EIT images(= the heating of the prominence), the upward velocity of the prominence decreases.
- After the heating, the upward acceleration of prominence becomes large or is back to the previous value.
- The prominence material flow to photosphere appeared after the brightening. It means the changing of the magnetic field connectivioty?

Simple model based on the observations



NSRO-CDAW11 Group2の目標

- Time resolution issue
  - The time resolution of the EIT/SOHO is only 10 mins. It is not enough to trace the evolution of the brightening in the prominence.
  - The time resolution of AIA/SDO is very high (~10 sec). It is very useful for the study.
    - ➔ We will perform the same analysis using new data (SDO/NoRH/Hinode/STEREO).