

# ON FINE STRUCTURE IN SOLAR FLARES FROM SDO, RHESSI AND TRACE OBSERVATIONS

*Porfir'eva G. A. and Yakunina G. V.*

*State Moscow University by M. V. Lomonosov,  
Sternberg Astronomical Institute, Moscow, Russia*

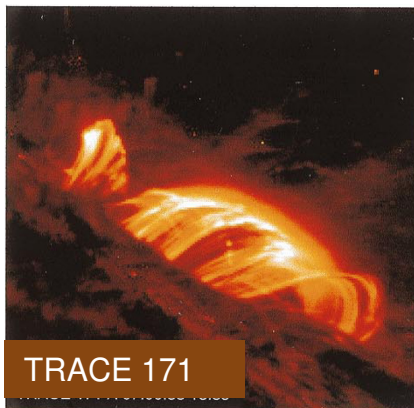
We present a **brief review** on flare fine structure observed in **EUV, UV, visible, near infrared (NIR)** and **X-ray spectral regions on the ground and from the space.**

Parameters of the observations of the white-light (WL) flare emission are given in the Table.

$\lambda$	Spectral width $\Delta\lambda$	spatial resolution	cadence
G-band	0.5-0.8 nm	$\sim 0.1''/\text{px}$	$2^s - 2^m$
1.53 $\mu\text{m}$	5.0 nm	$\sim 0.1''/\text{px}$	$2^s - 2^m$
520 nm	52 nm		$1^m$

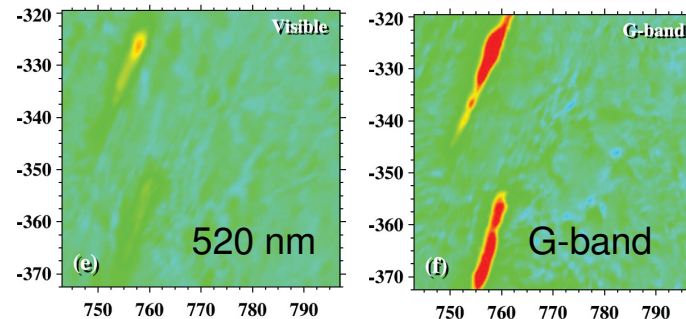
## Fine structure of flares

X3.4 flare on 1998 November 22, **TRACE**.



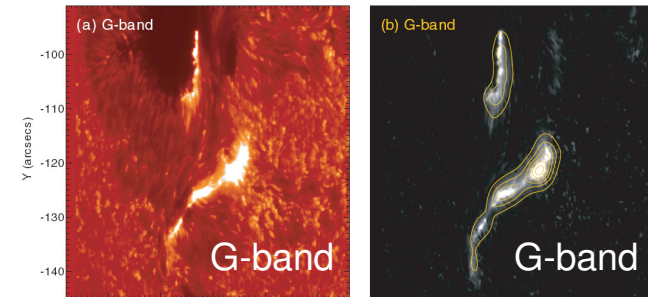
Multiple fine distinct loops are seen.

Two ribbon X8 flare on 2003 November 2, **Sacramento Peak**.



Flare kernel consists of a bright inner part and a weaker outer halo.

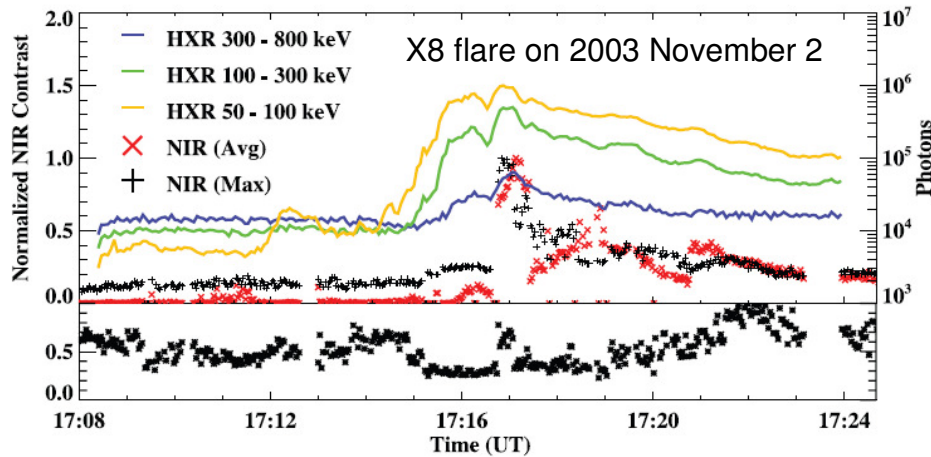
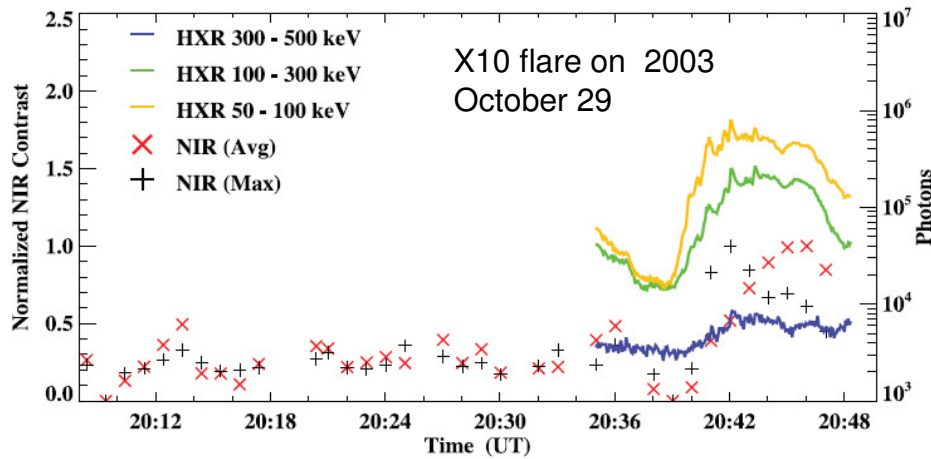
2006 December 6 X 6.5 flare, **Hinode**.



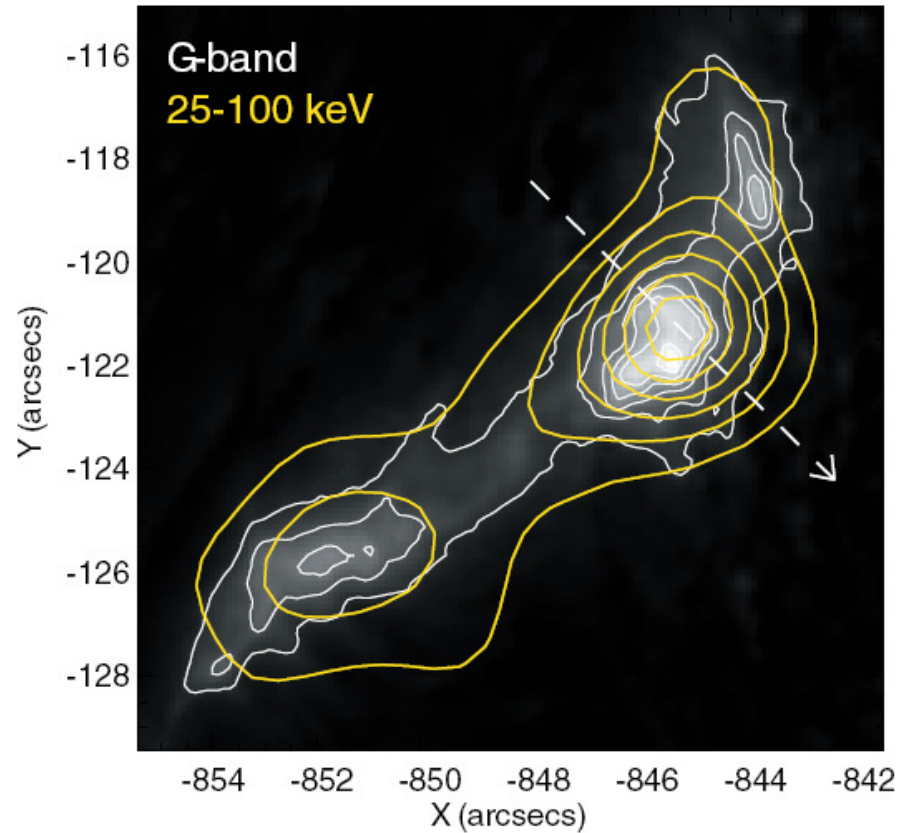
Narrow fine ribbons with a thickness of  $0.5-1.8''$

# Relations between W-L and X-ray flare emissions

W-L emission correlates with hard x-rays in site and time.

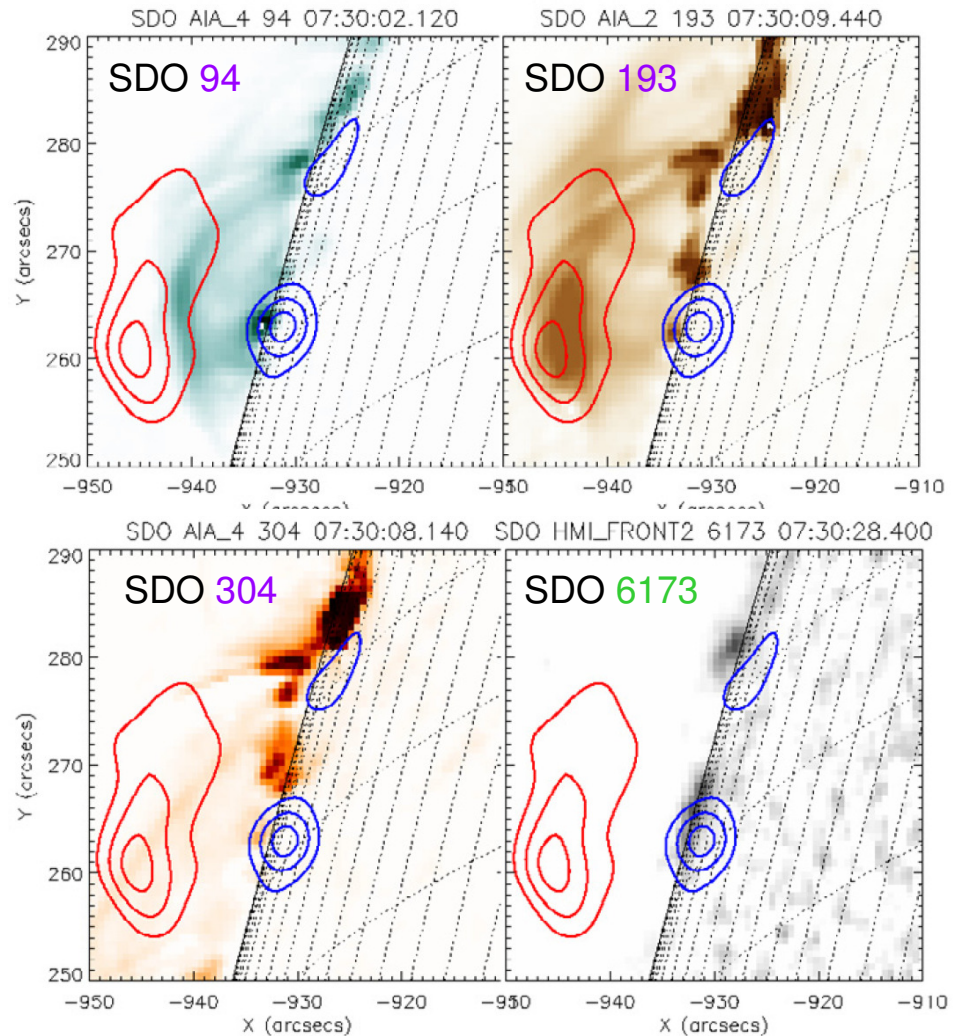
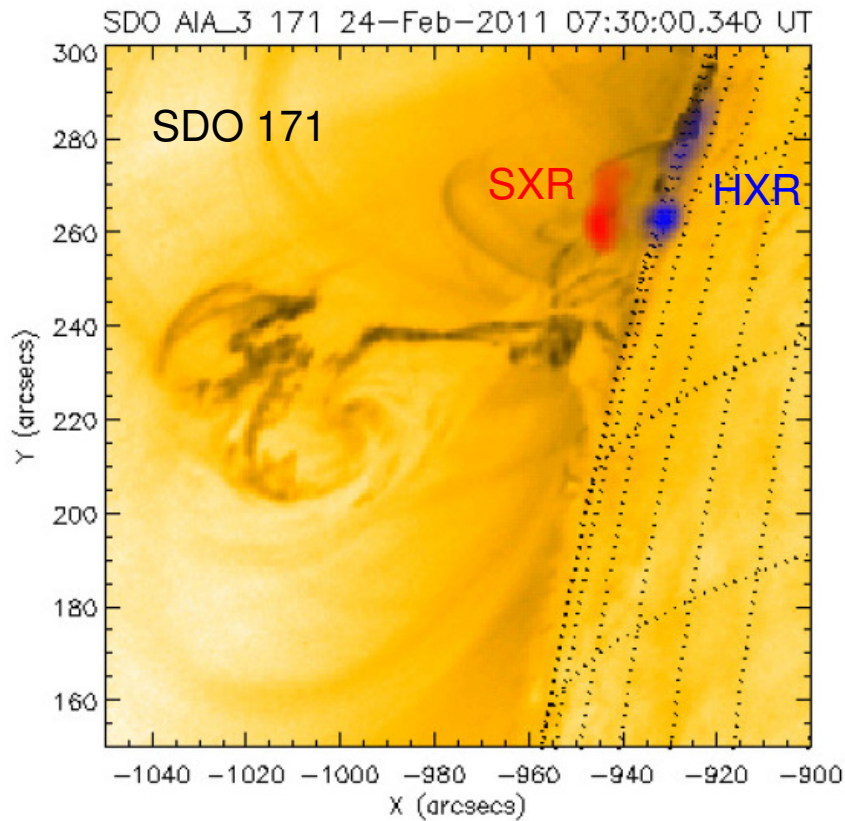


The time lag between the HXR and continuum emission in  $1.56 \mu\text{m}$  is of 20-30<sup>s</sup>.



Coincidence in location between continuum emission in G-band and hard X-rays for X6.5 flare on 2003 December 6.

# HEIGHT STRUCTURE OF FLARE by SDO



Limb flare M3.5 on 2011  
February 24 associated with  
the **filament eruption**.

35-100 keV **HXR** sources (**blue**) were located at heights of **0.8 – 1.7 Mm** above the photosphere, **617.3 nm** originated at **1.5 – 3 Mm**, **EUV** emission was observed at height of **~3 Mm** and **SXR** emission (**red**) was at the loop top in corona.

## Summary

In conclusion it is necessary to point that spatially and temporally correlated W-L and hard X-ray emission show that continuum enhancement and accelerated electrons are closely related.

The **time lag** between the HXR and continuum emission in  $1.56 \mu\text{m}$  of 20-30<sup>s</sup> **agrees with the time of photosphere heating** but the opacity during the flare must change and flare continuum might originate higher in photosphere and chromosphere. The limb observations in  $\lambda 6173$  by **SDO** have given the **height of 1.5 – 3 Mm above the photosphere.**

**A well-defined model is need, which would be able to understand if the flare continuum emission originates beneath or above the upper photosphere.**

*Thank You*