Microburst Time of Flight Dispersion

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Inverse (positive) dispersed microbursts

Hypothesized by a time-of-flight model in Miyoshi et al., (2010) and Saito et al., (2012)

Called inverse dispersion in Miyoshi et al., (2010) paper, and positive dispersion in Saito et al., (2012)

I stumbled into them. Surprisingly, I did not find them when I looked for them in ~2016.

I identified microbursts using the burst parameter and fit all of the microbursts with a Gaussian + linear trend.

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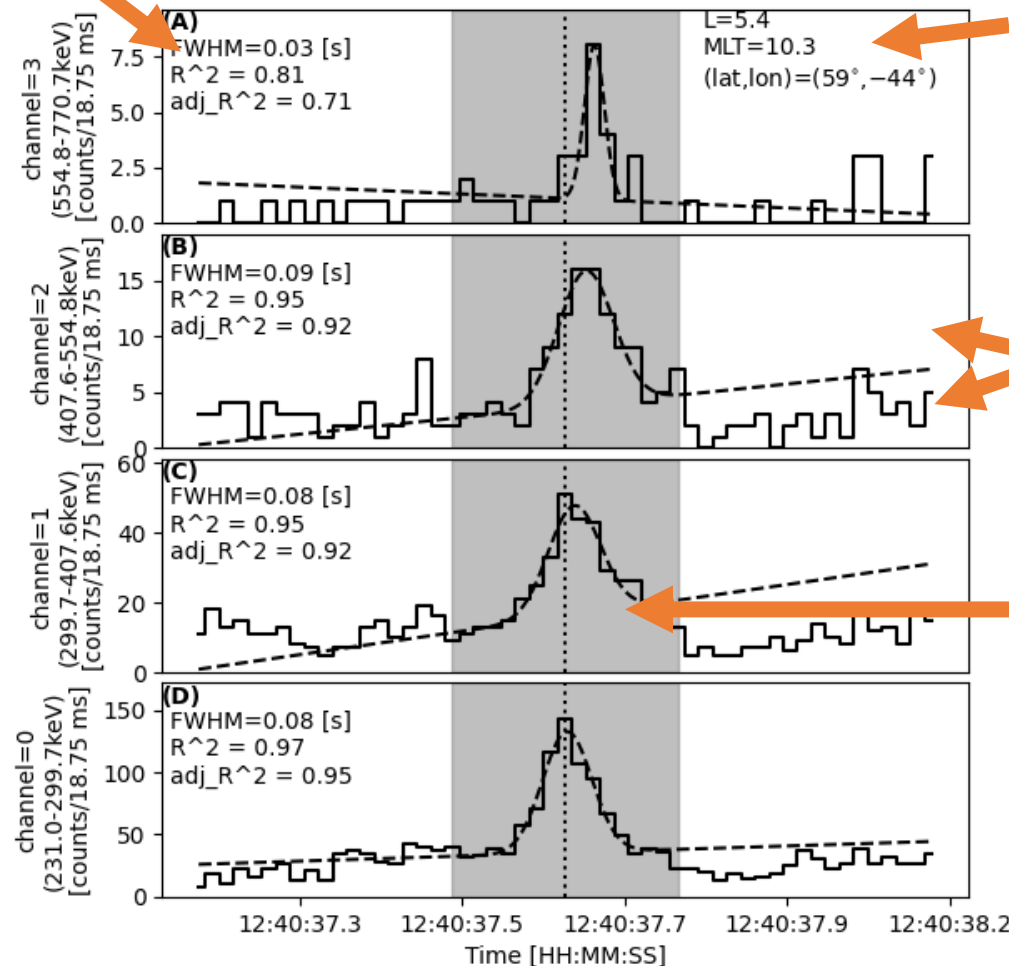
R^2 and adj R^2 are the quality of fits

Fit info

Location

HiRes data shown in solid and Gaussian fit shown in dashed

Gray rectangle is the fit time range and black vertical dotted line is at channel 0's t0
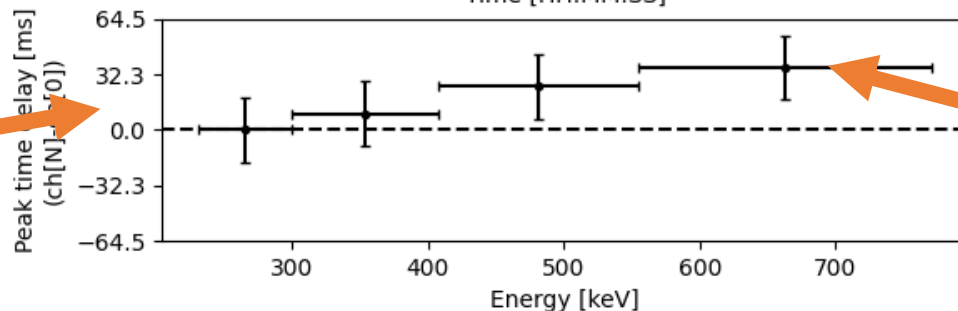
- Points are microburst t0
- X-errors are energy channel widths
- Y-errors is the HiRes cadence

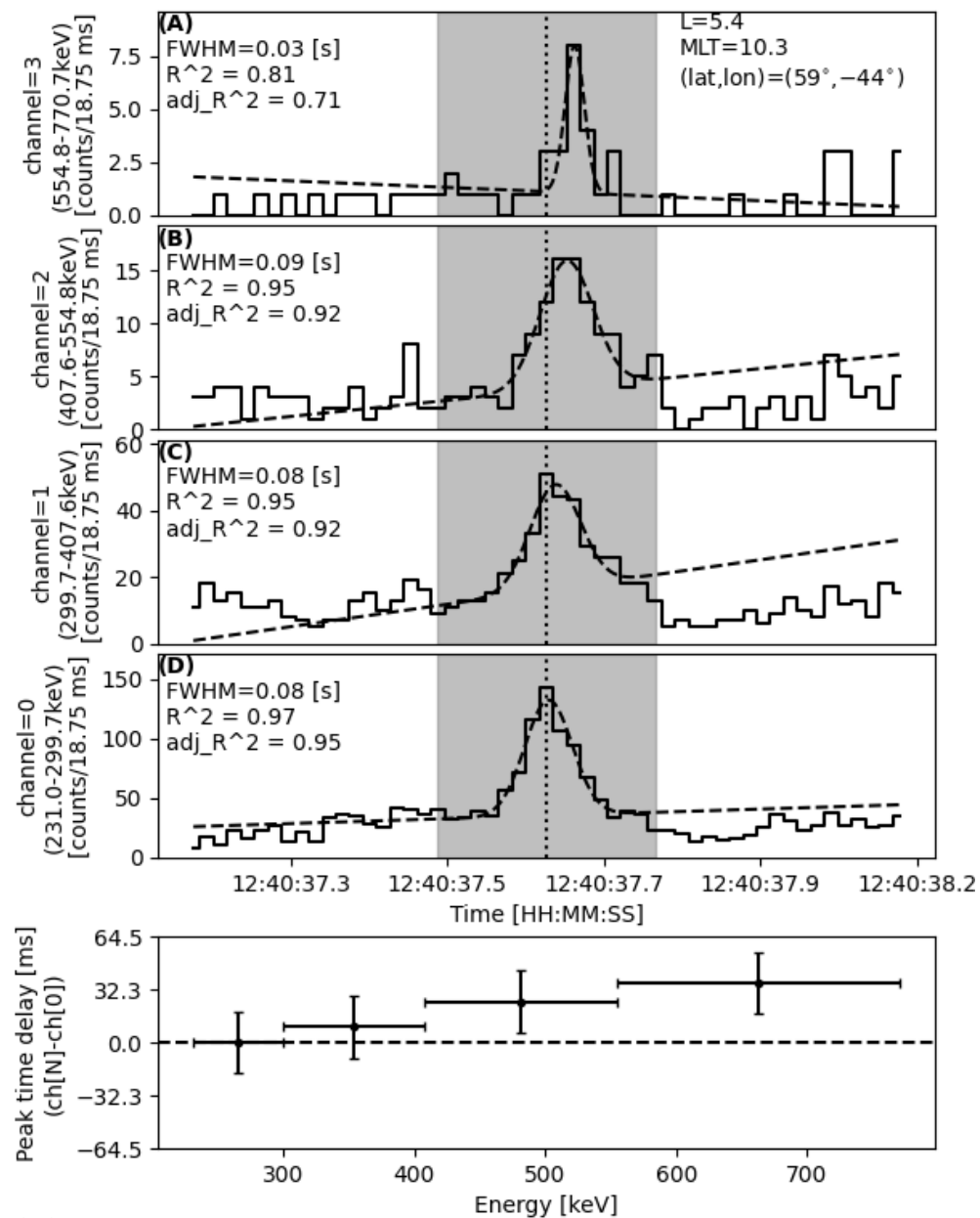**Positive peak time delay == positive dispersion == inverse dispersion (with respect to CH0)**

FU3 Microburst Dispersion
2015-08-27 12:40:37.696750

(A) FWHM=0.03 [s] R^2 = 0.81 adj_R^2 = 0.71
L=5.4 MLT=10.3 (lat,lon)=(59°,−44°)
channel=3 (554.8-770.7keV) [counts/18.75 ms]

(B) FWHM=0.09 [s] R^2 = 0.95 adj_R^2 = 0.92
channel=2 (407.6-554.8keV) [counts/18.75 ms]

(C) FWHM=0.08 [s] R^2 = 0.95 adj_R^2 = 0.92
channel=1 (299.7-407.6keV) [counts/18.75 ms]

(D) FWHM=0.08 [s] R^2 = 0.97 adj_R^2 = 0.95
channel=0 (231.0-299.7keV) [counts/18.75 ms]

Time [HH:MM:SS]

Peak time delay [ms] (ch[N]-t0])

Energy [keV]

FU3 Microburst Dispersion
2015-08-27 12:40:37.696750

FU3 Microburst Dispersion
2015-08-27 12:41:01.663000
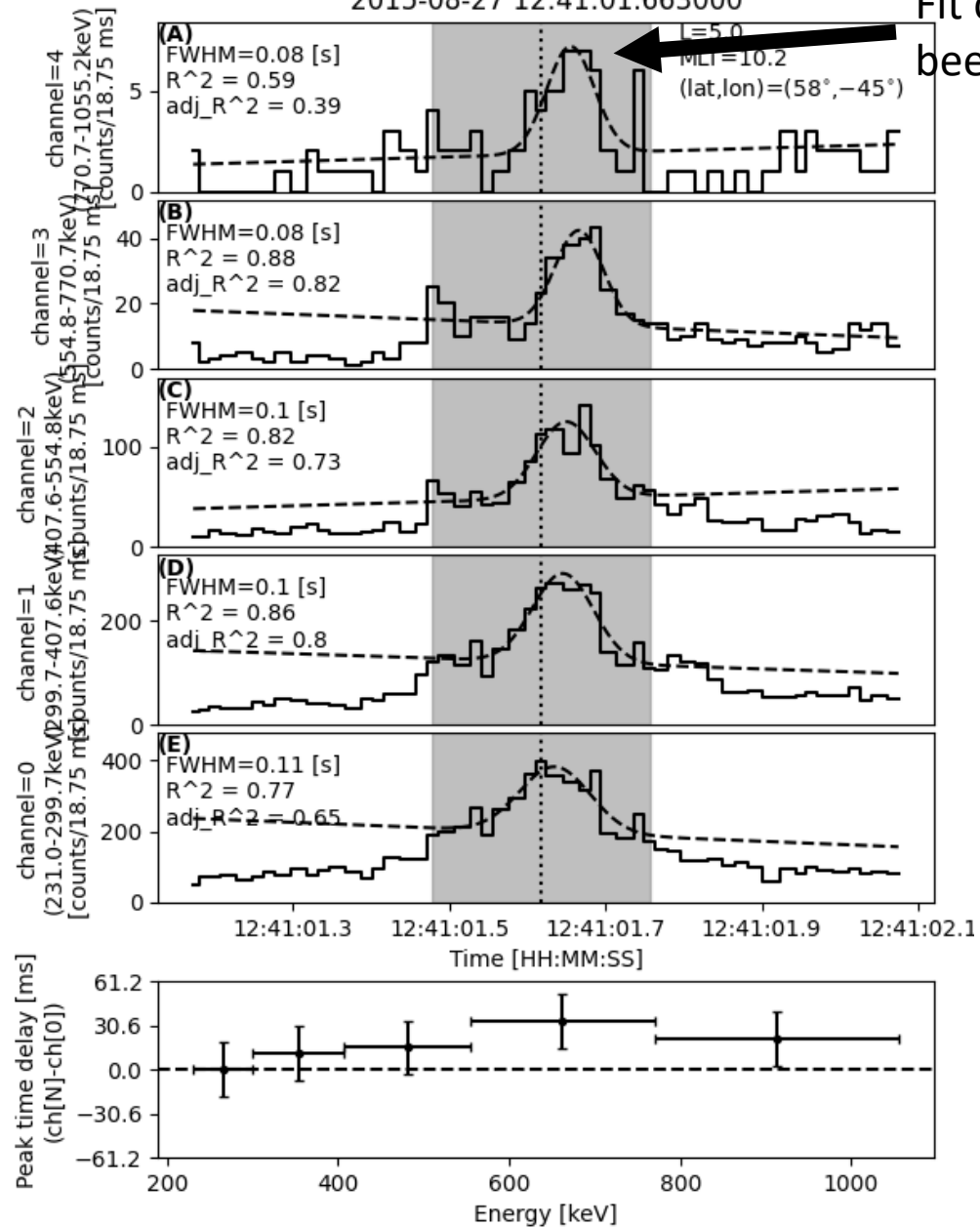
Fit could have been better
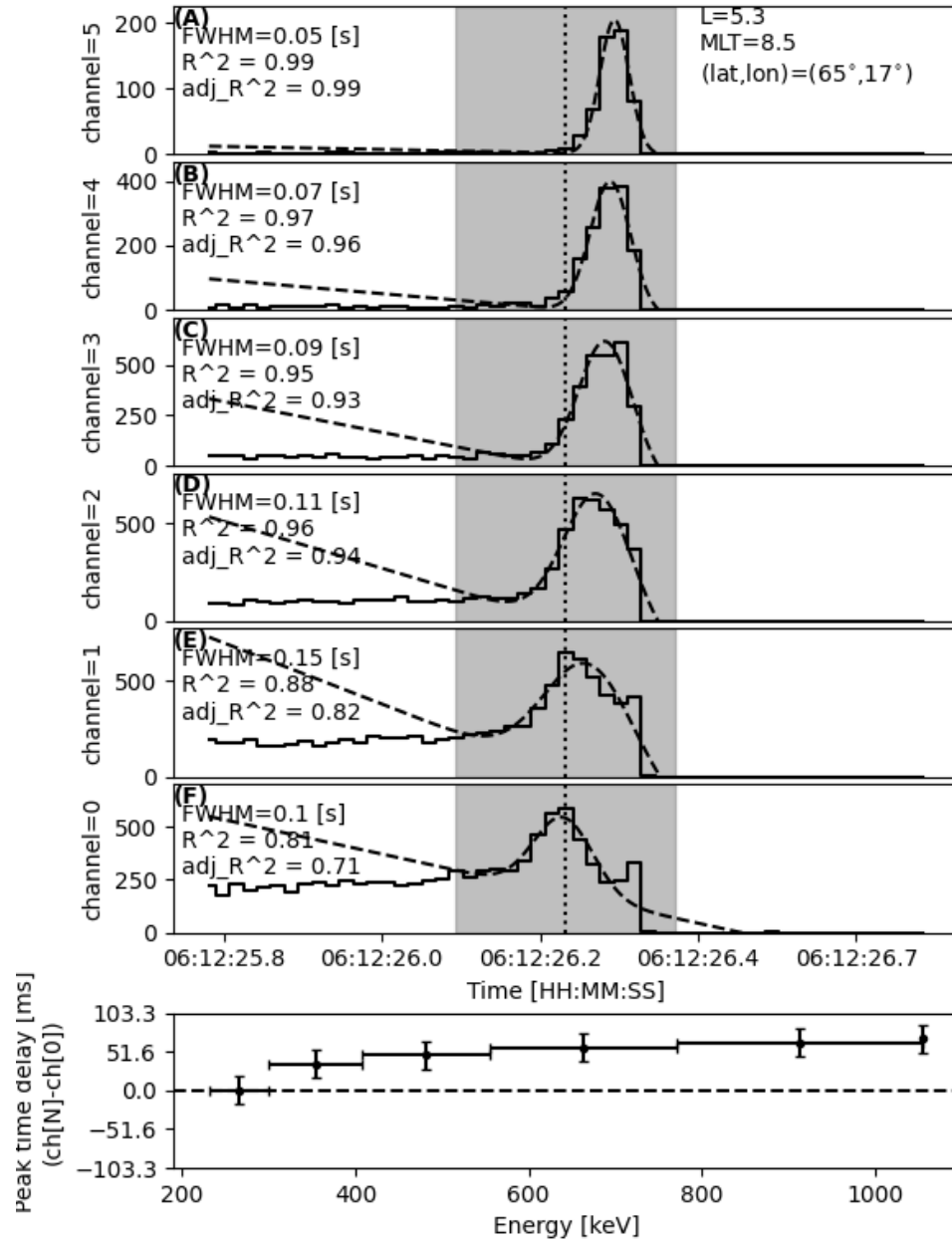
2/9/2023

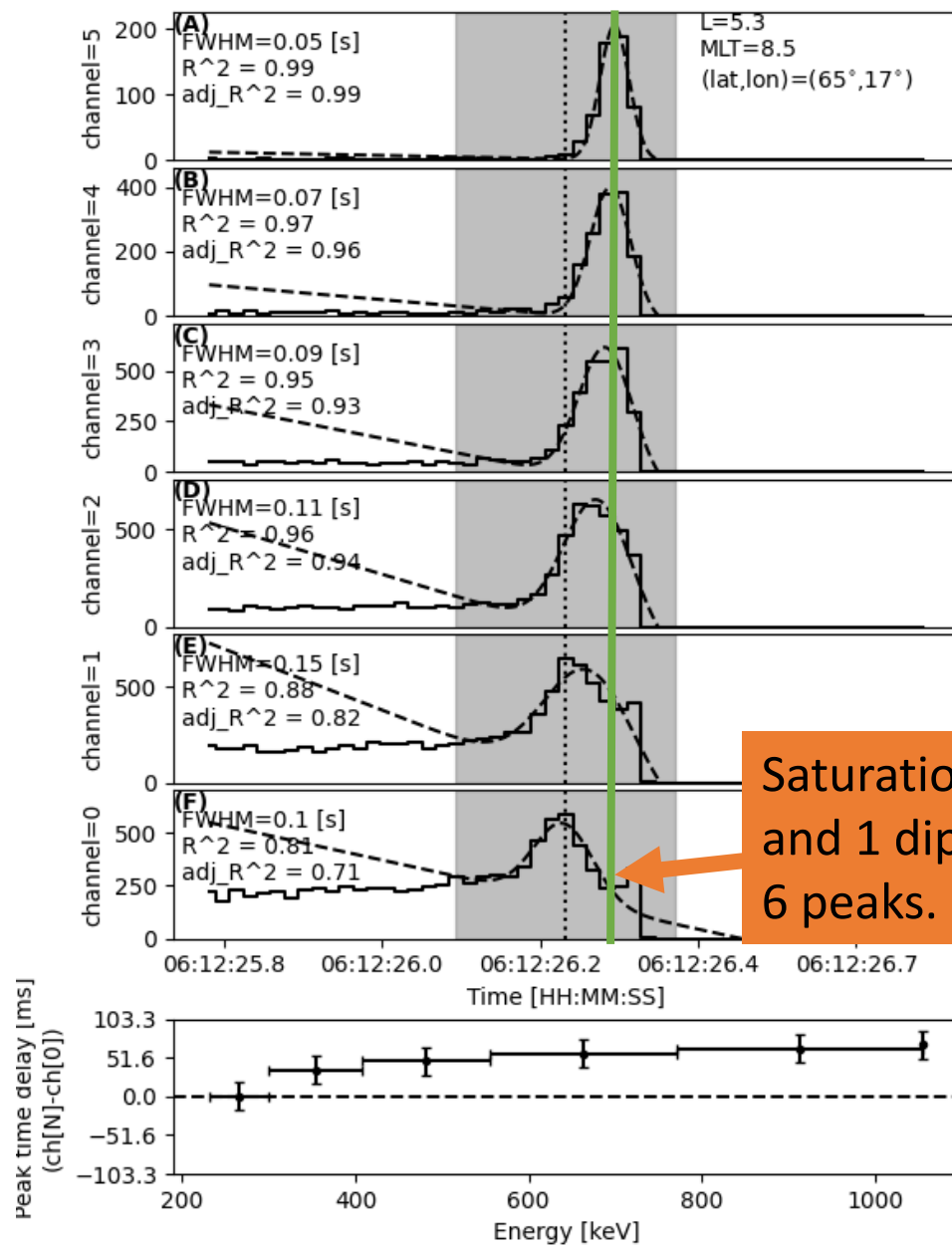Microburst Time of Flight Dispersion
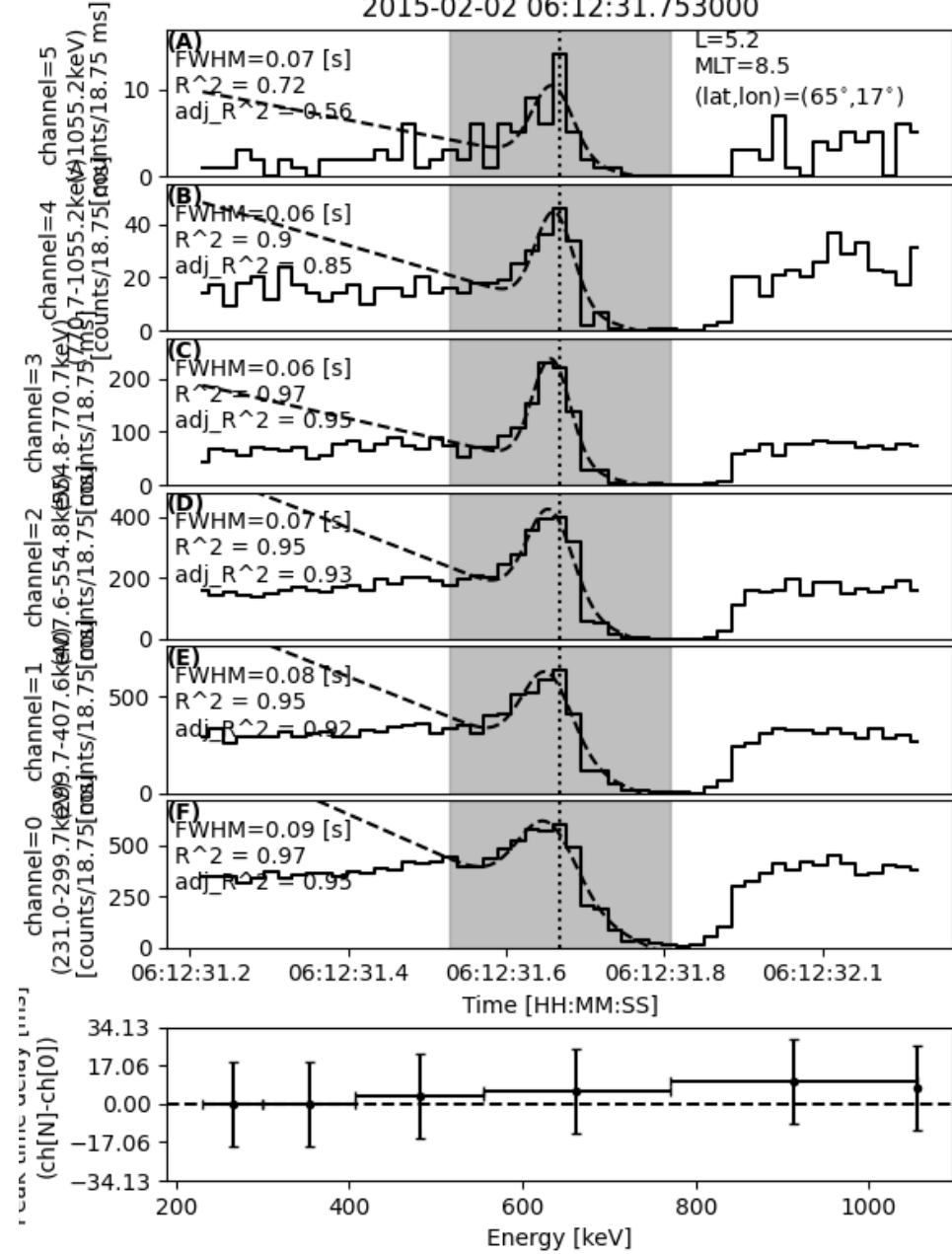
Saturation? Channels 0 and 1 dip right as channel 6 peaks.
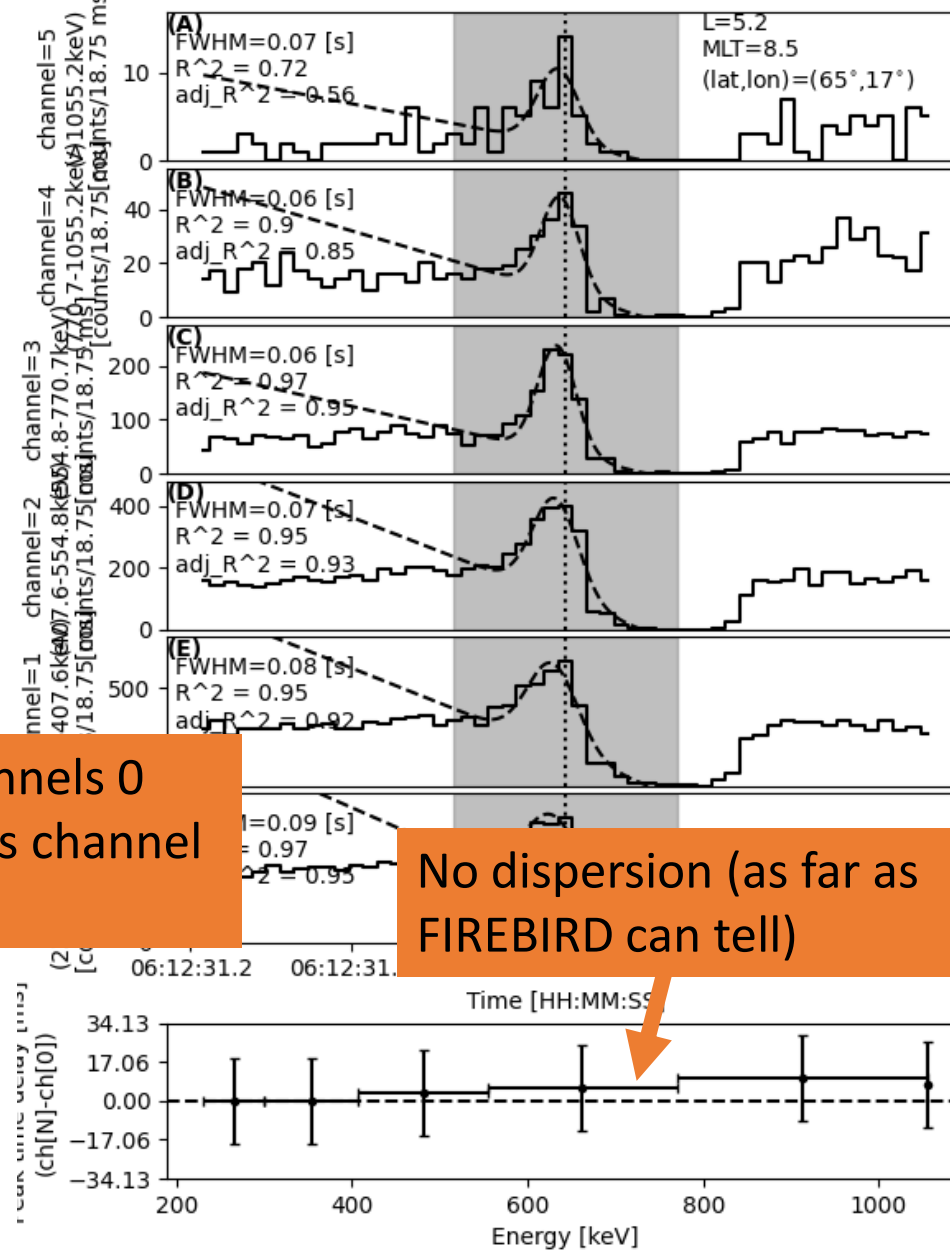
No dispersion (as far as FIREBIRD can tell)

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