Expected On-orbit Performance of Data Compression

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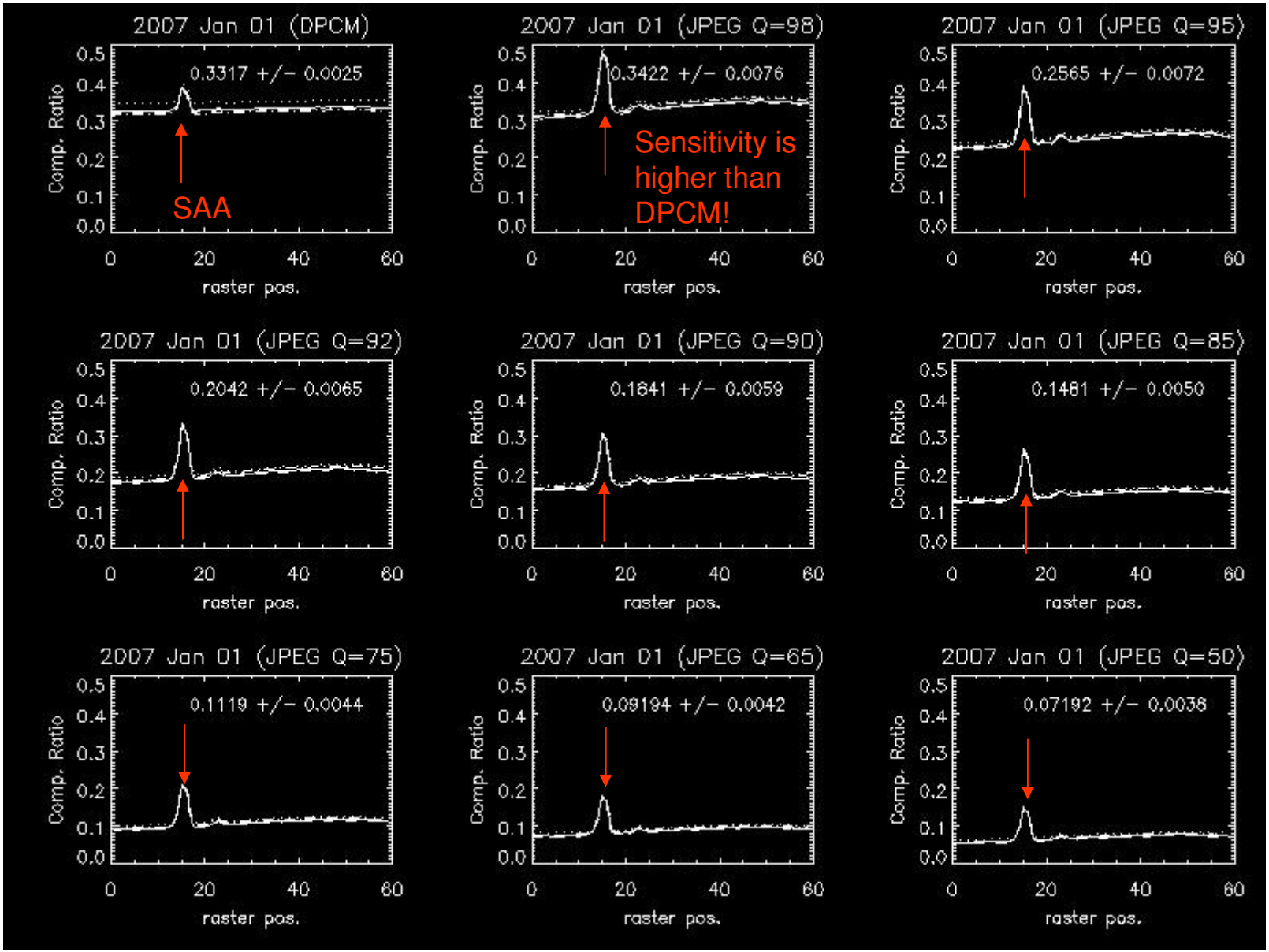
Quiet Sun (1” wide slit)

- Data compression for quiet sun data is investigated.
- The presence of QS is checked with EIT and XRT data.
- Compressed data volume are calculated from EIS FITS files using the JPEG simulator in this investigation. Data used here were compressed by MDP DPCM.
- Compression ratio ≡ compressed size/original size
  Compression factor ≡ 1 / (Compression ratio)
- 1” wide slit

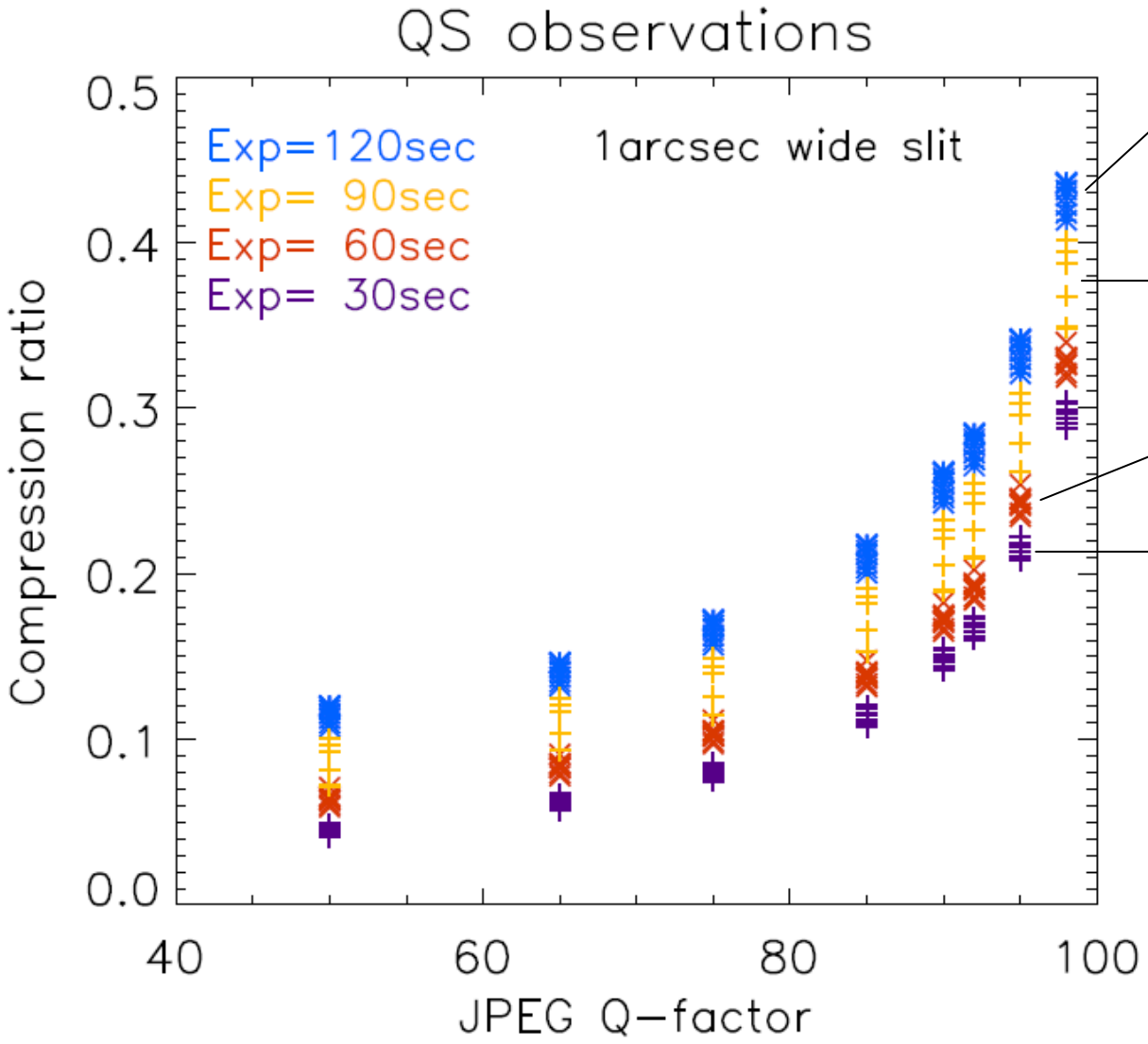
Sensitivity for cosmic rays

- Compressed data volume by JPEG appear to be sensitive for cosmic rays (and hot or warm spikes).
- See figures on the next page.

Study 39: 2007 Jan 01



Compression ratio as a function of JPEG Q-factor and exp. duration



120s [Study 070]
(run on 20070307)

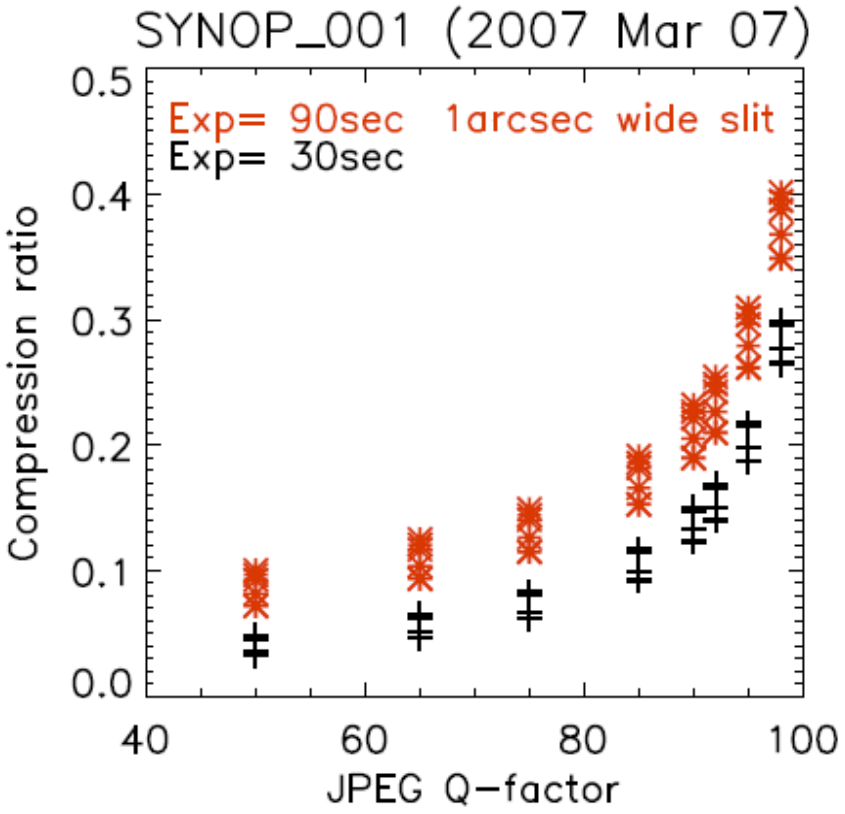
90s [Study 034:synop001]
(run on 20070307)

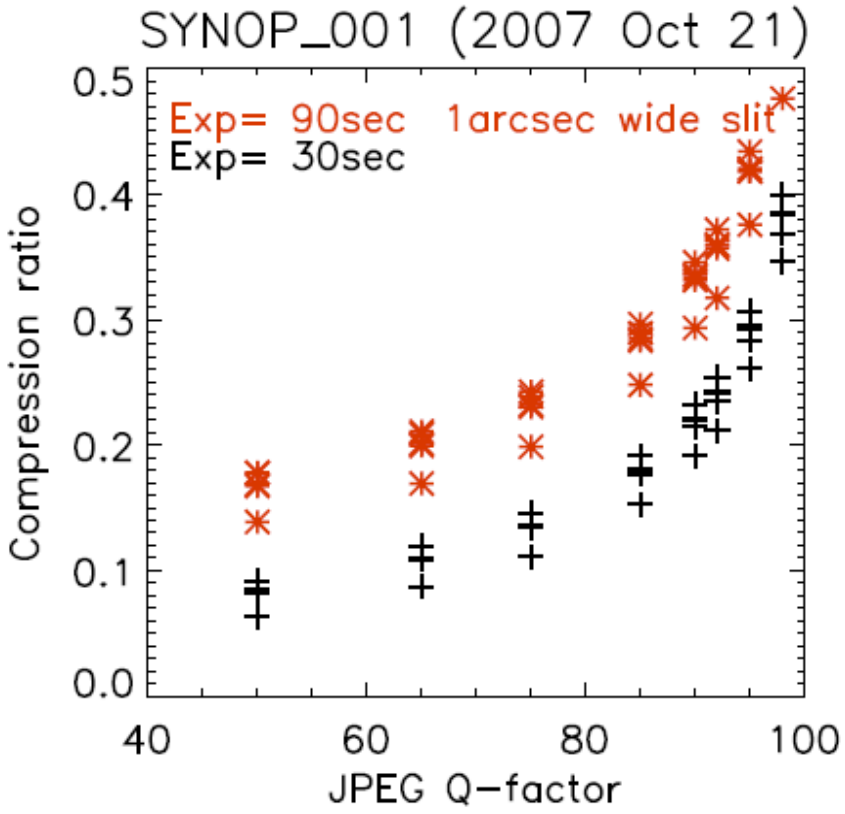
60s [Study 039]
(run on 20070101)

30s [Study 070]
(run on 20070307)

These were all obtained outside SAA.

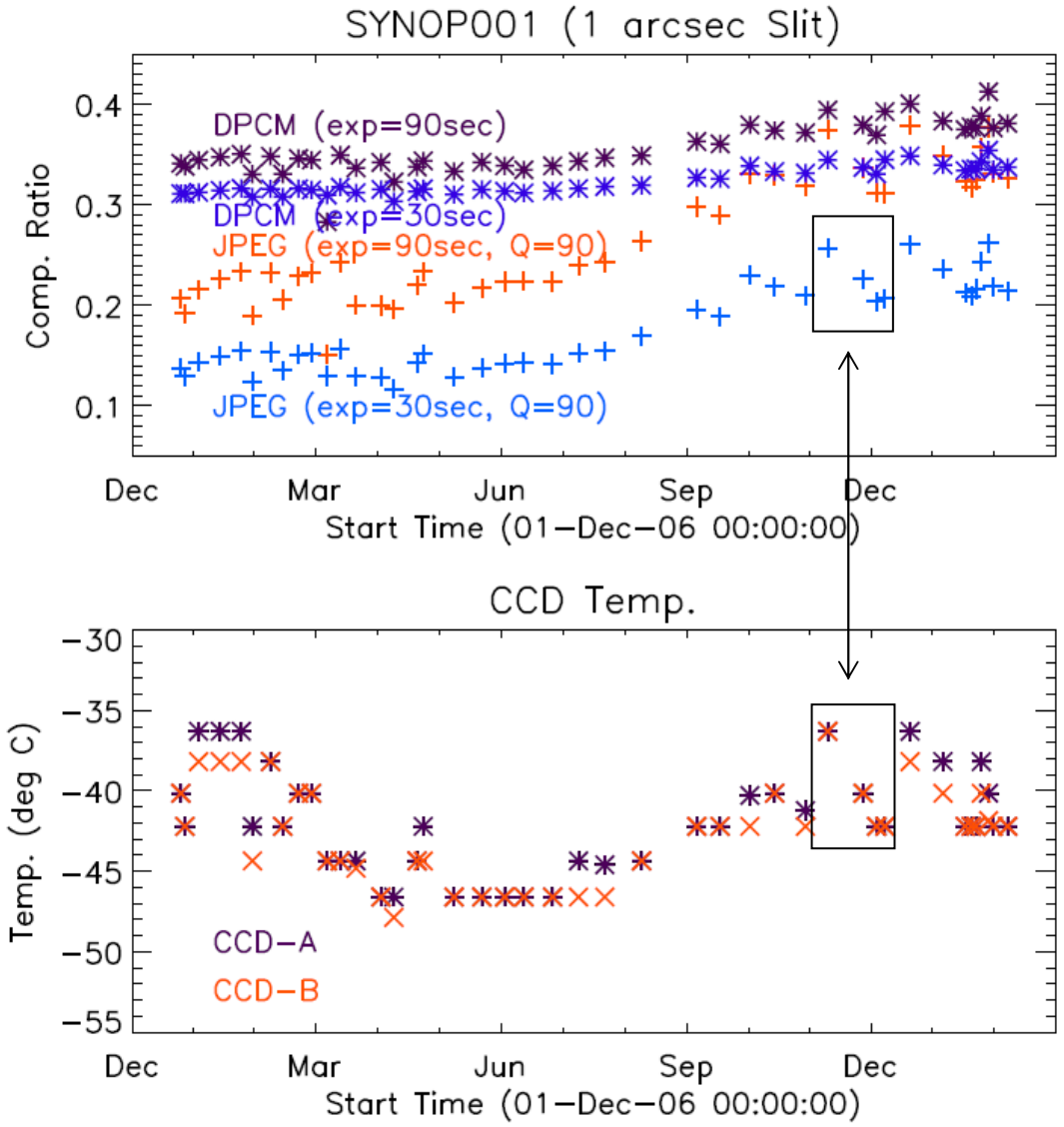
Change of compression efficiency by change of data quality





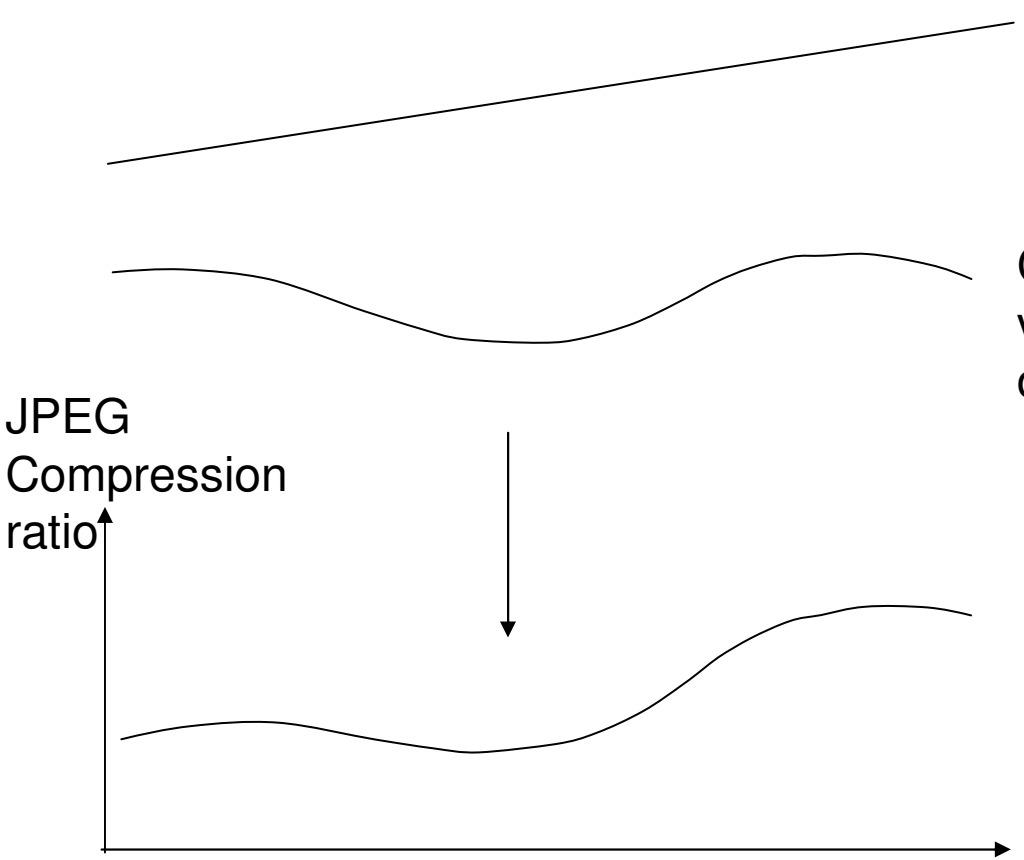
The number of dark spikes and warm pixels on Oct 21 is larger than that on Mar 7.

Performance of Compression as a function of time



- Cases of DPCM and JPEG(Q=90) are shown.
- Performance of DPCM compression is slightly degraded, and JPEG performance appears to largely be changed.
- There appears to be correlation with CCD temperature.
- The performance will be affected by the quality of CCD data.

Interpretation



Conclusions

- Performance of DPCM/JPEG is checked with JPEG simulator and DPCM compressed EIS data obtained in the solar quiet sun regions.
- DPCM appears to be robust for cosmic rays and spikes, and JEPG is rather sensitive to these effects.

- Compression ratio for a region is a function of exposure duration.

- Compression efficiency is changing with time. Causes of the change are (1) change of CCD data quality (by spikes and warm pixels) and (2) the change of DN level due to temperature variation of CCD.

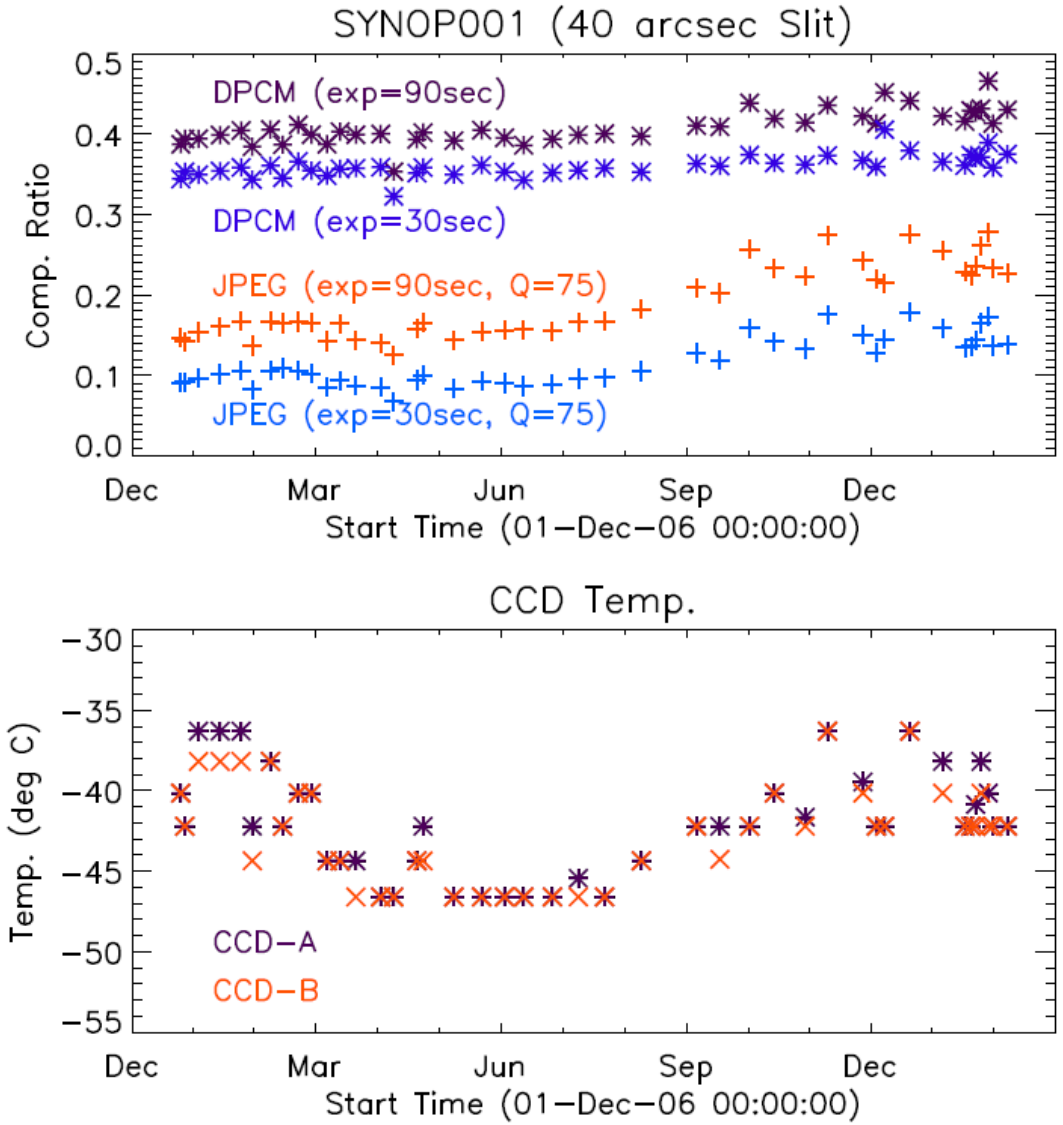
- Small difference between DPCM and JPEG (Q=90) for recent long exposure data are expected.

Discussion

- Large JPEG compression ratio reported by H. Warren may be explained by the degradation of compression due to change of CCD data quality.
- Need monitoring the DPCM/JPEG performance with time when data are reformatted to FITS files. Actual compression values should be reported to the EIS FITS binary header for easier investigation.

- Use of JPEG compression for long exposure data, which contain bright hot pixels and many cosmic rays, are not recommended.

Append. QS obs. with 40” wide slit



- The same investigation is performed for 40” slot data.
- The same degradation of compression performance is found for slot data.
- There will still be a gain when JPEG Q=50-75 is used.