

SVI at C3VP

The NASA Snowflake Video Imager obtained nearly continuous data from 1 Dec 06 thru 7 Mar 07.

This presentation contains a summary for the entire data set, which is sorted into
(a) priority days selected by GSFC investigators, and
(b) non-priority days.

The results are displayed in images of DSD(t), which reveal
(a) the large variability of snowflakes sizes during events and
(b) the intermittency of snowfall – even during intense storms.

Additionally, results from a preliminary study of snowflake orientation reveals that there is a higher occurrence of snowflakes that are ‘horizontally’ orientated than ‘vertically’ orientated.

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Larry Bliven \614.6
12 March 2007

>>> Internet Explorer & FireFox allow random page access. Safari does not! <<<

Video Snowflake Imager (SVI)

Larry Bliven at NASA\GSFC. Phone: 757-824-1057. Francis.L.Bliven@nasa.gov

Field Tested in North Dakota. Deployed in Canada for C3PV during winter of 06/07.



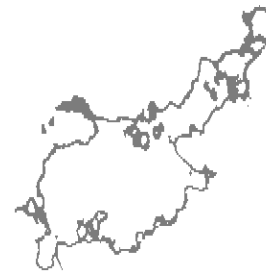
- ✓ **Measures Snowflake Size Distributions.**
- ✓ **Measures Snowflake Orientation Distributions.**

Open measurement volume = low wind distortion.
CCD camera, not line scan camera = direct image.
Very simple setup.
Field tested to -40 degrees.
24/7 operation for months.

Camera Specs

- standard rs170 analog video
- 60 frames per second – non-interlaced
- 1/80,000 s shutter speed
- Focal plane size 24 x 32 mm
- Calibrated to 0.05 x 0.1 mm resolution

Snowflakes: 9 mm



11 mm



SVI Data

Step 1: Precipitation particles are imaged using video camera hardware and PC Labview Software.

The images are archived on the PC.

Level 1 files: compressed video images from SVI during the 24/7 operation at the field site.

Step 2. We characterize individual particles in the video images.

Level 2 files: Spreadsheet formatted files that

- (a) Contain identification and characterization of individual particles,
- (b) Provide 1 second data summary and
- (c) Provide 1 minute data summary.

Step 3. We calculate DSDs for each minute using Level_2 files.

Level_3 files: DSDs summarized for each minute in spreadsheet file format.

Get the C3VP DSD Level_3 files:
[Zipped Excel Files](#)

C3VP 2007 IOP3 Case Summary

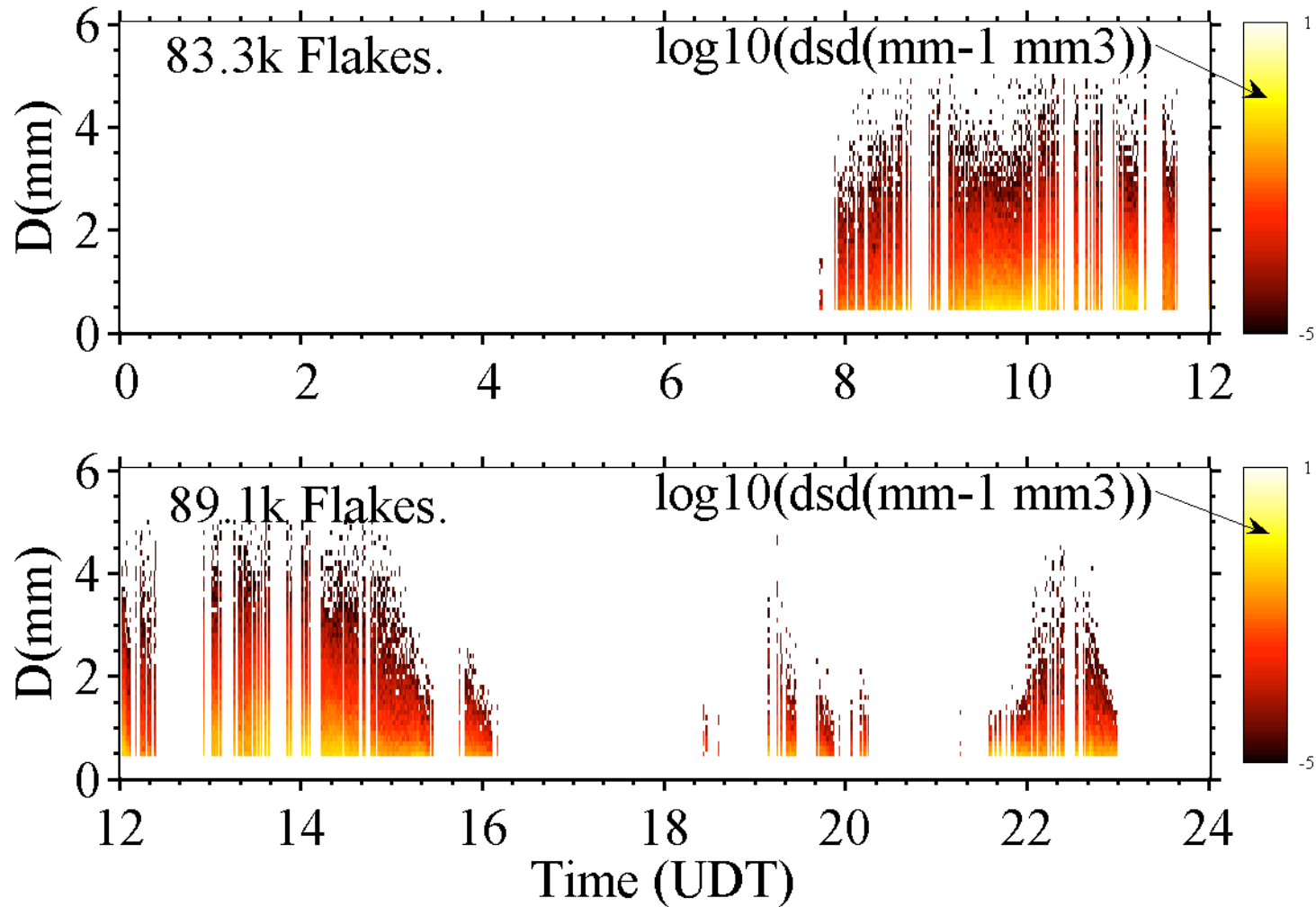
Priority Days.

M/D	UTC	EVENT	AC OPS	AMSU-B OP	SONDE UTC	AMFR	KING RADAR
01/15	1230-1700	Synoptic	No	N15-1214; N17-1514, 1654	1130,1430,1700	PPI/RHI/VPT.	Yes
							<i>Rimmed aggregates on site; freezing rain near King Radar</i>
01/19	1640-1830	Strong Band	No	N17-1522,1639	1200,1815	PPI/RHI/BRL	Yes
							<i>Large Aggregates; Stellars, branched crystals; dendrites; graupel-like snow</i>
01/19-20	2300-0130	Lake-Effect Bands	Yes	No	2217,0134	No	Yes (RHI @350° to cover AC)
							<i>Good AC microphysics in strong snow band that should be very similar to sampling at 1640-1830</i>
01/22	0200-0800	Synoptic	Yes	N17-0338;N18-0642,0823	0403,0830	PPI/RHI/TS/VPT	Yes (CARE RHI, Chandra TS)
							<i>Convair over CARE (spiral descent/ascent; radial stacked leg along King C-band RHI 331°). Stellar dendrites and aggregates of dendrites</i>
01/23	1830-2300	Pre-Frontal	No	N16-1952;N18-1800	2116	PPI/RHI	Yes (CARE RHI)
							<i>Light snowfall, dendrites and aggregates</i>
01/24	1830-1930	Clouds	Yes	N16-1941; N18-1932	1745	PPI/RHI	Yes (CARE RHI)
							<i>Few clouds, Convair flew but not over CARE</i>
01/26	0345-0430	Lake-Effect Bands	No	N17-0207,0347	None	PPI/RHI	Yes (CARE RHI)
							<i>Ku wouldn't work due to cold. Scanned with Ka only. Very small ice crystals in snow. AMFR saw very little.</i>
01/26	2105-0000	Synoptic bands	Yes	N15-2234; N17-0144	2120, 2350	PPI/RHI	Yes (CARE RHI)
							<i>Convair did spiral descent over CARE and stacked 251° radials; Ku worked but then dropped out just prior to AC arrival.</i>
01/27	2130-2345	Synoptic Low	No	N15-2210; N16-2047; N17-0301	2240,0120	PPI/RHI	Yes (CARE RHI)
							<i>AMFR computers died 2345, nice long snow band off Lake Huron hit site afterward</i>

Analysis Priority: **Red- High^{***}** ; **Green- Moderate^{**}**; **Black- Lower^{*}**

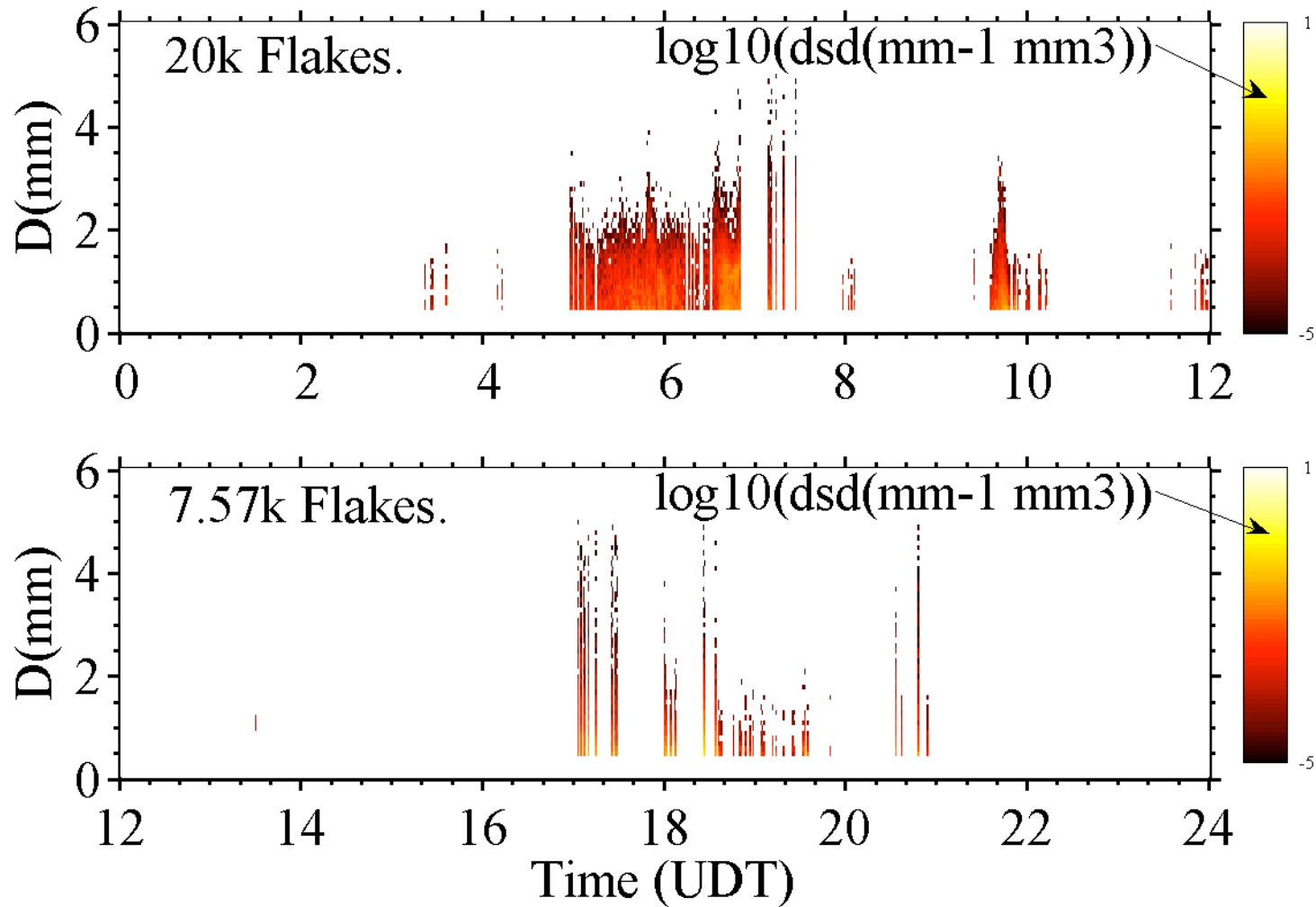
1/15/07 (1230-1700)**

C3VP. GSFC SVI.



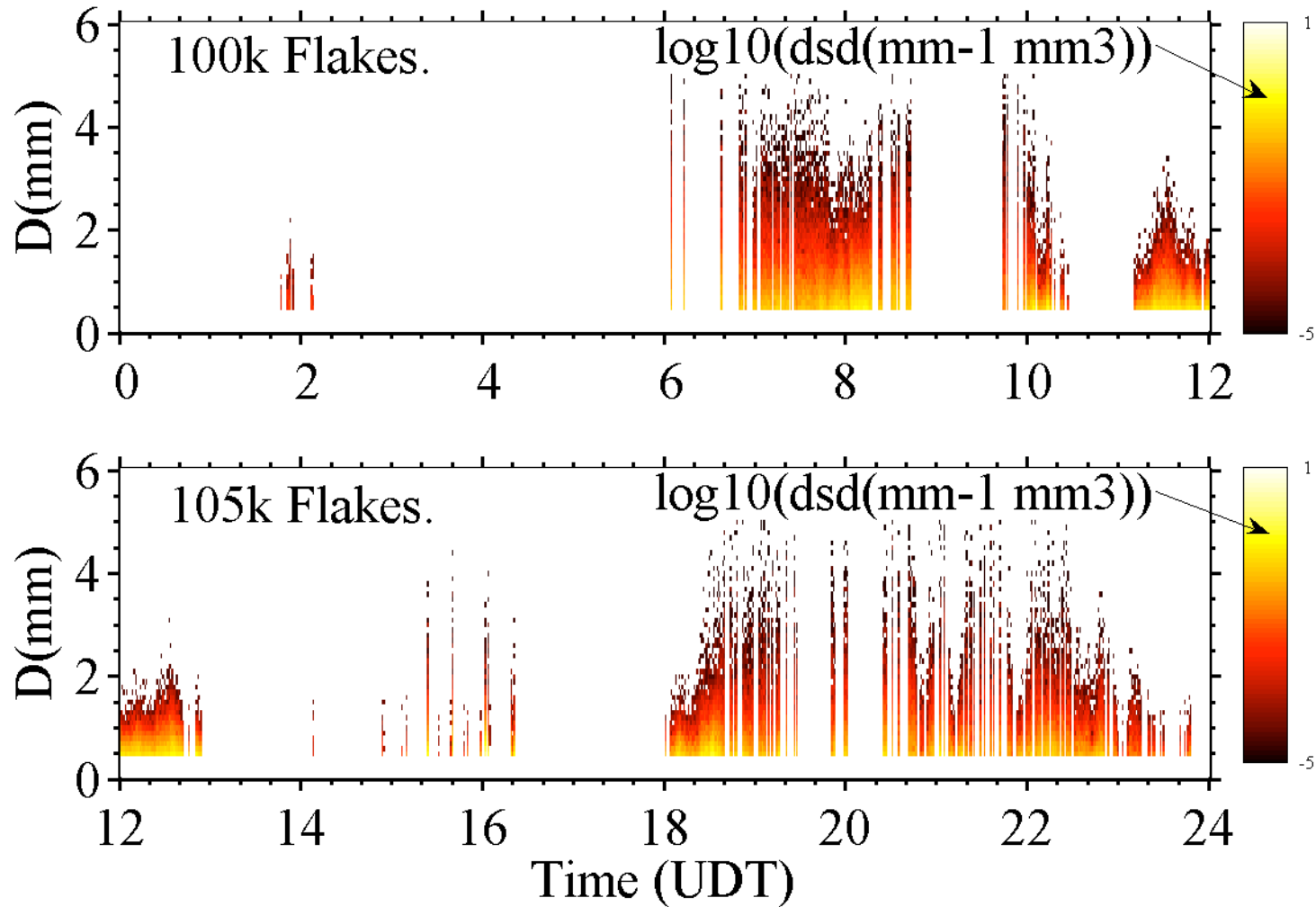
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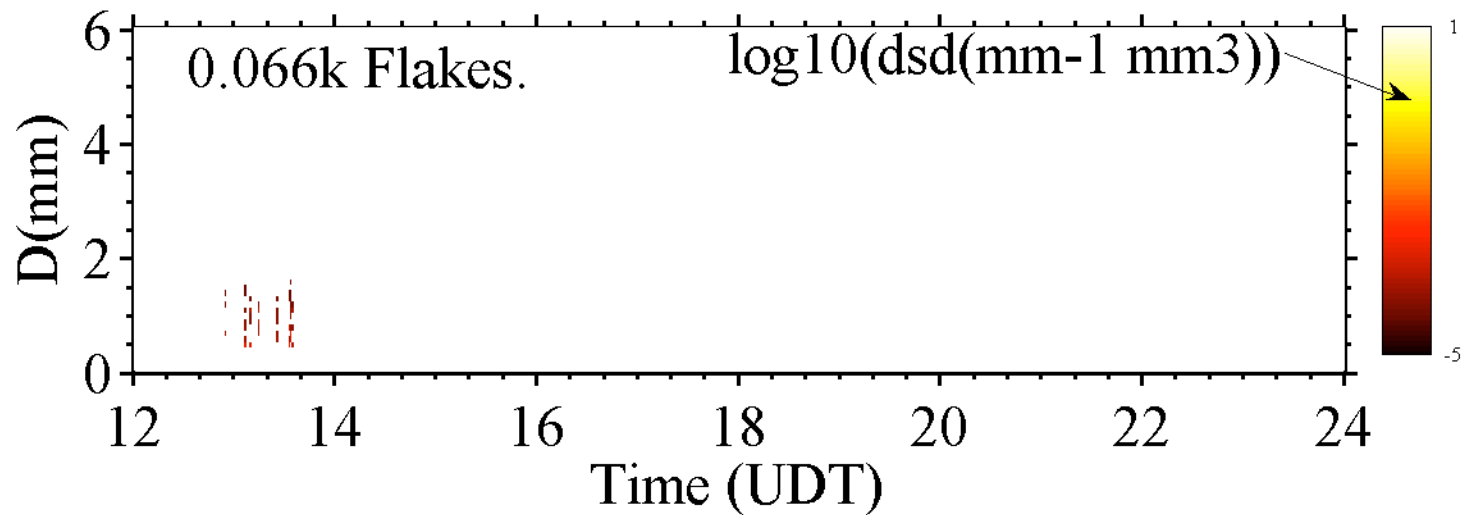
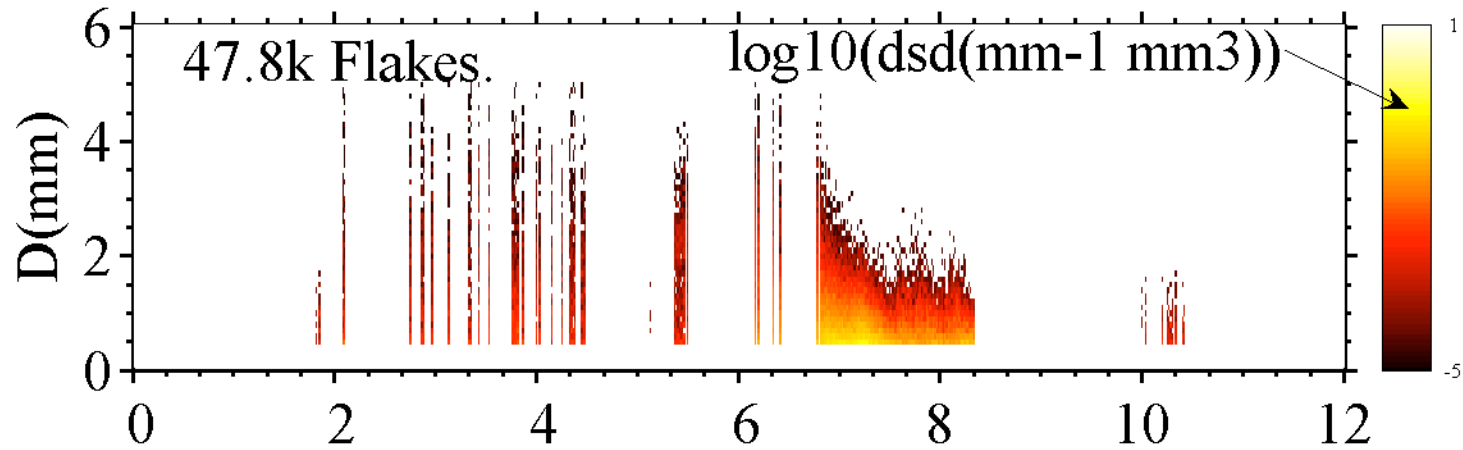
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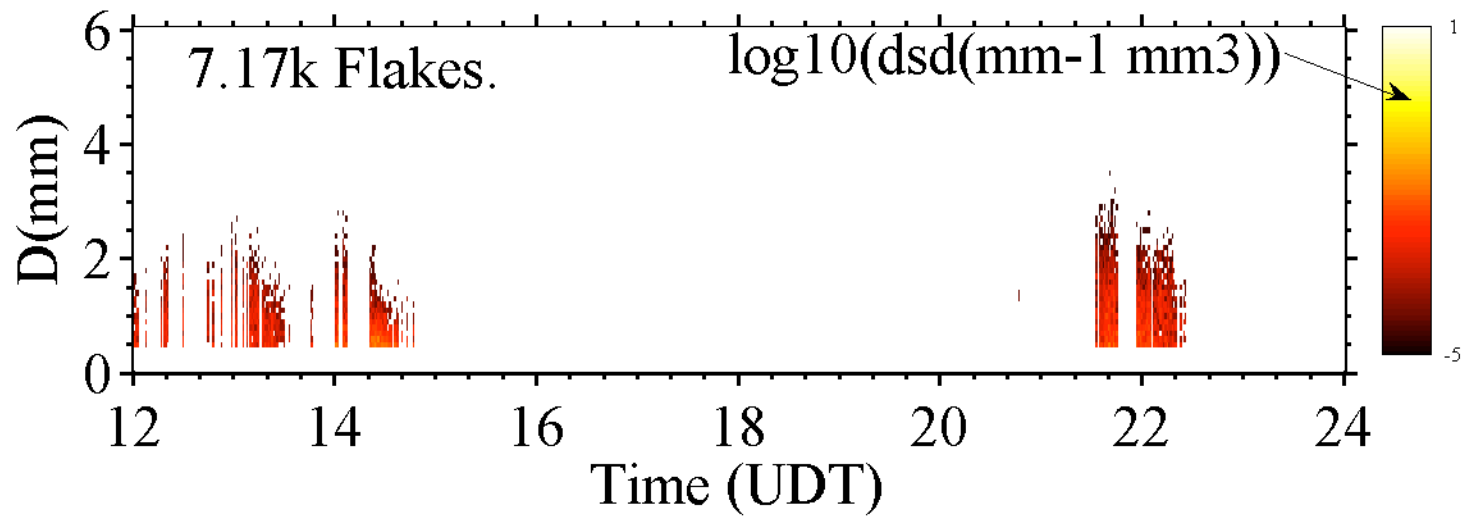
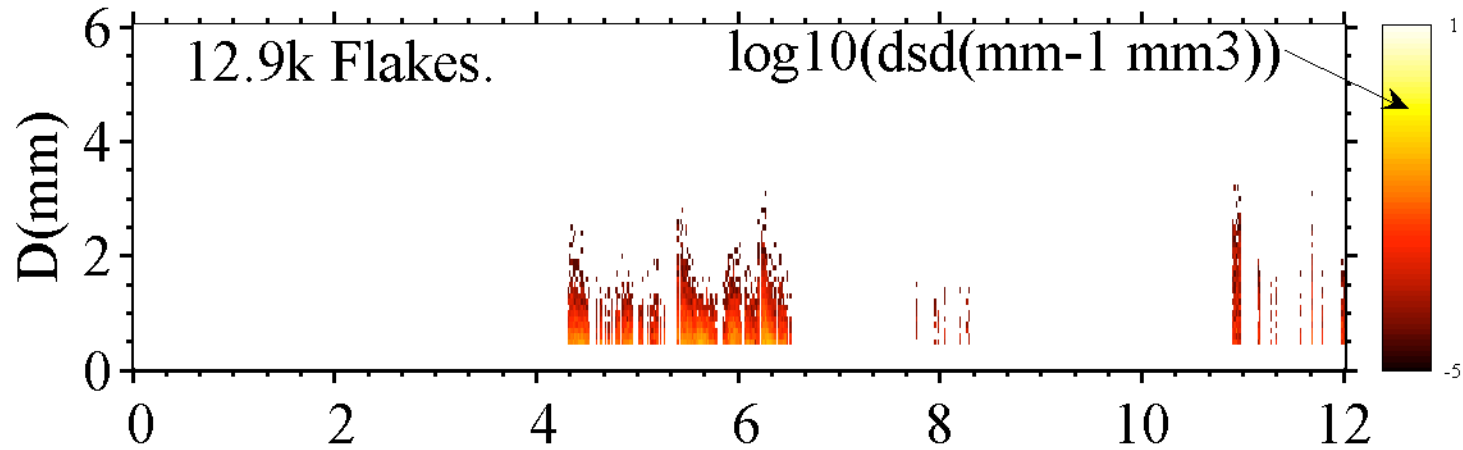
1/22/07 (0200-0800)***

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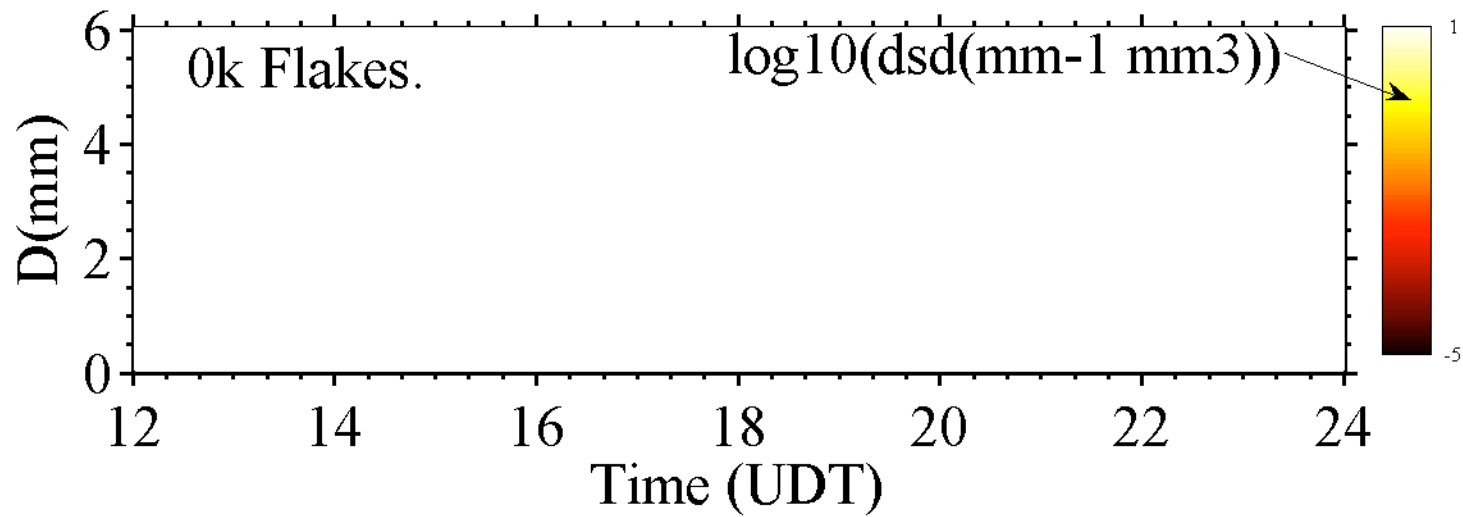
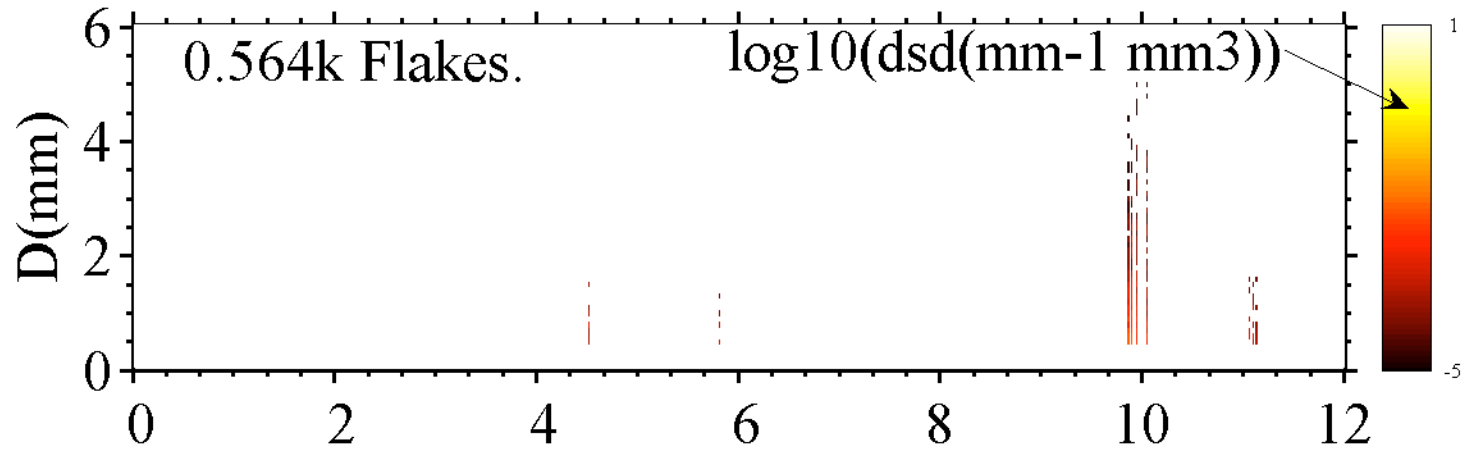
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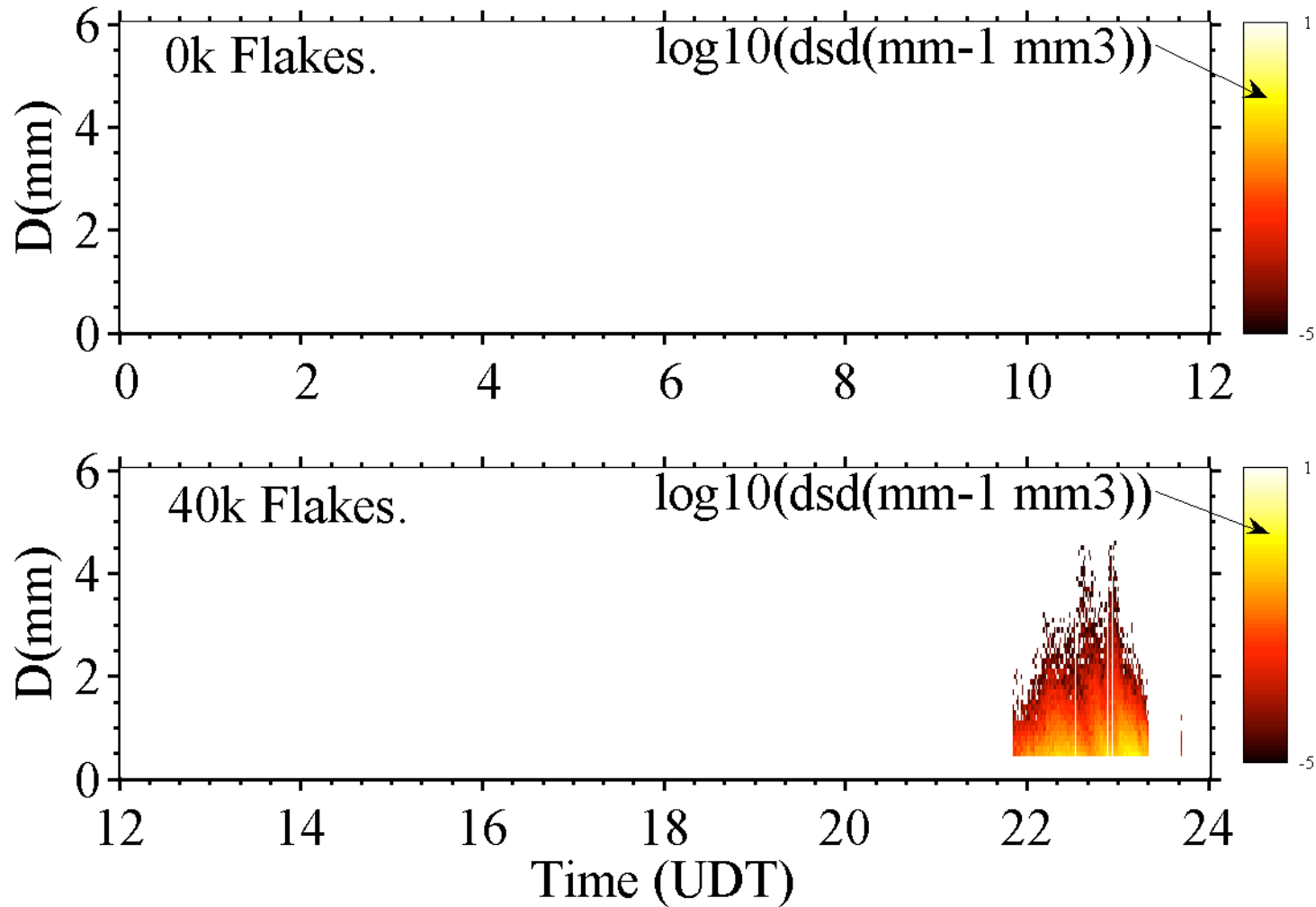
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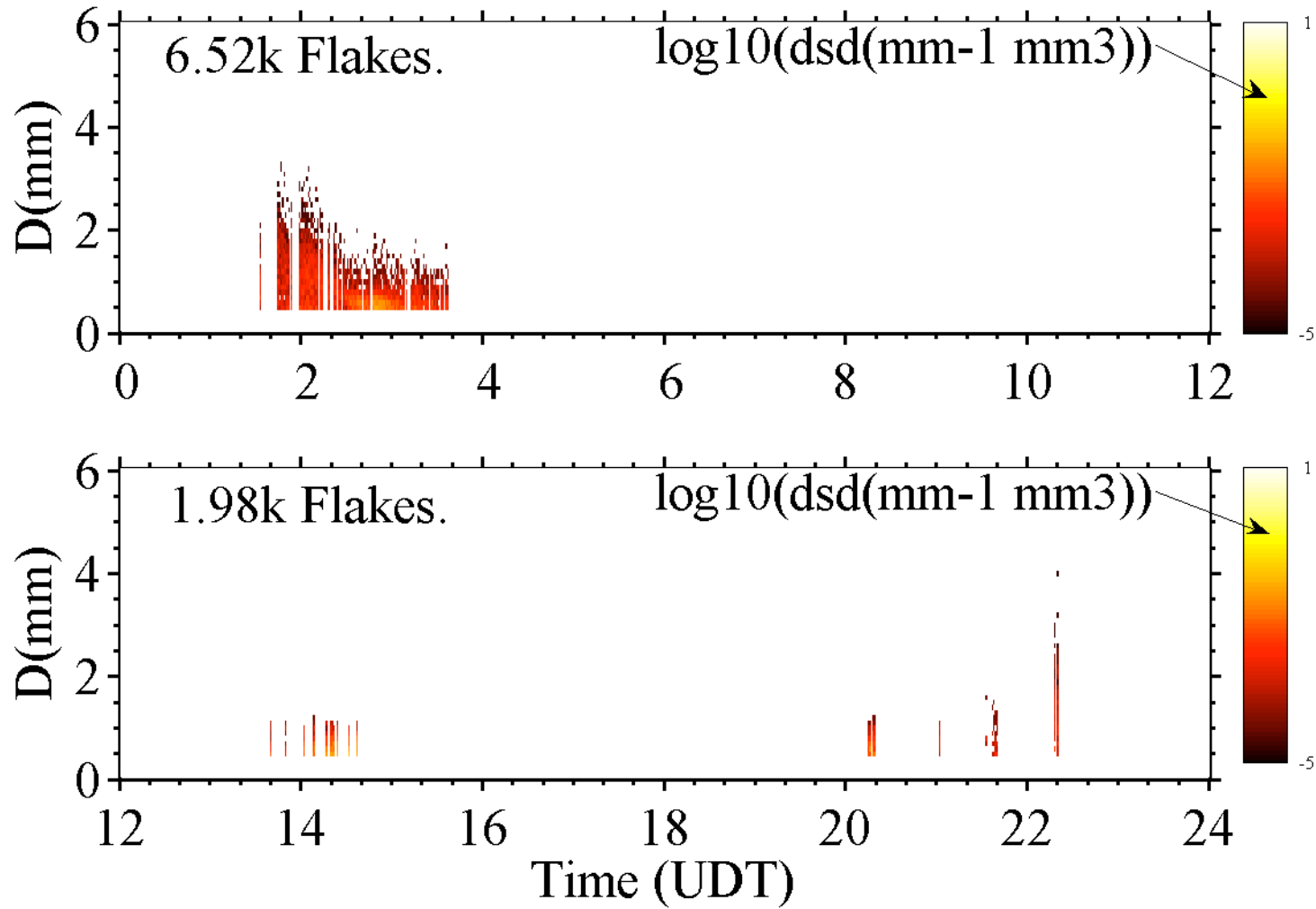
1/26/07 (2105-0000)** (0345-0430)*

C3VP. GSFC SVI.



1/27/07 (2130-2345)*

C3VP. GSFC SVI.



Non-Priority Days.

In addition to the Priority Days, the SVI obtained precipitation data on about 40 Non-Priority Days. Those data are summarized in the following figures.

The days are classified by the number of snowflakes.

0k to 50k particles: *

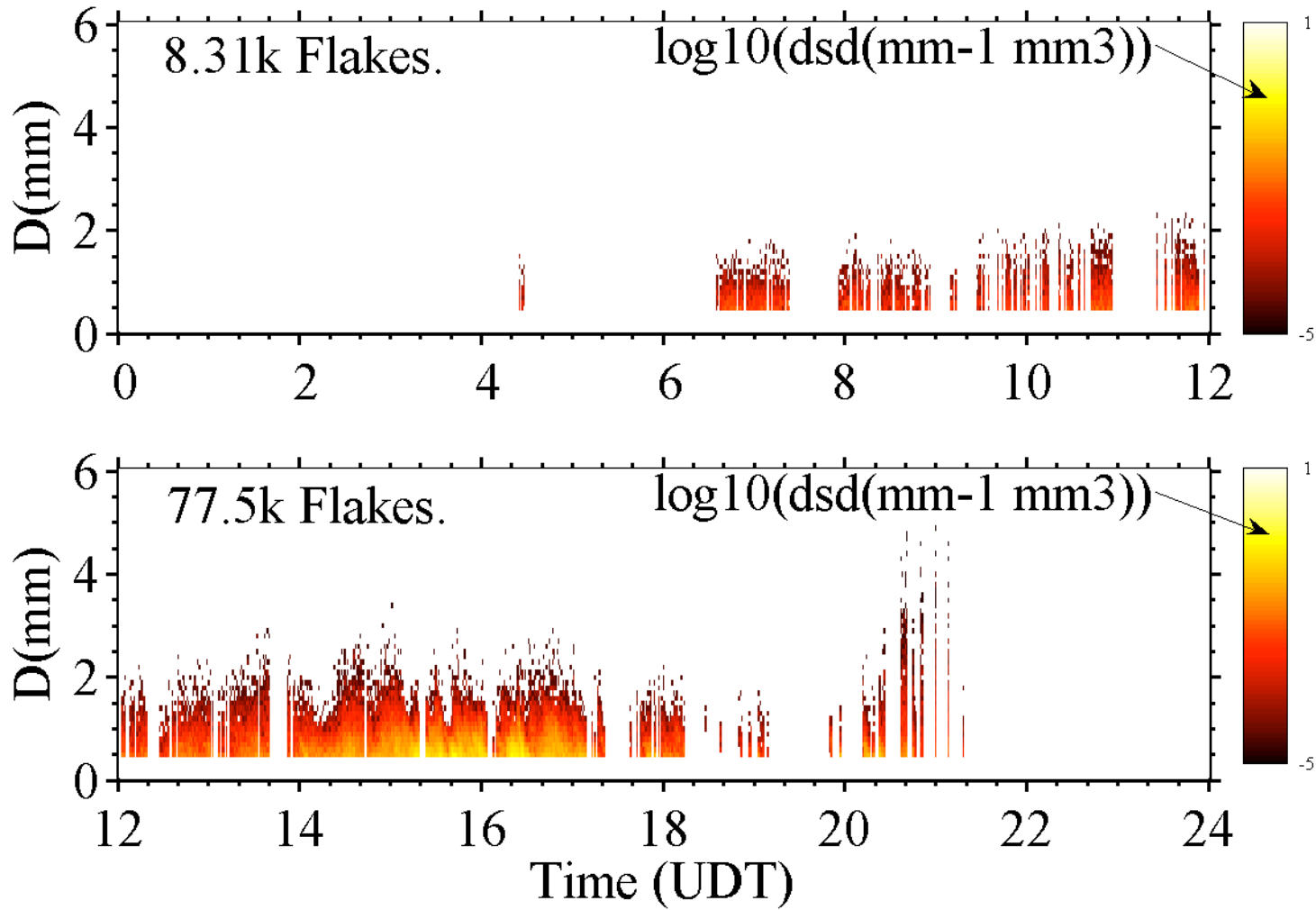
50k to 100k particles: **

100k to 200k particles: ***

>200k particles: ****

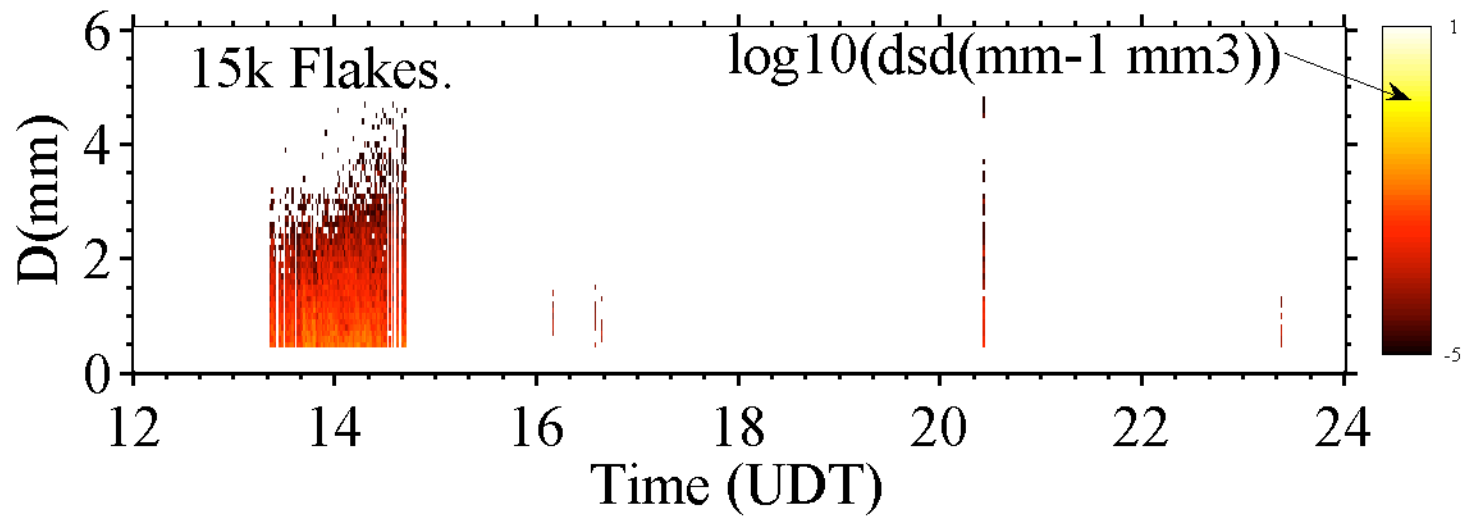
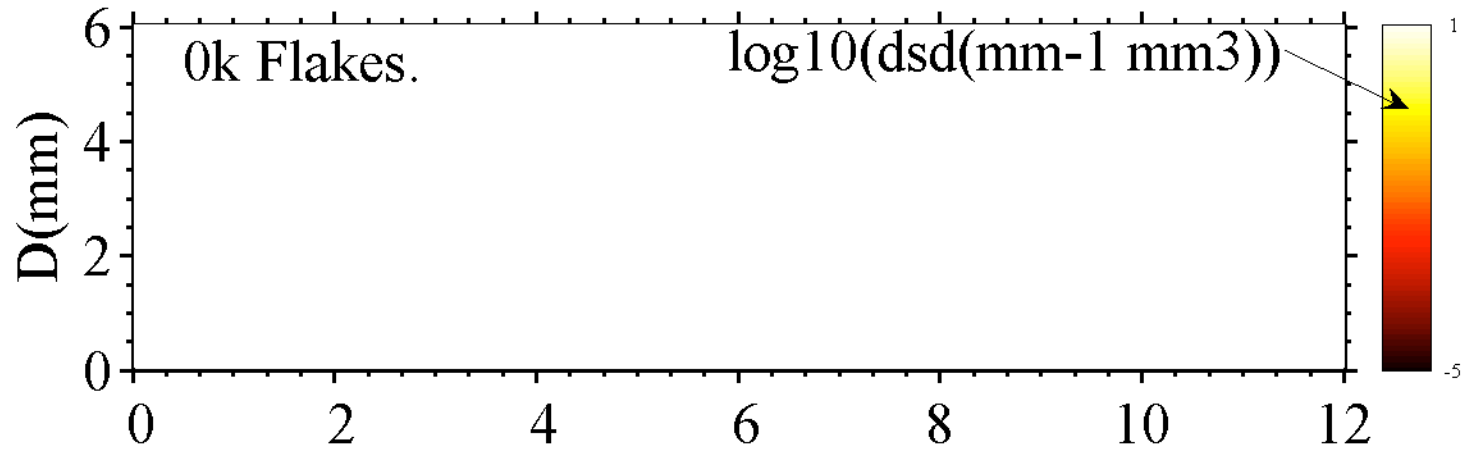
12/1/06**

C3VP. GSFC SVI.



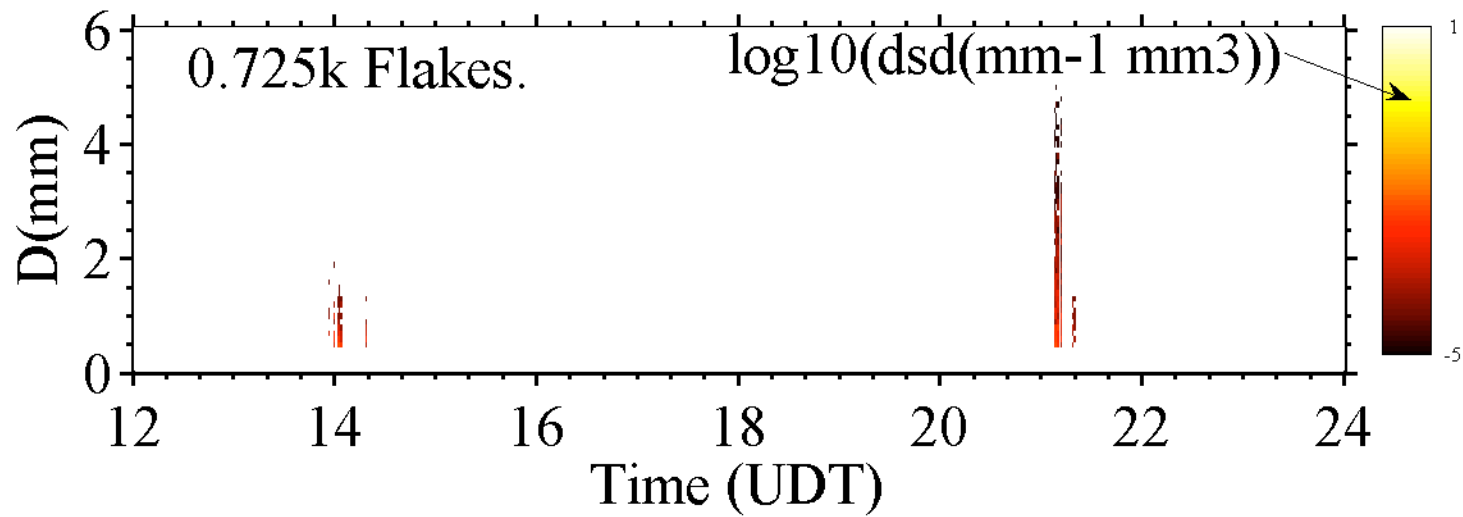
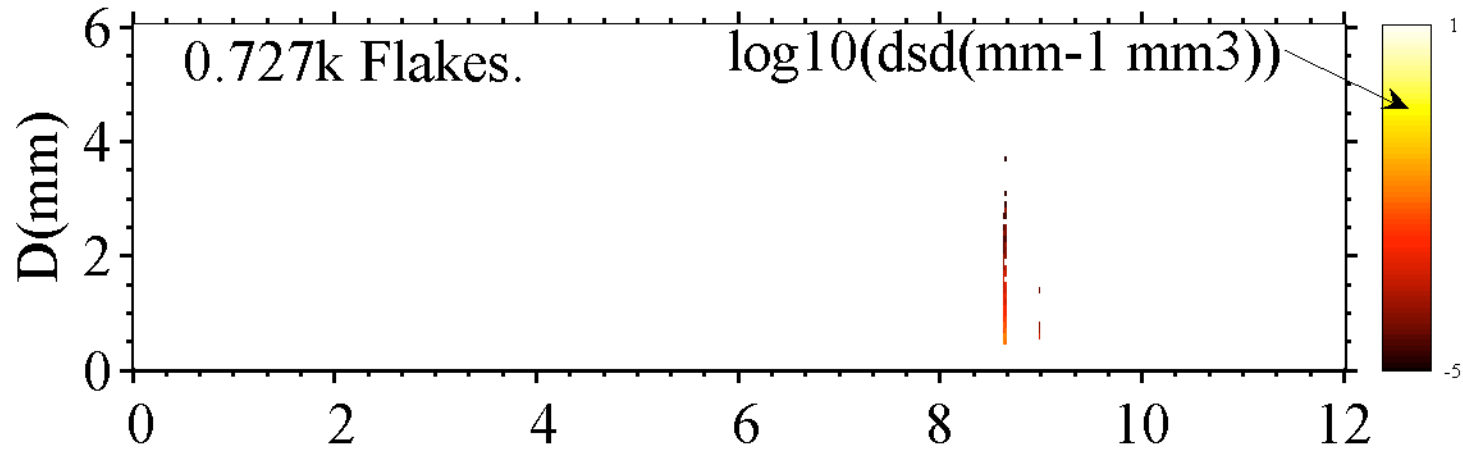
12/3/06*

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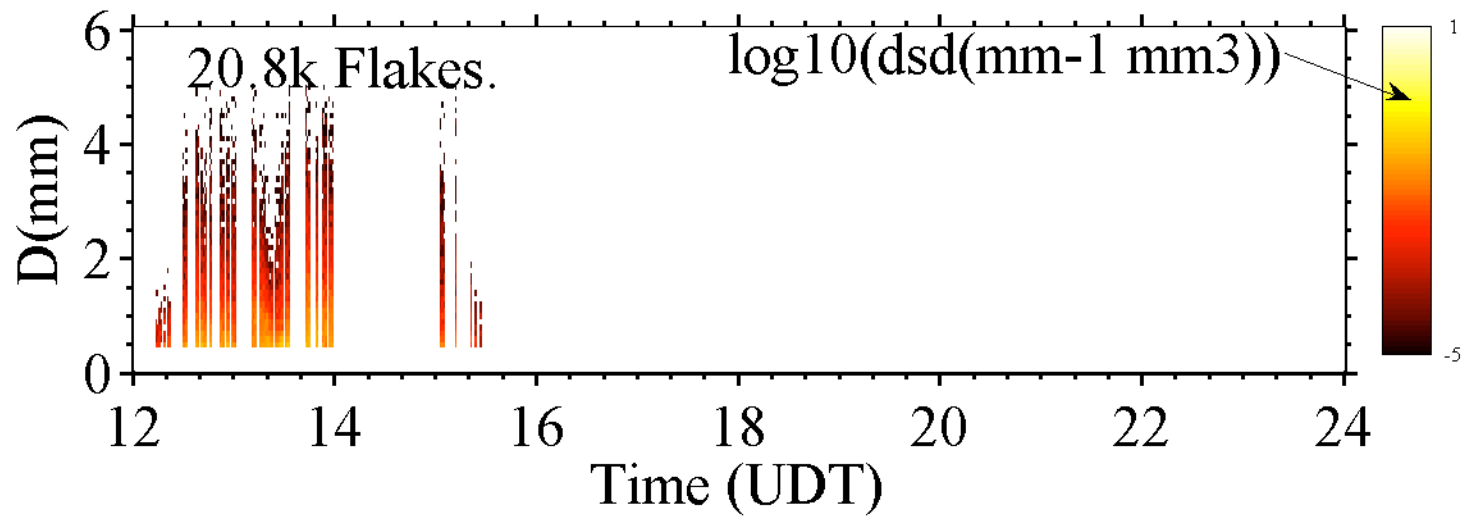
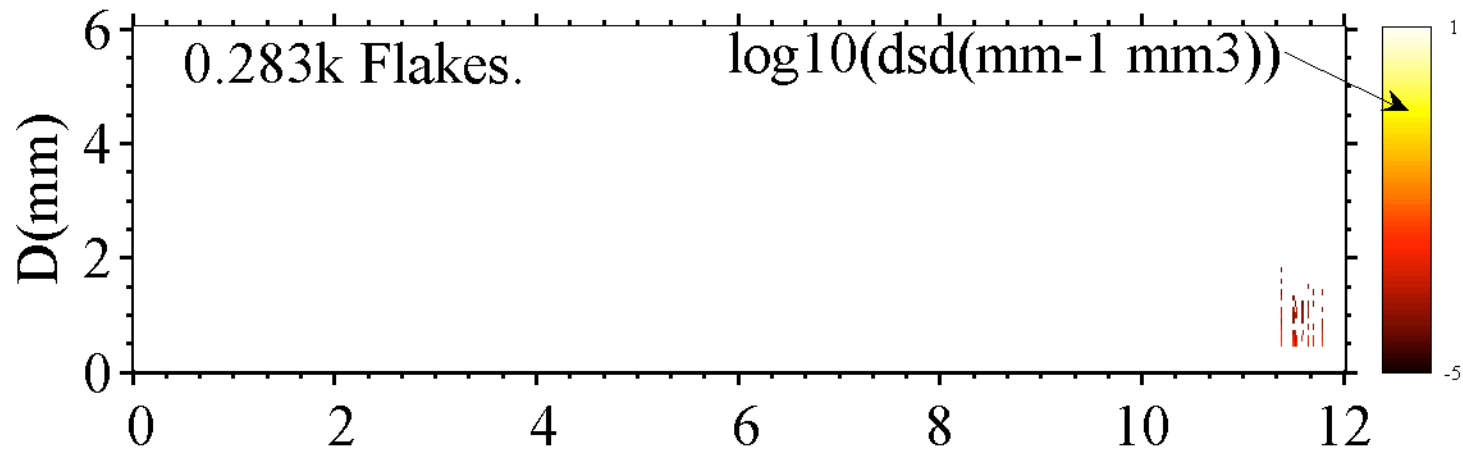
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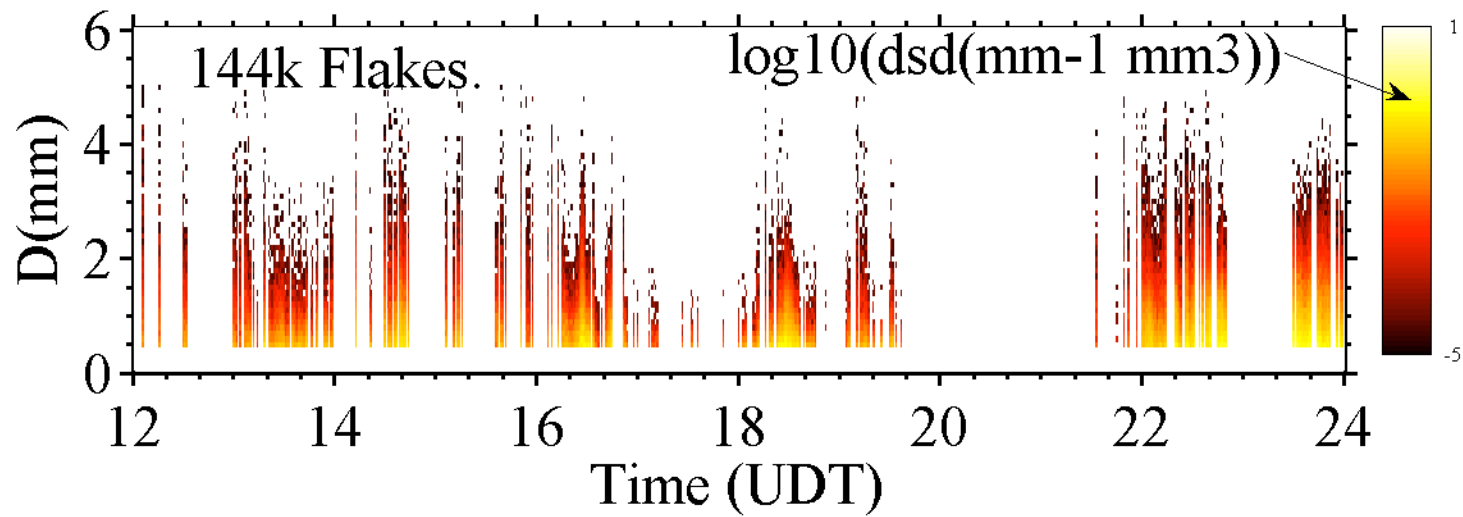
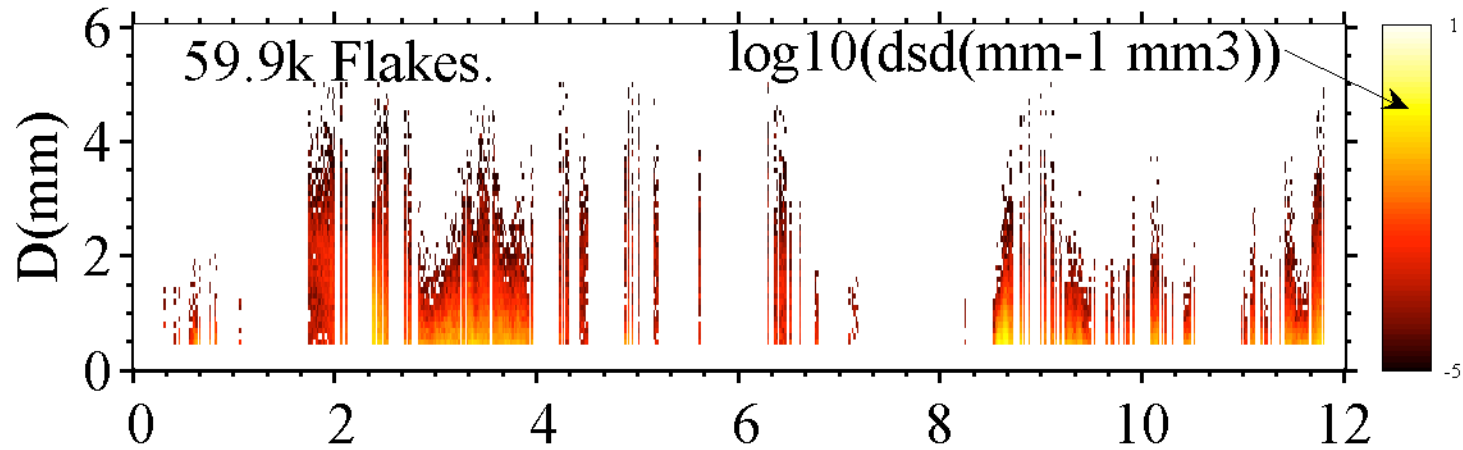
12/6/06*

C3VP. GSFC SVI.



12/7/06****

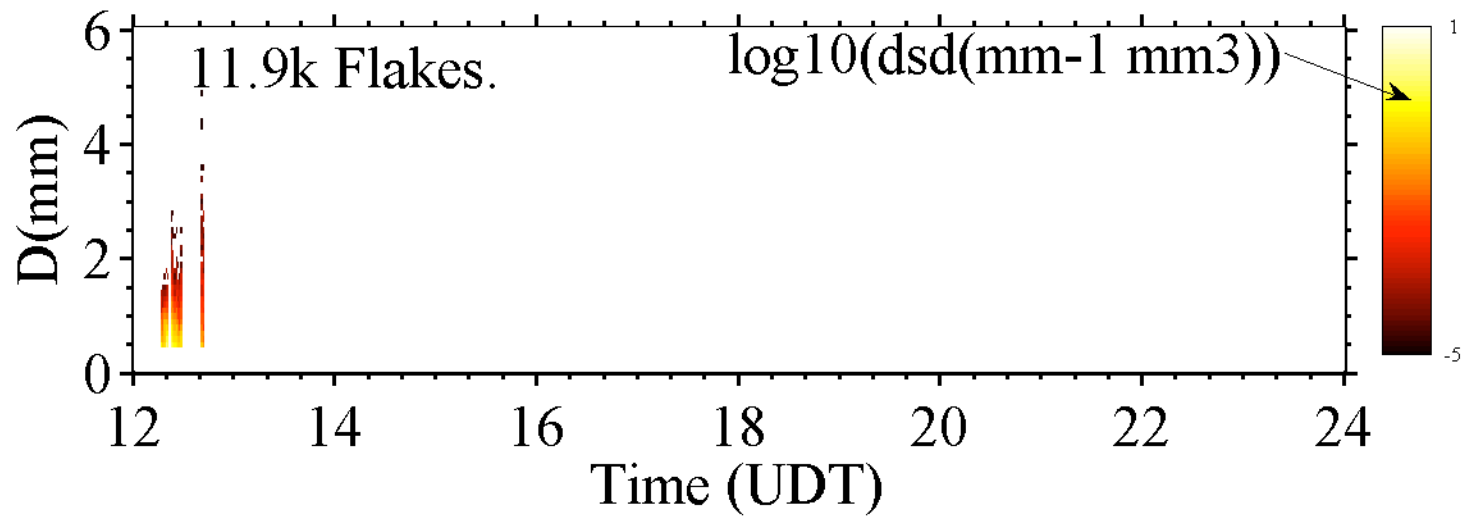
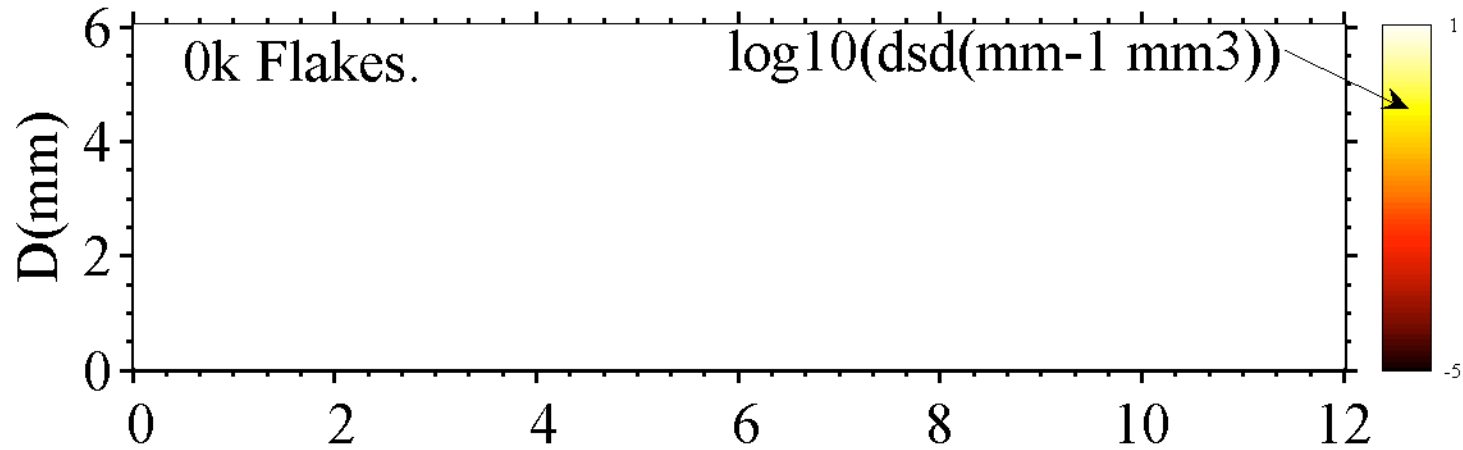
C3VP. GSFC SVI.



12/16/06

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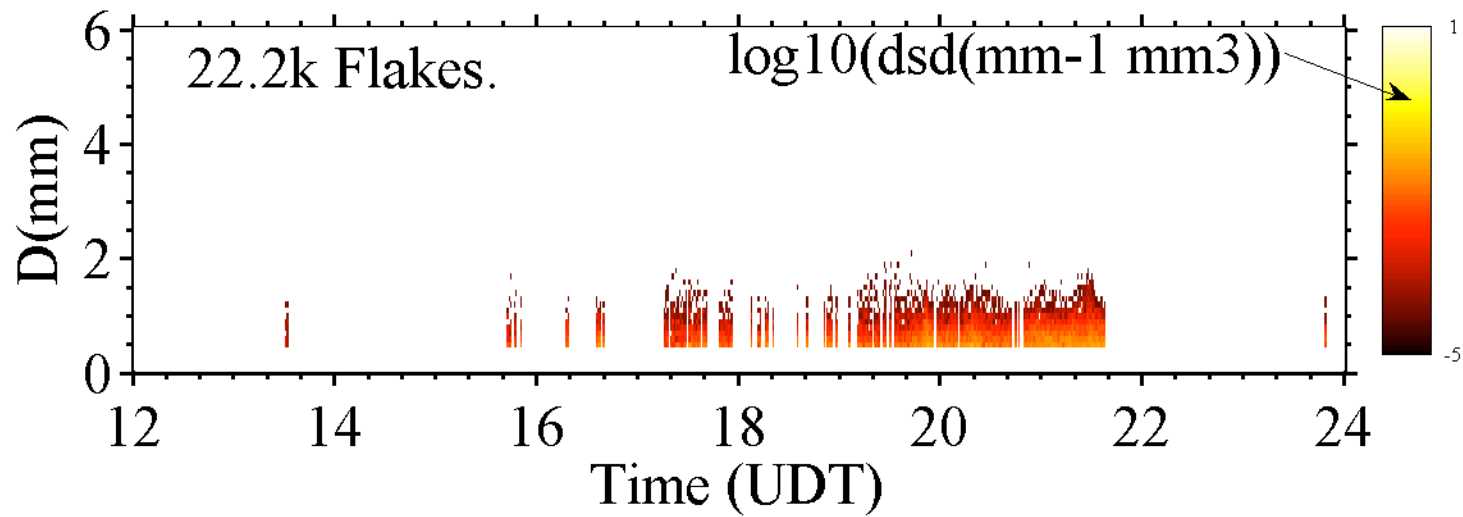
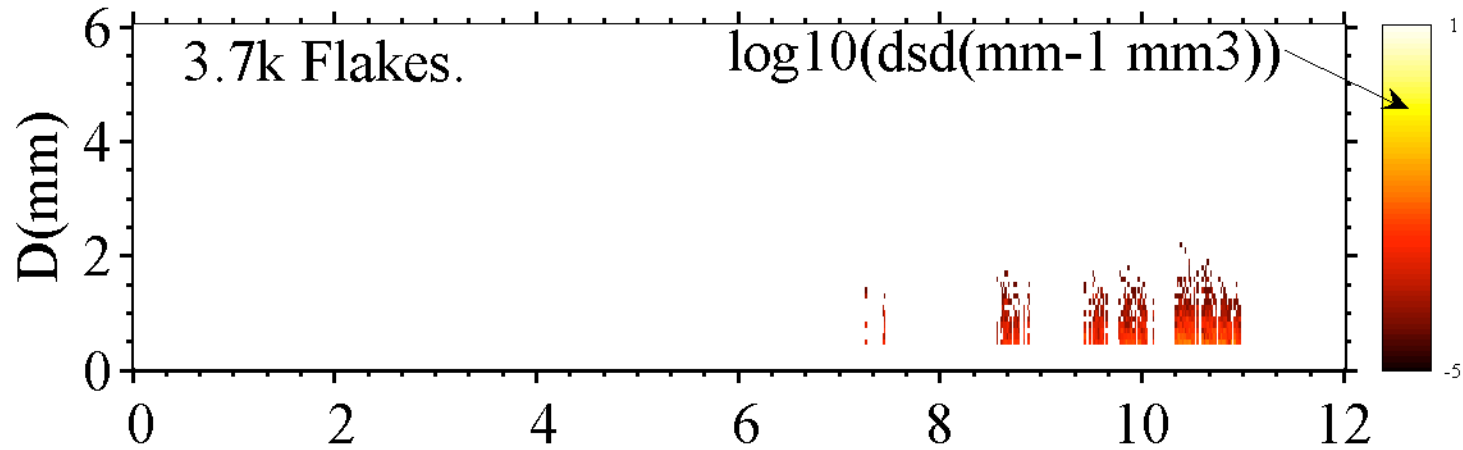
C3VP. GSFC SVI.



12/22/06

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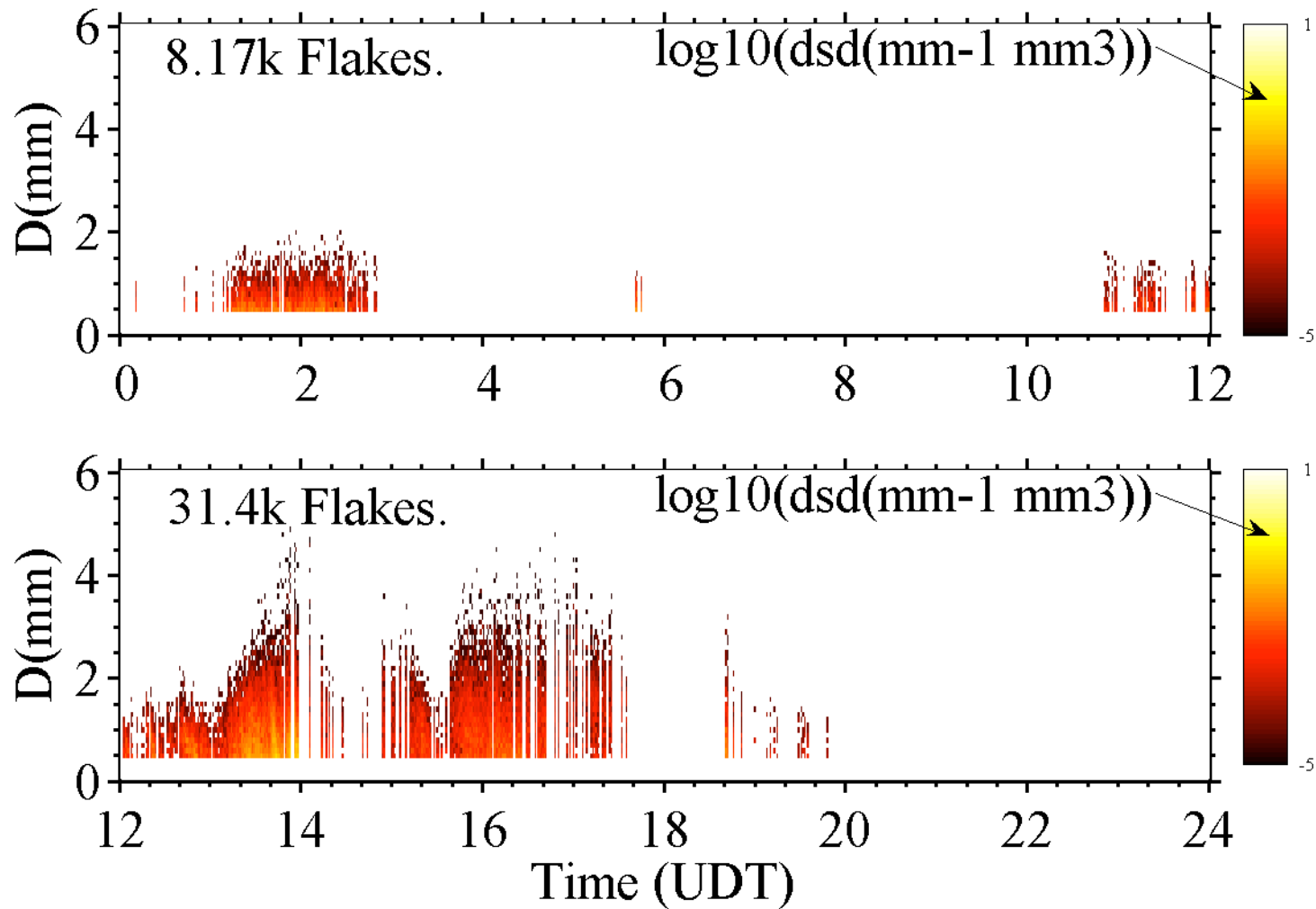
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12/27/06

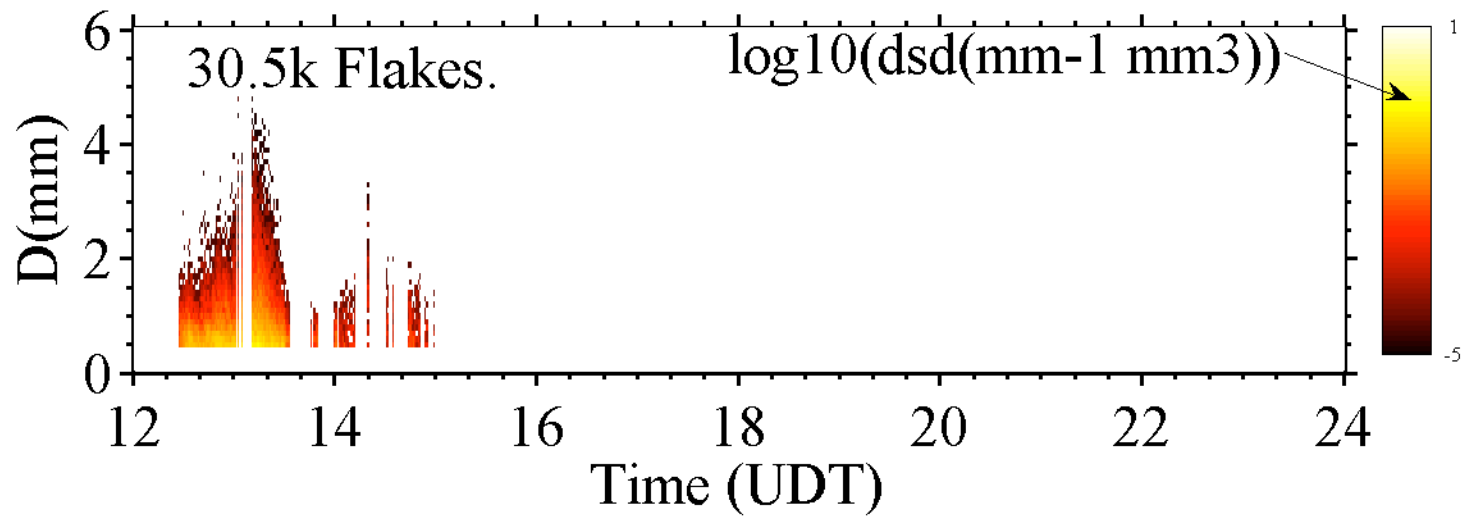
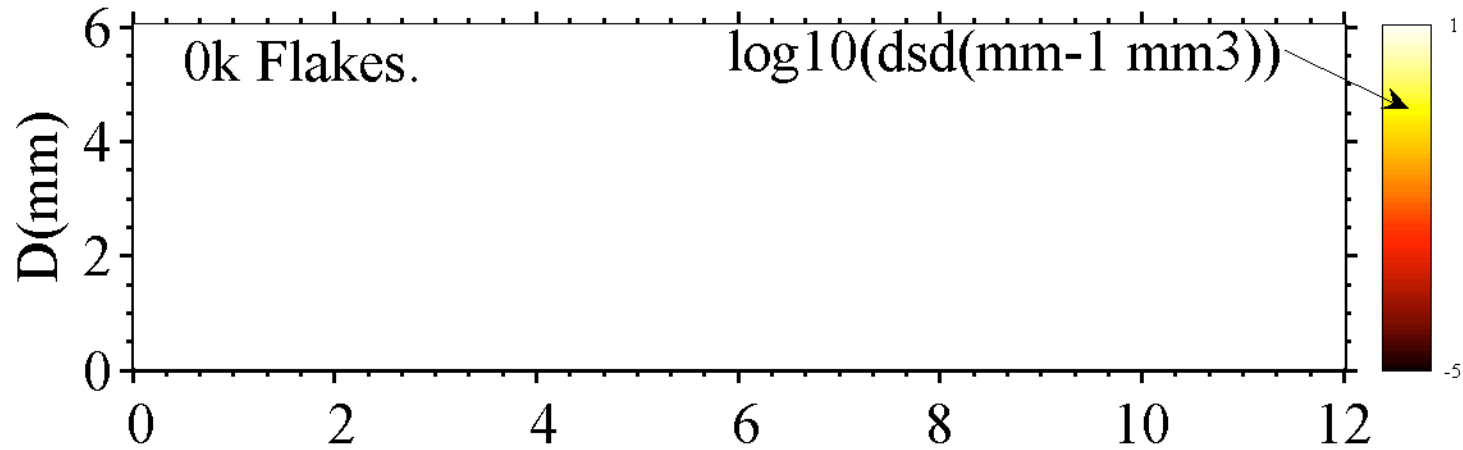
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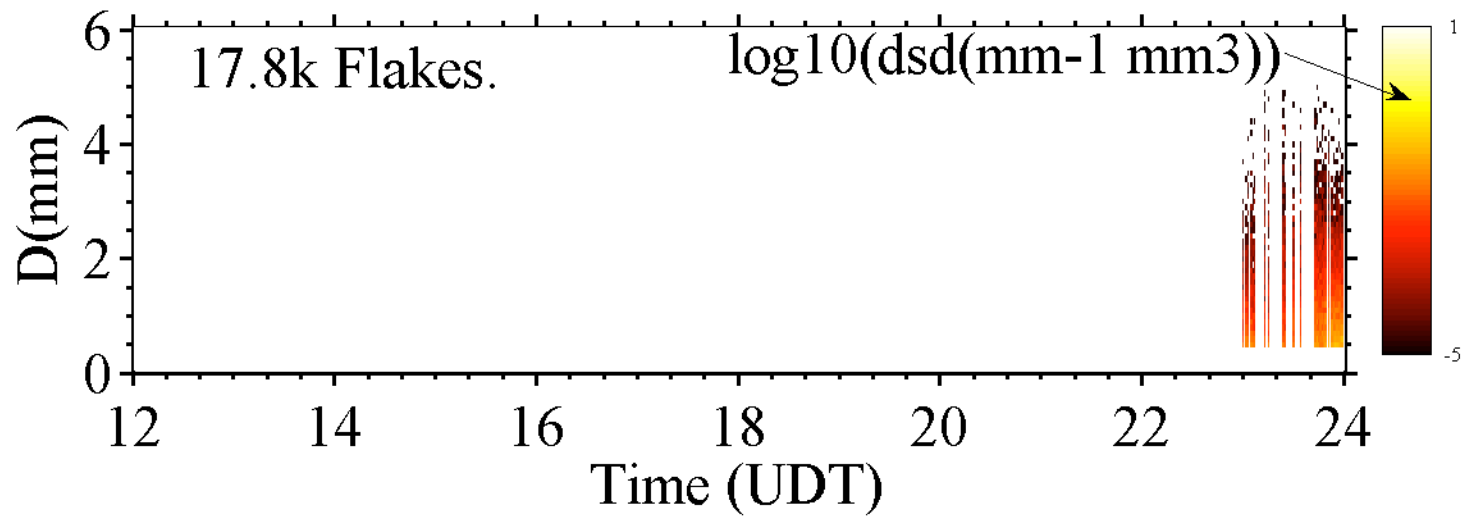
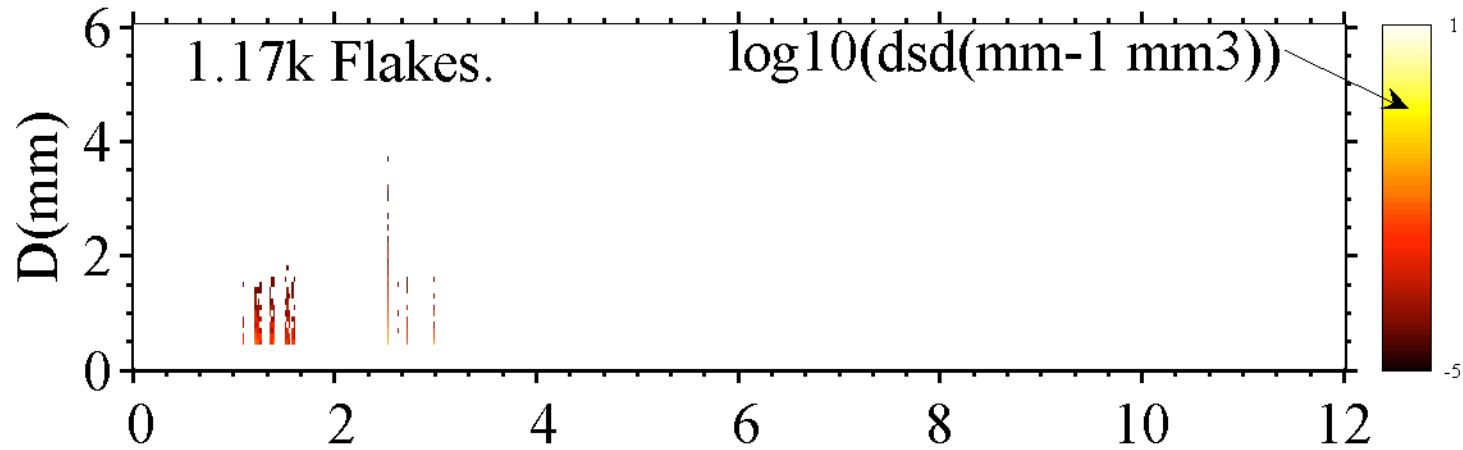
12/30/06*

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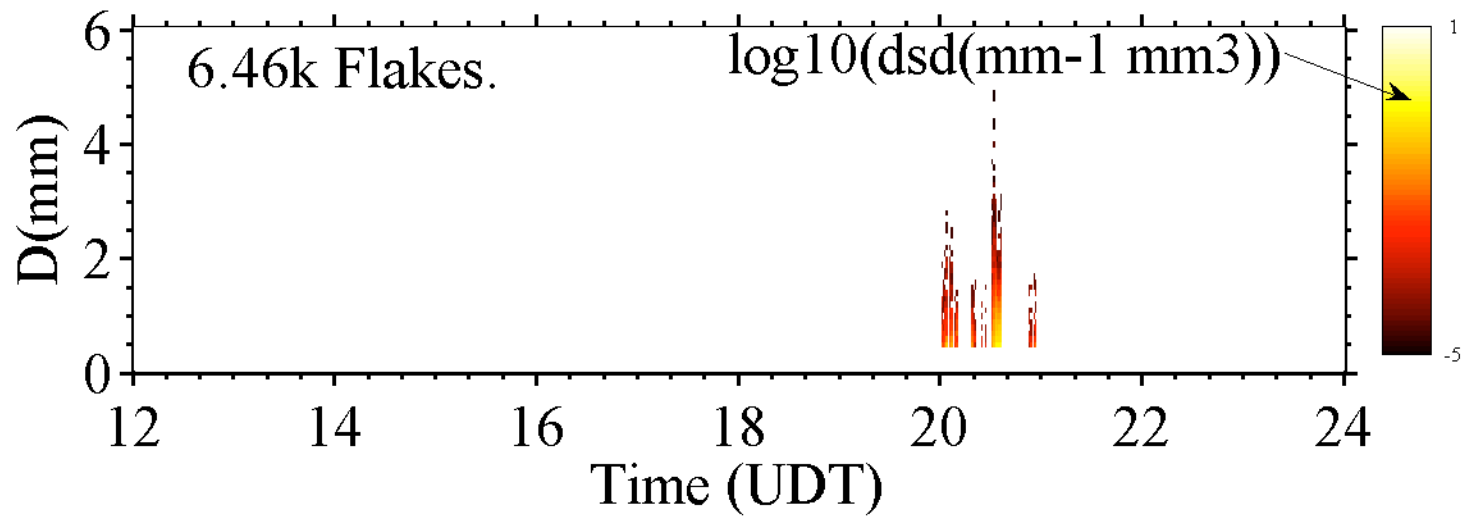
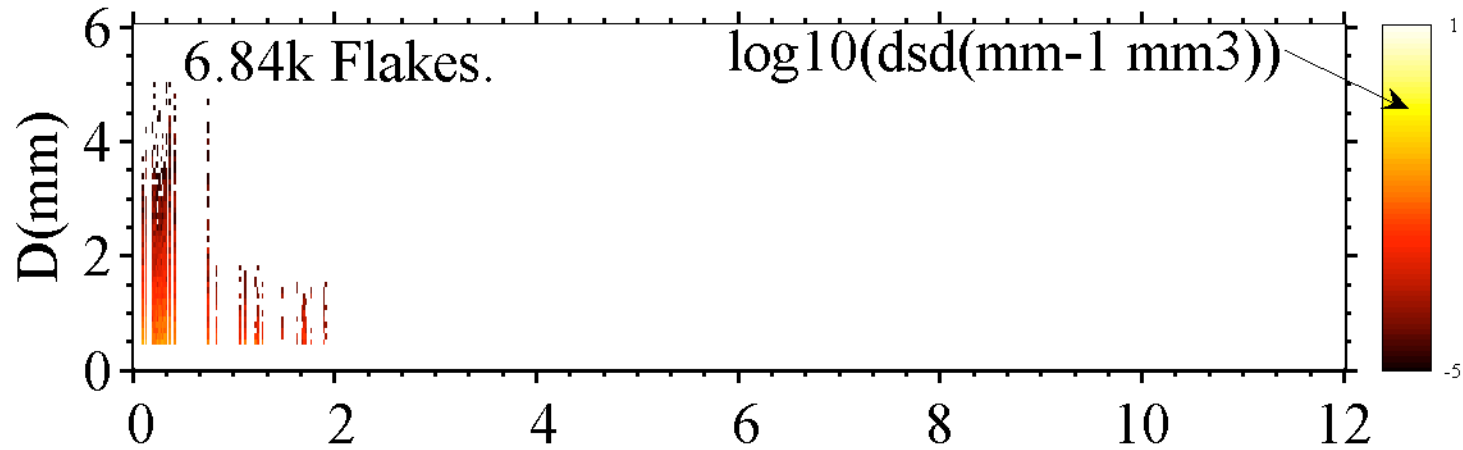
1/2/07*

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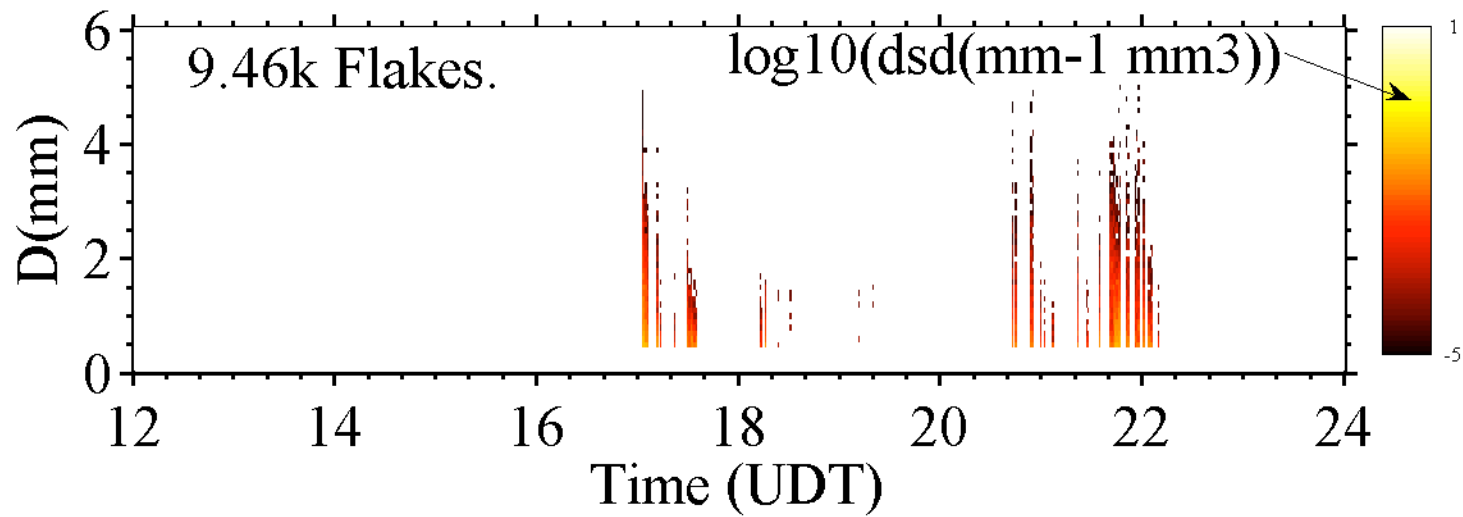
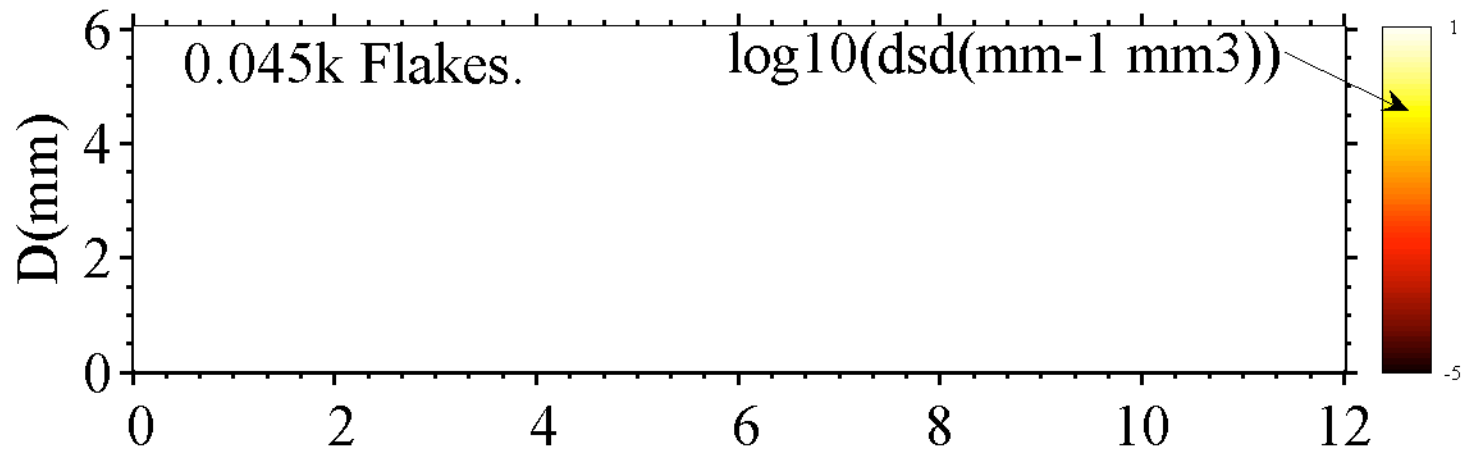
1/8/07*

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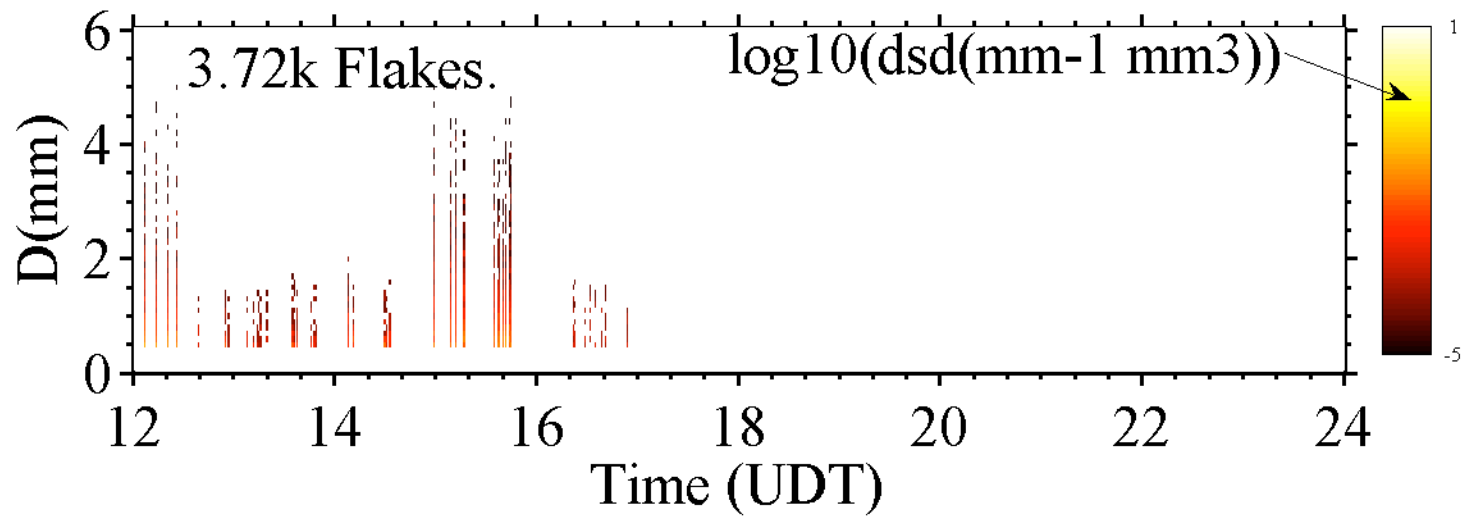
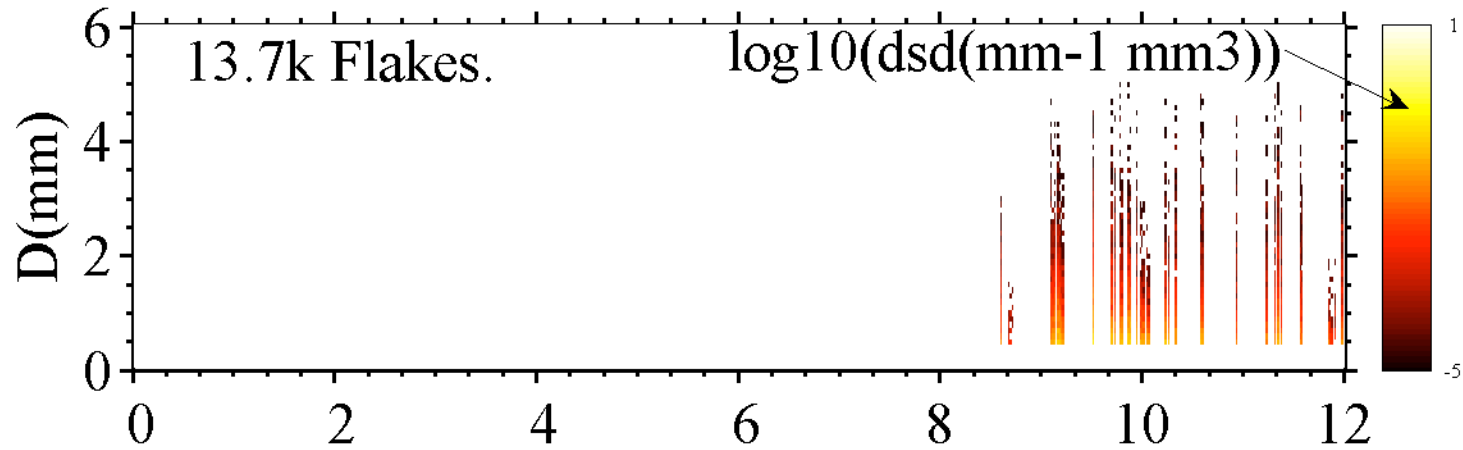
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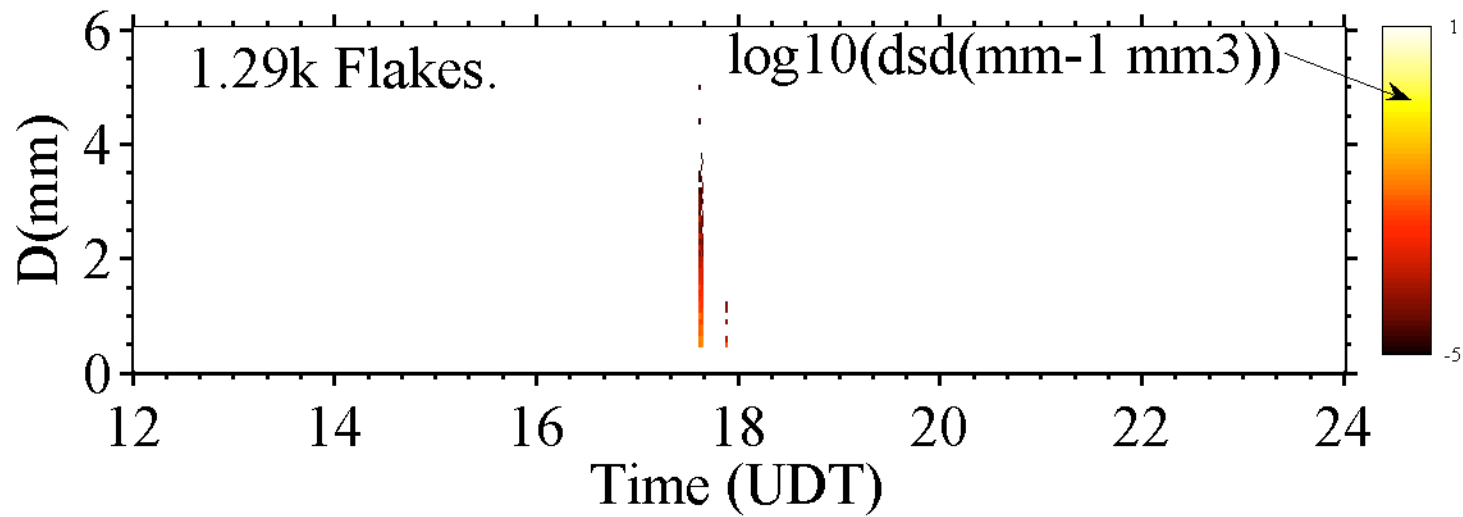
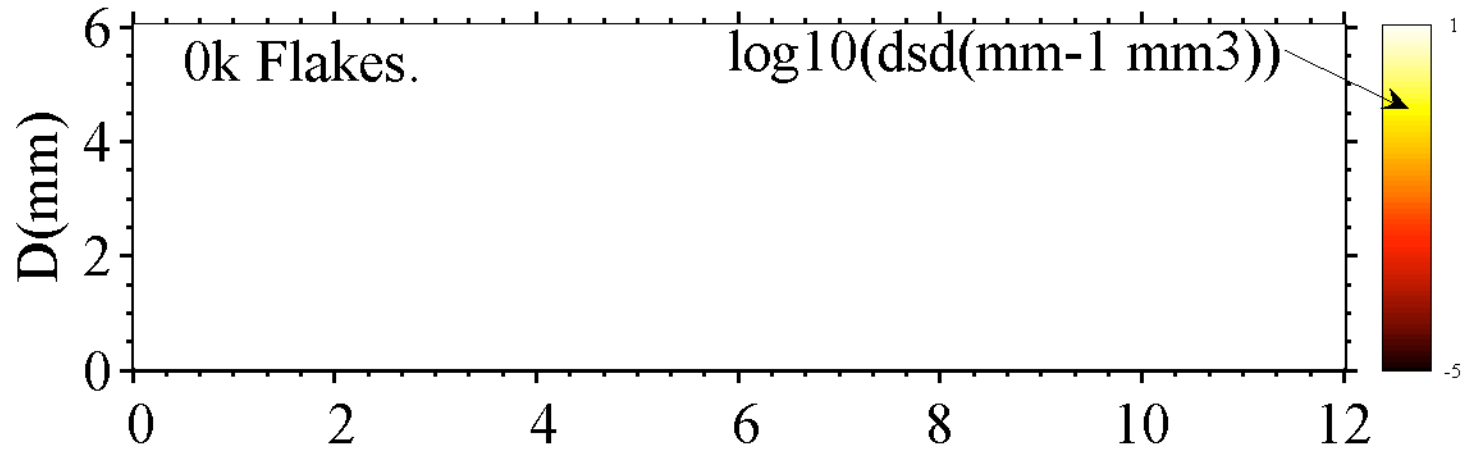
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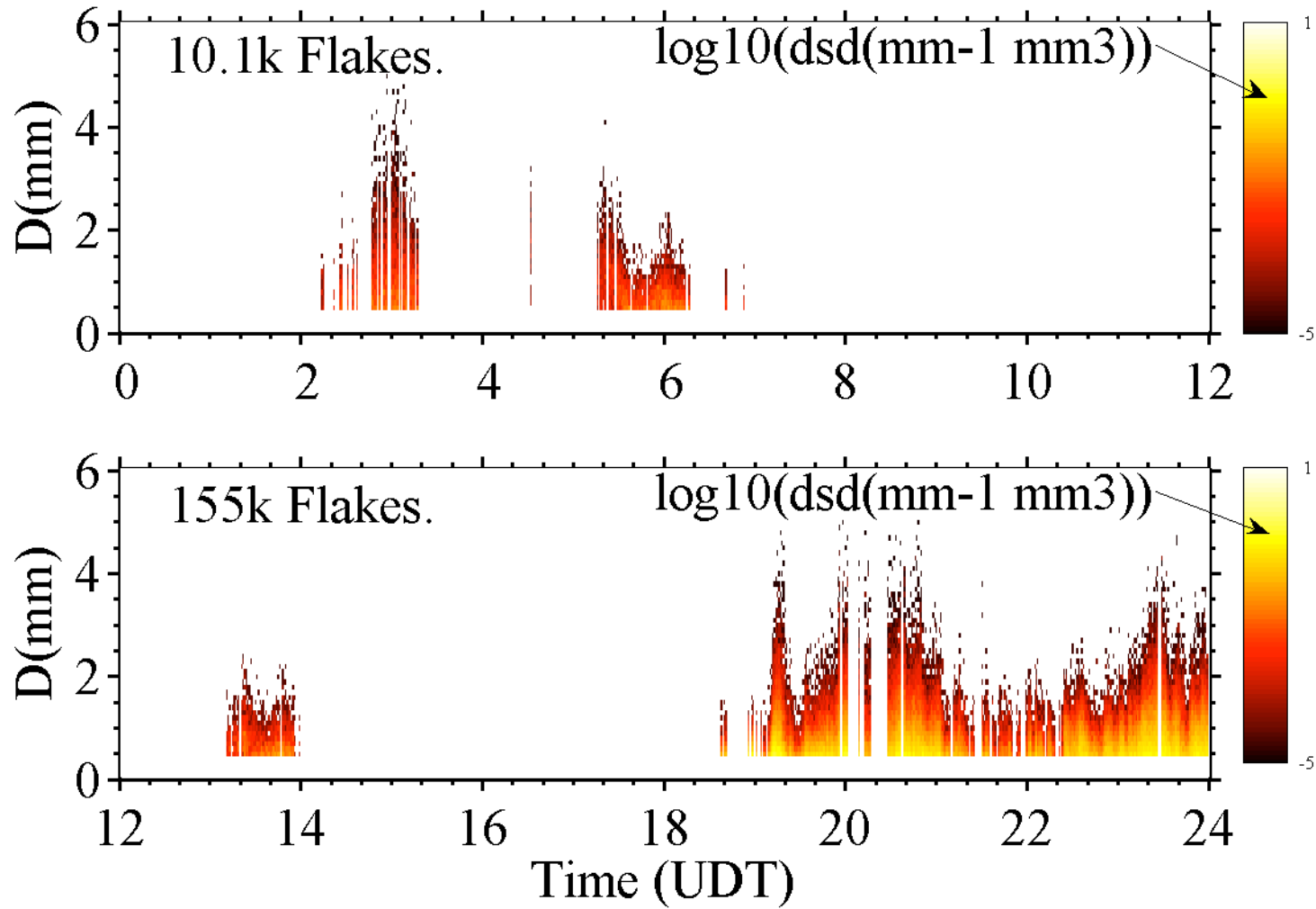
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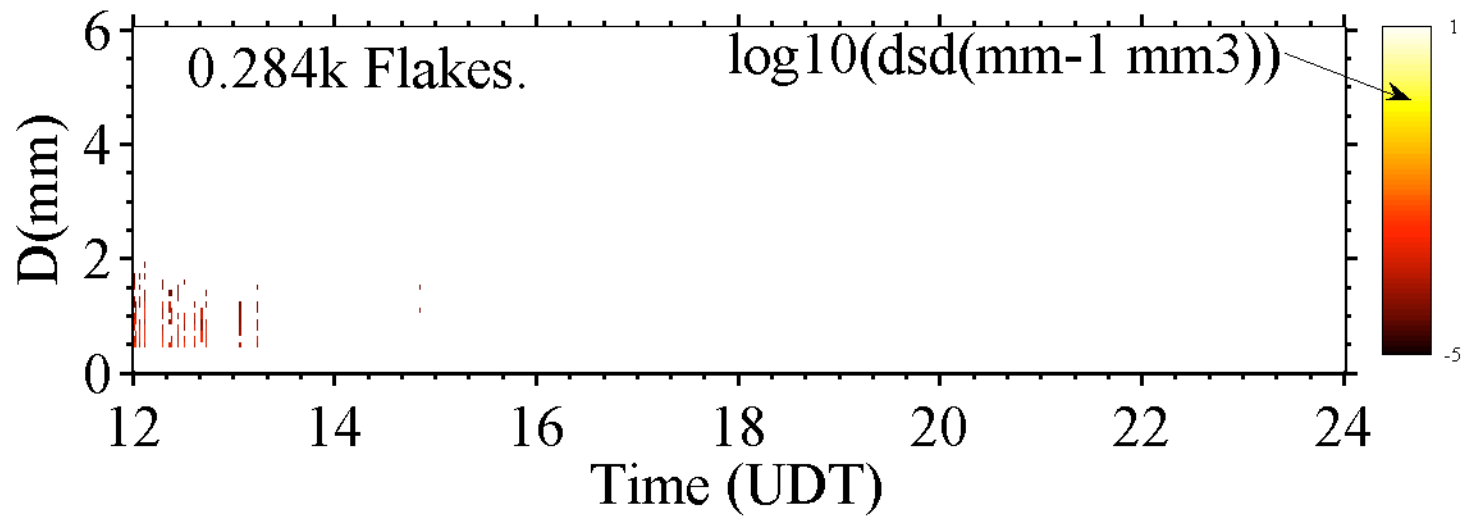
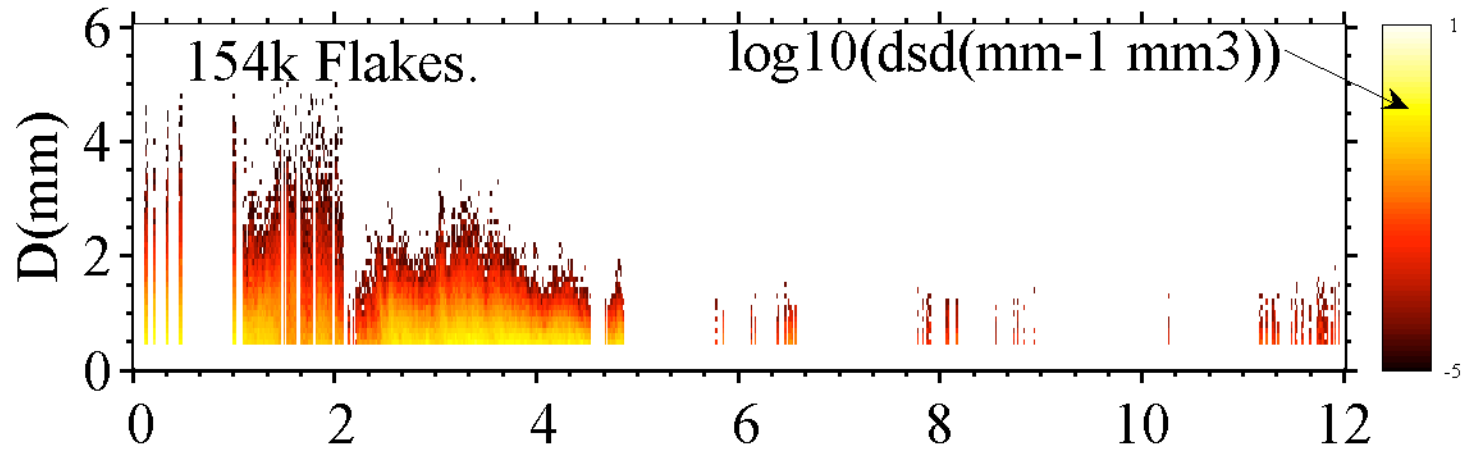
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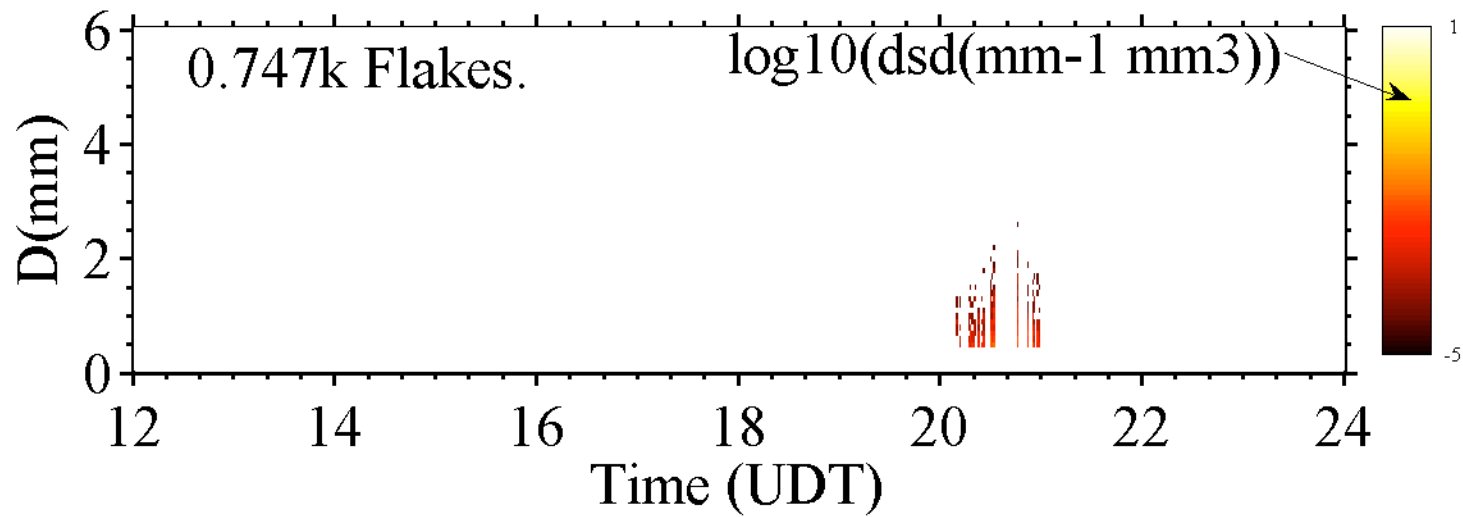
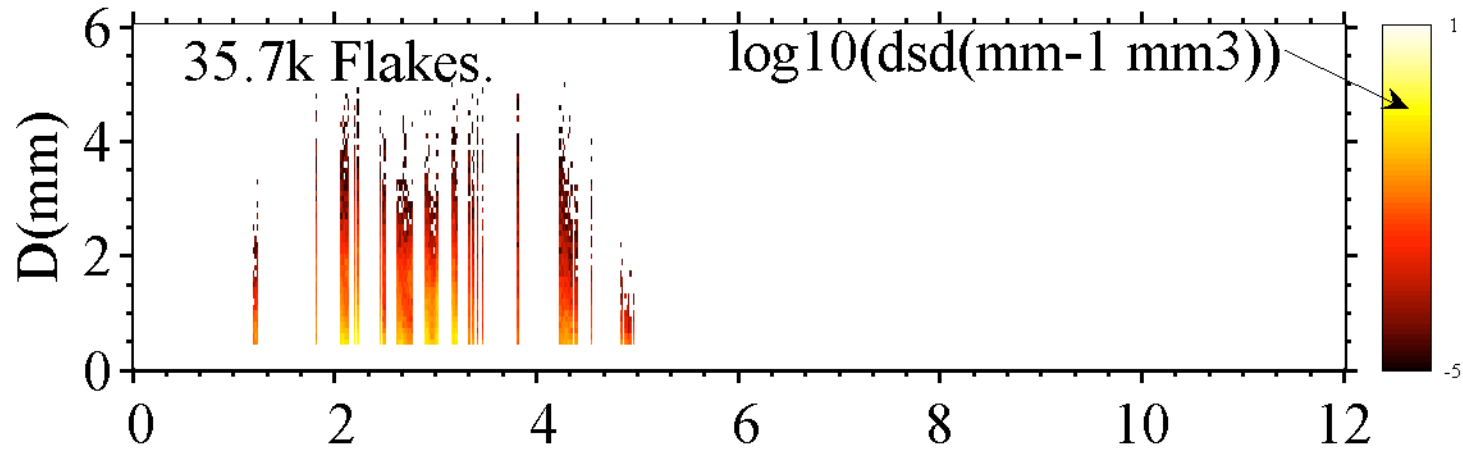
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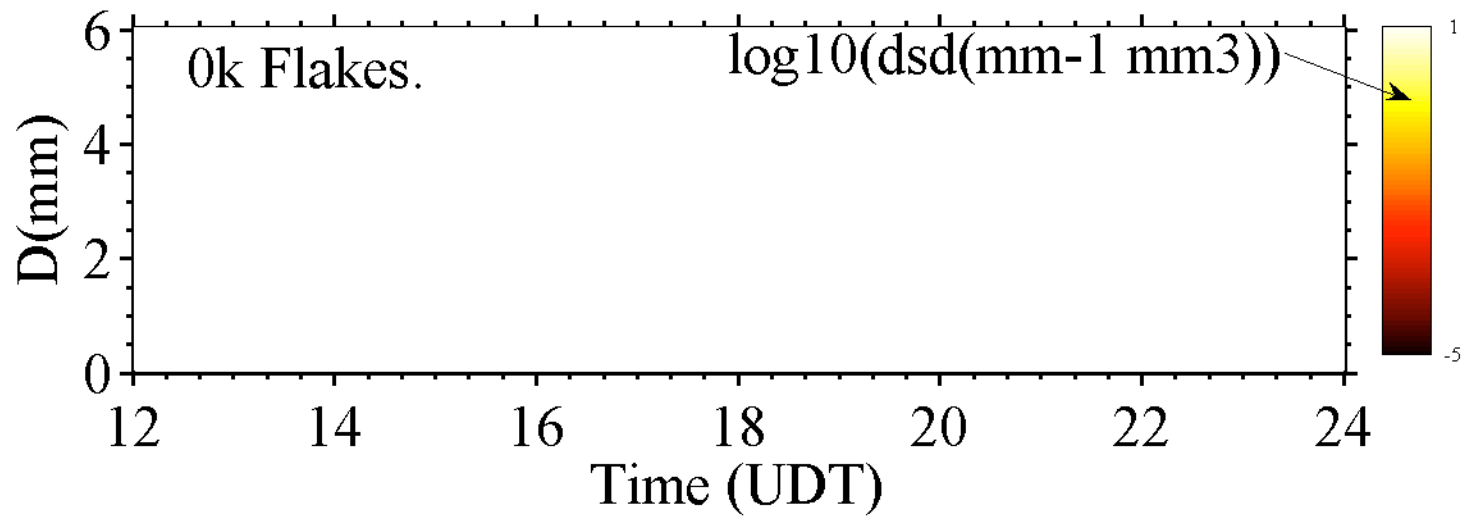
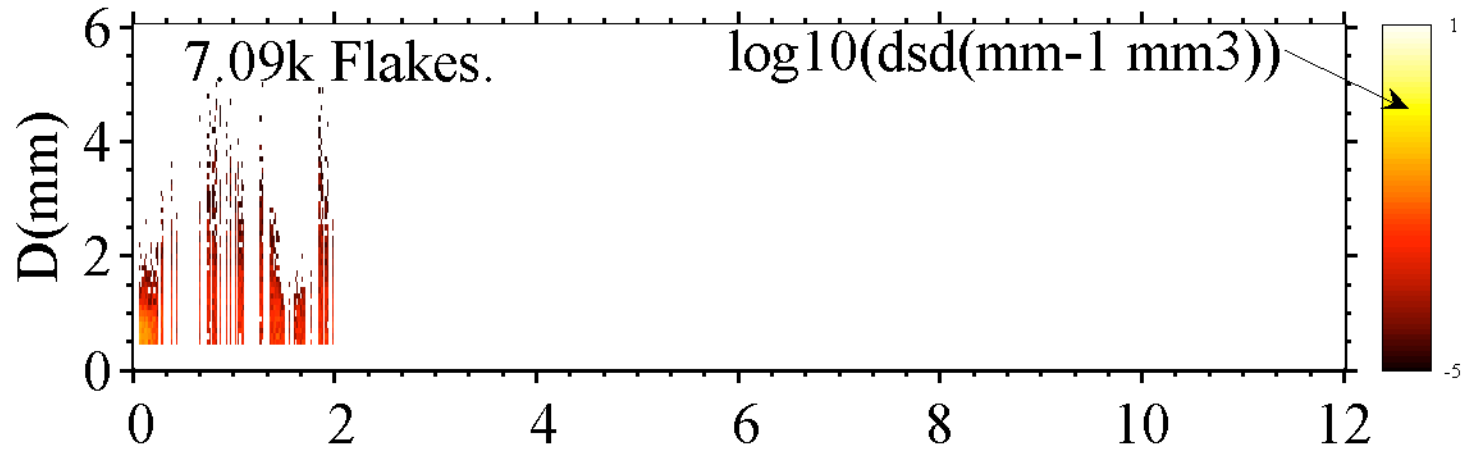
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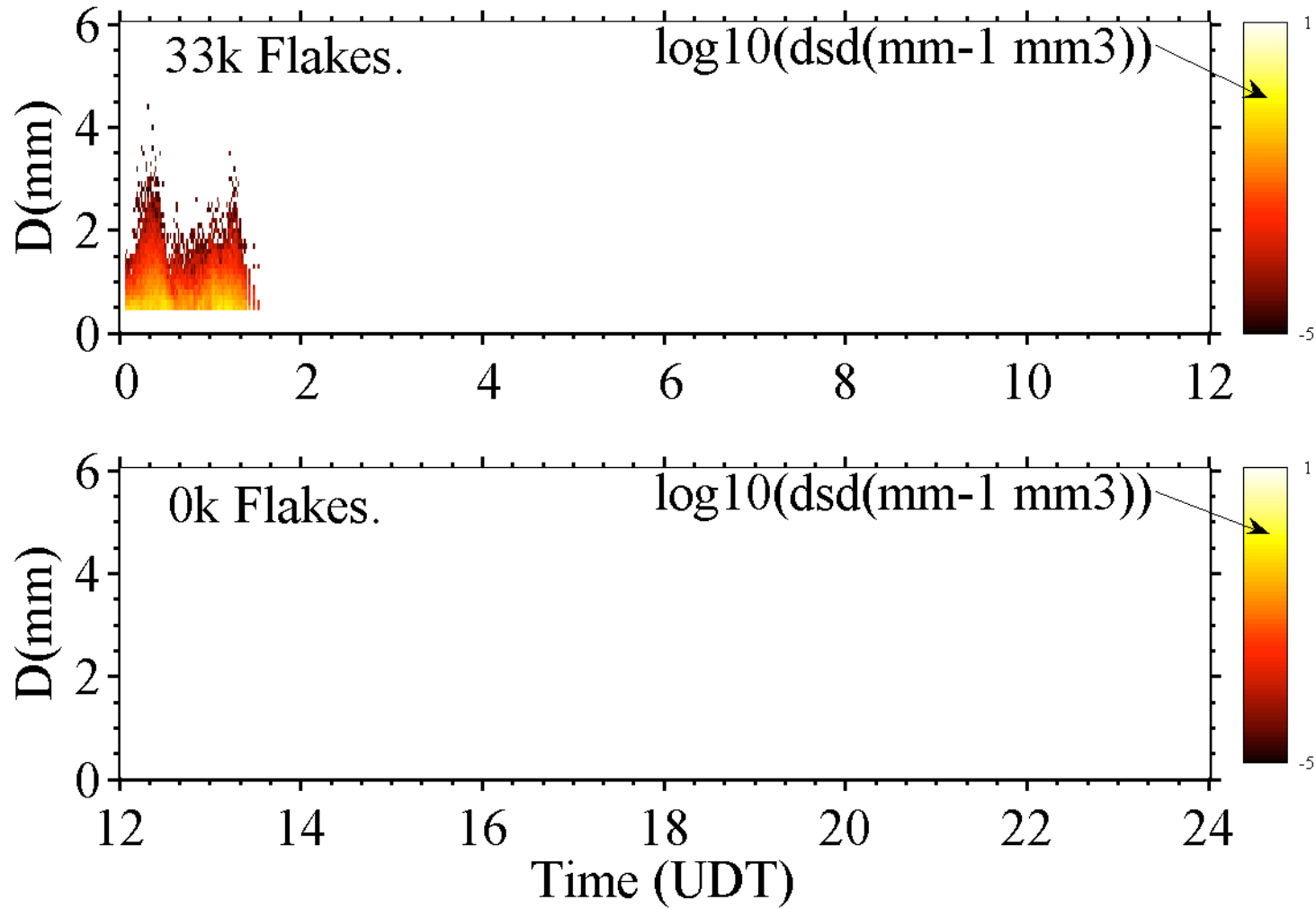
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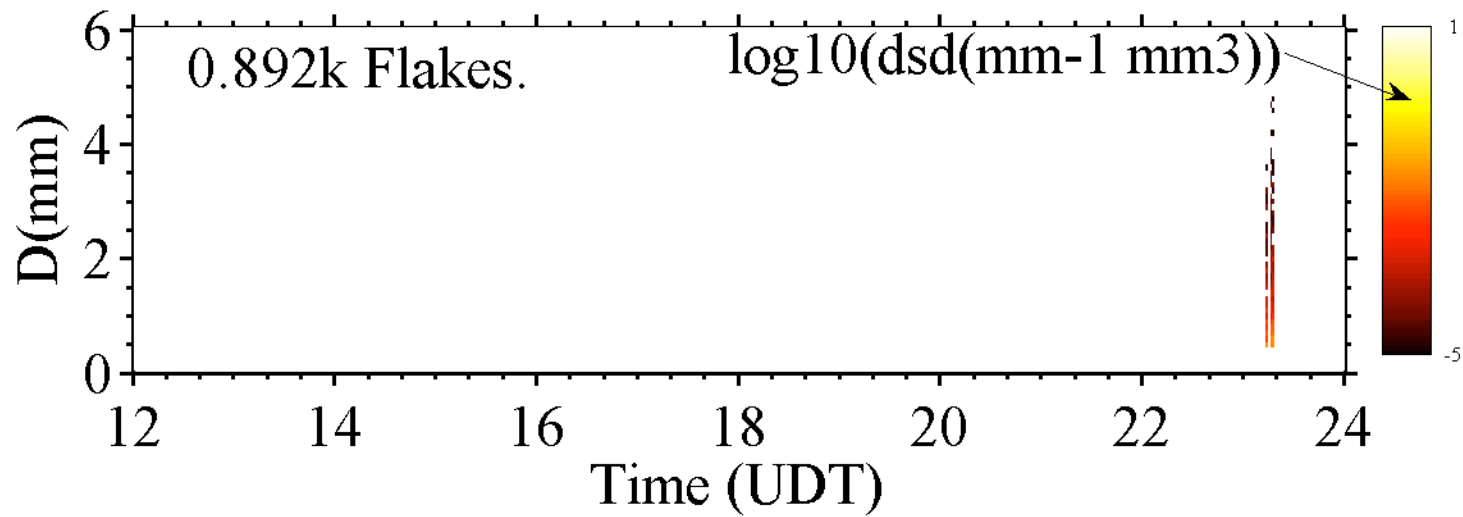
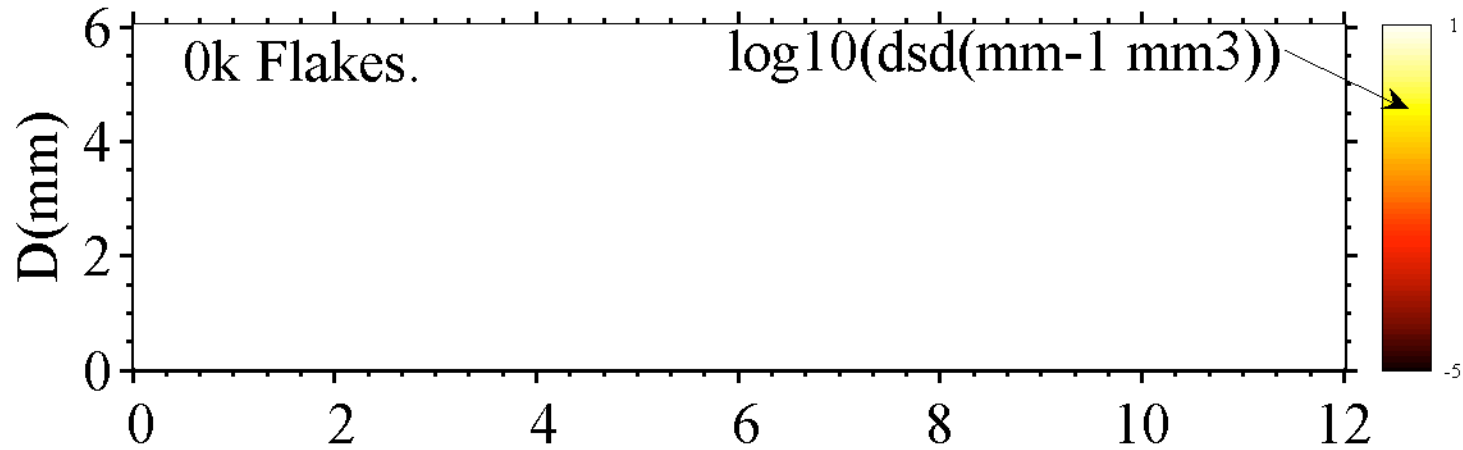
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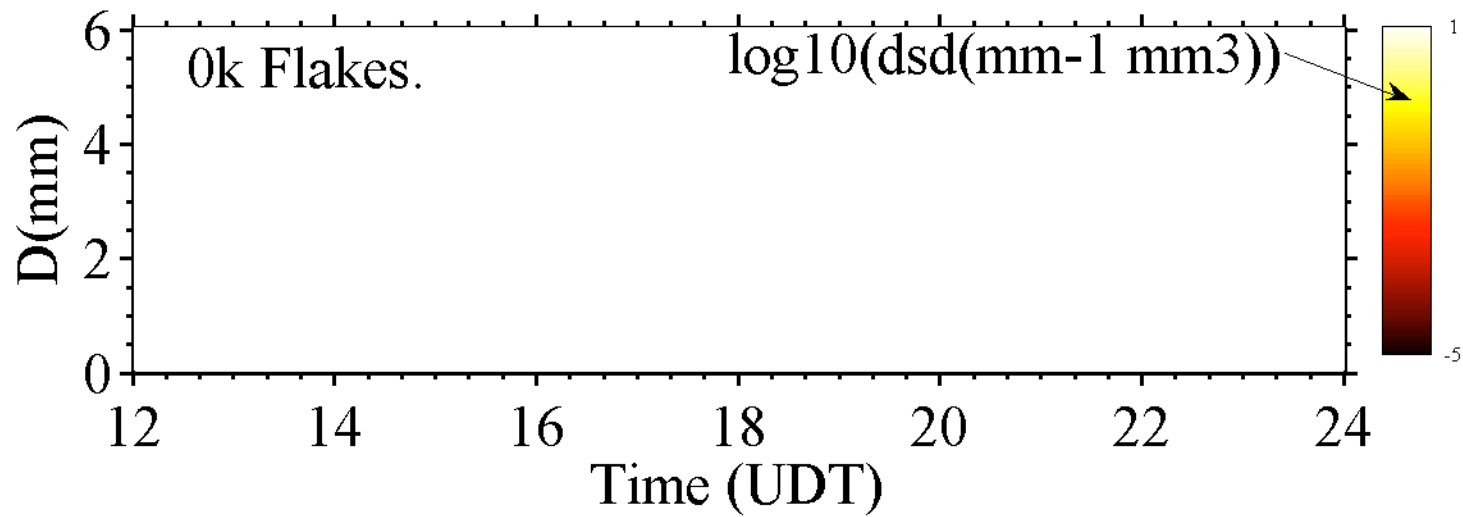
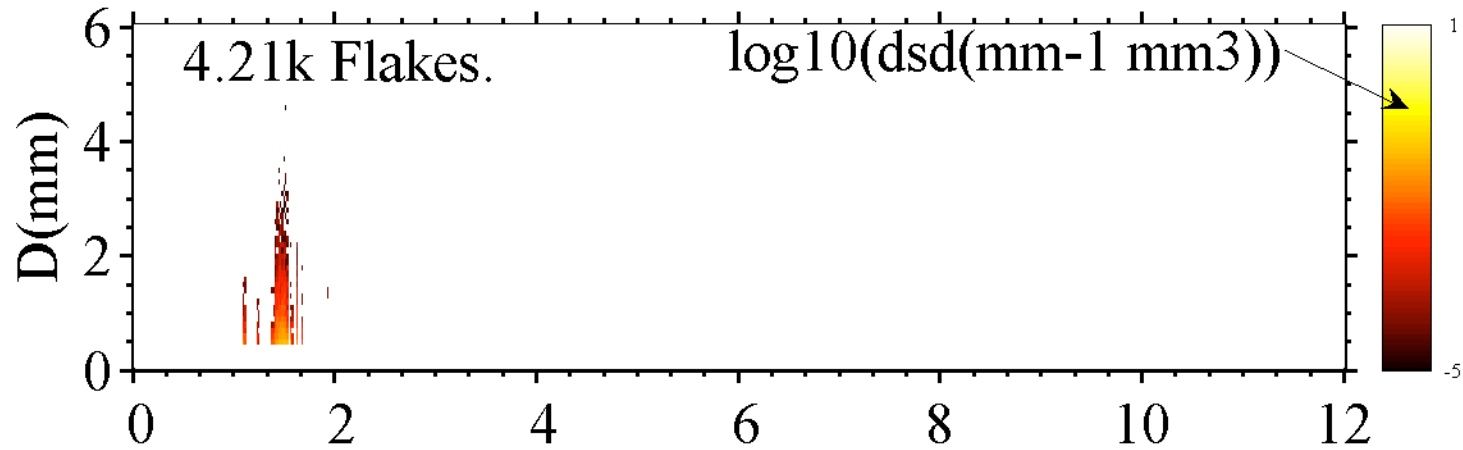
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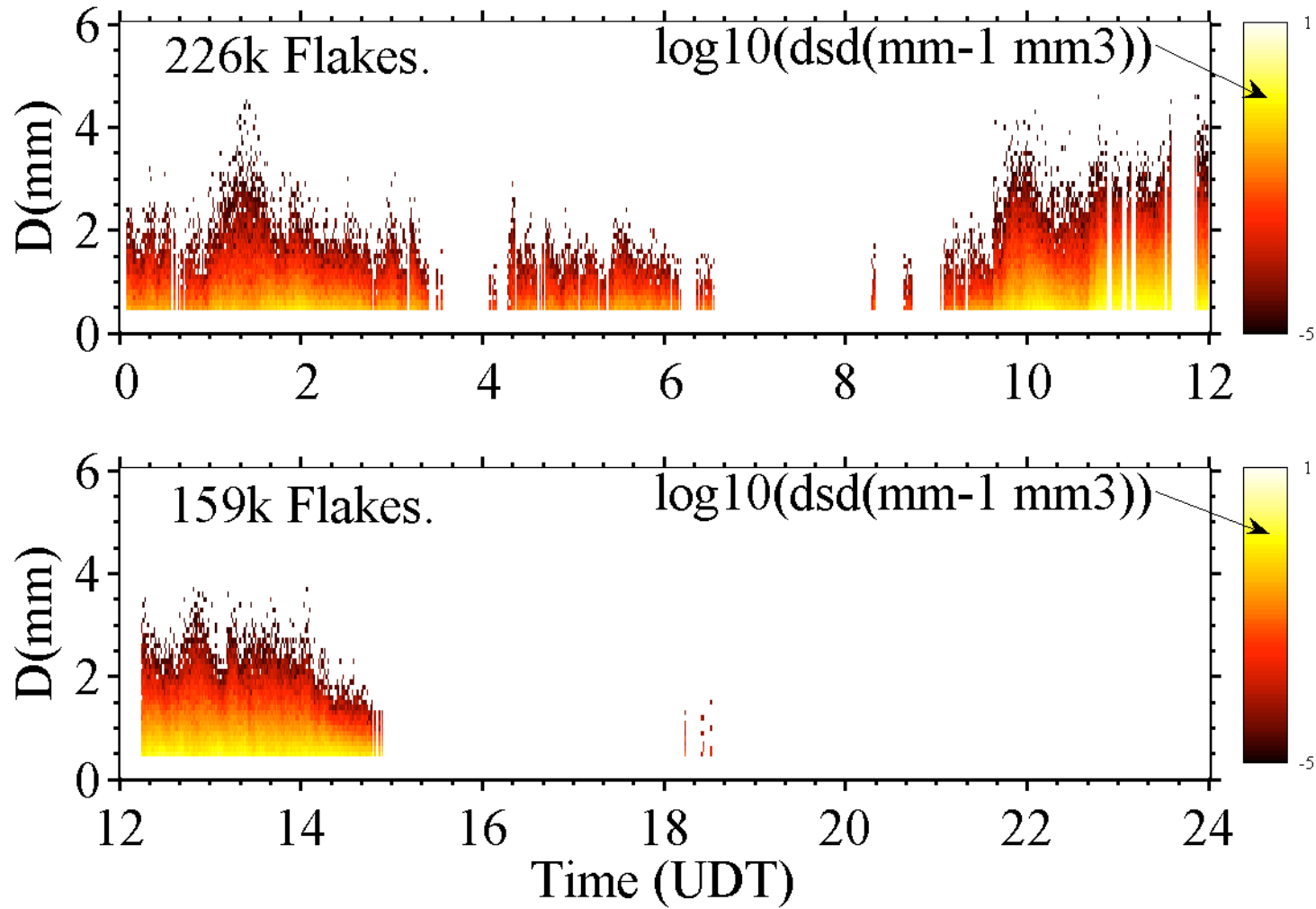
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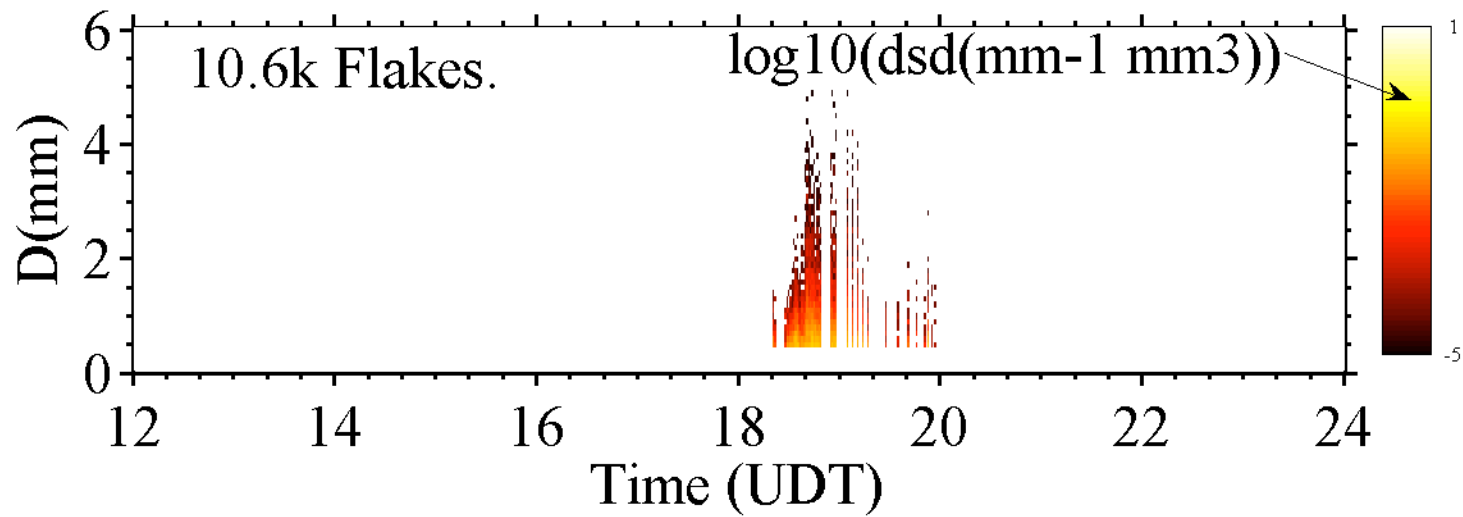
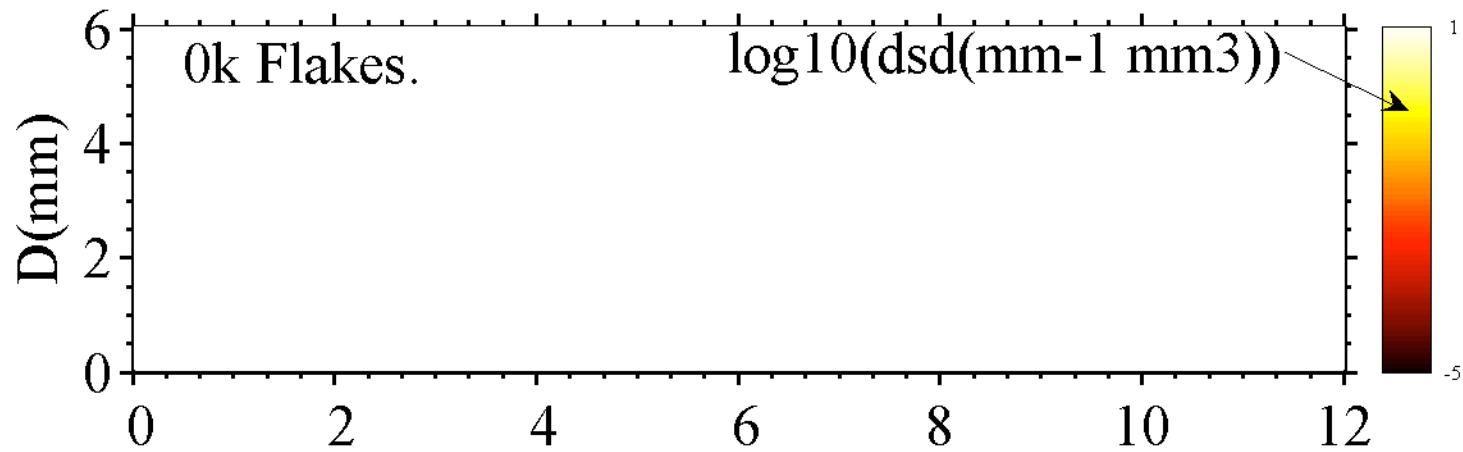
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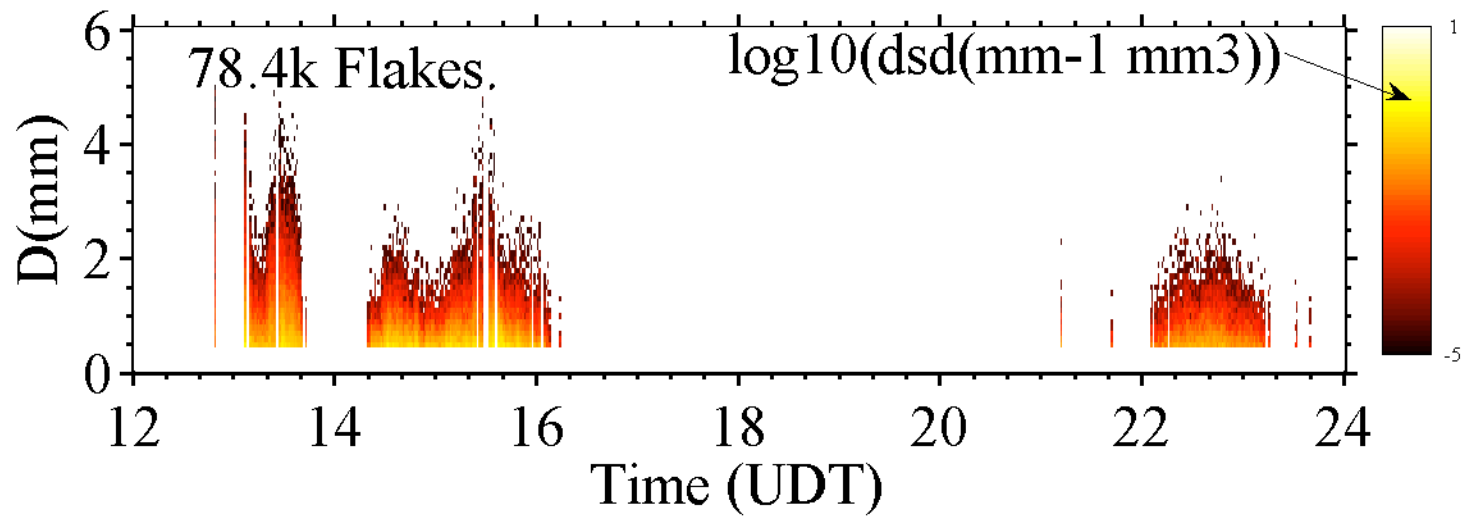
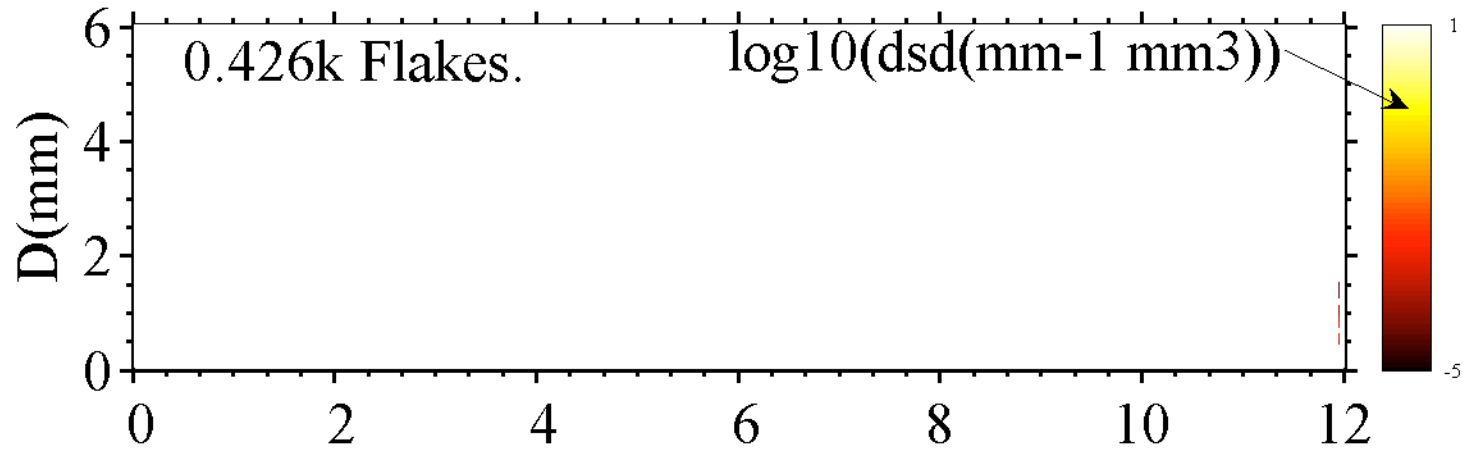
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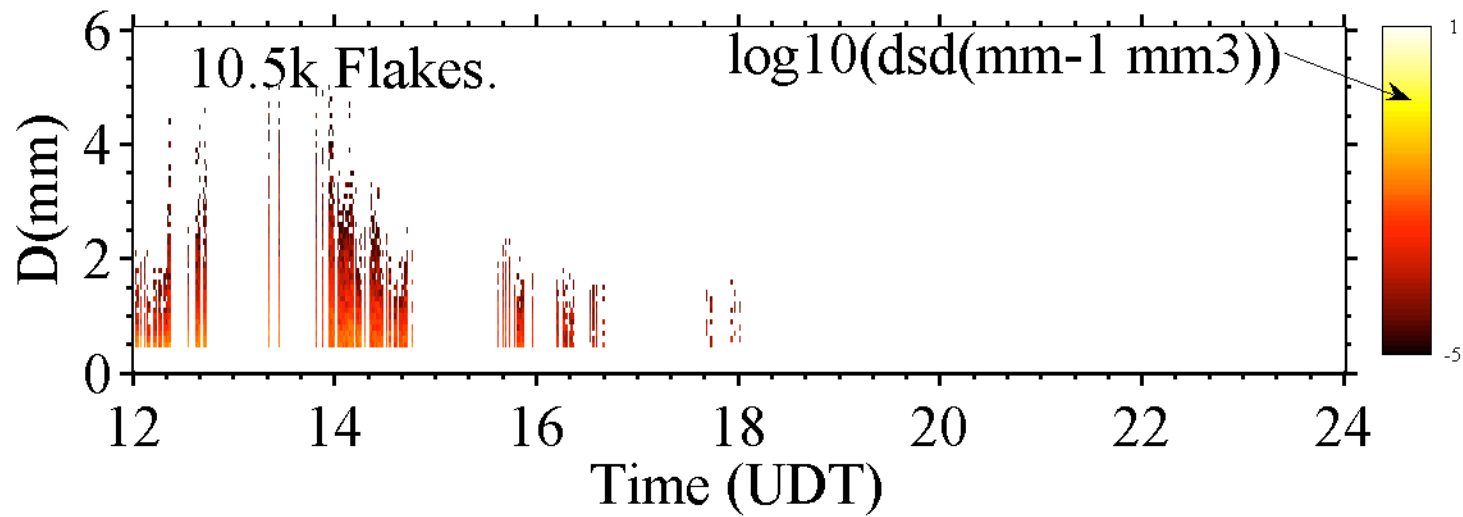
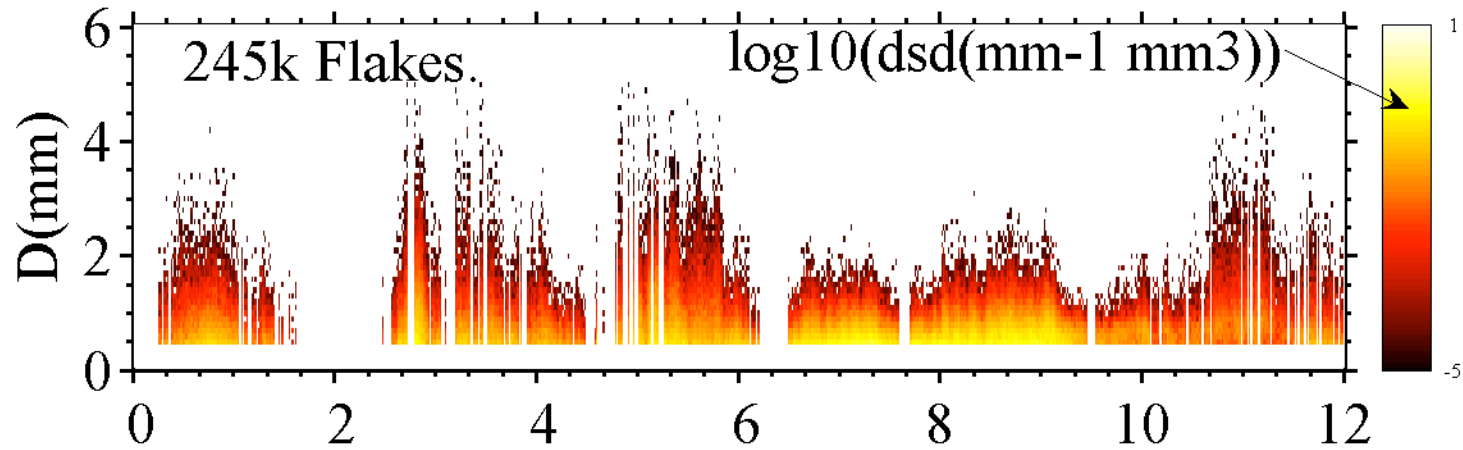
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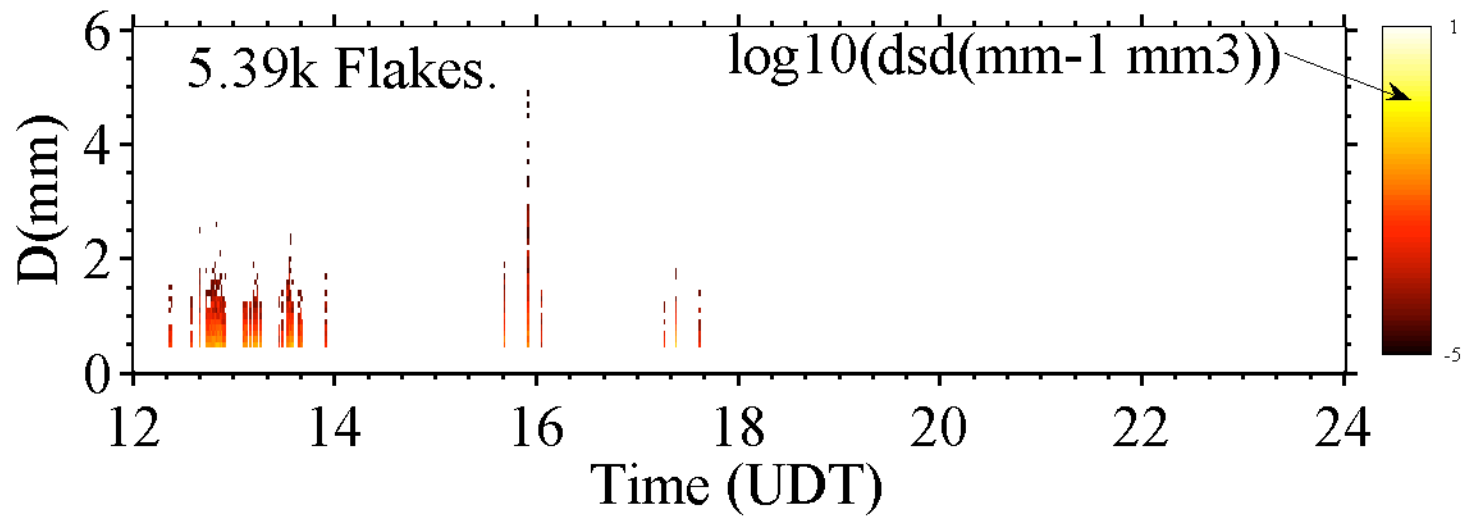
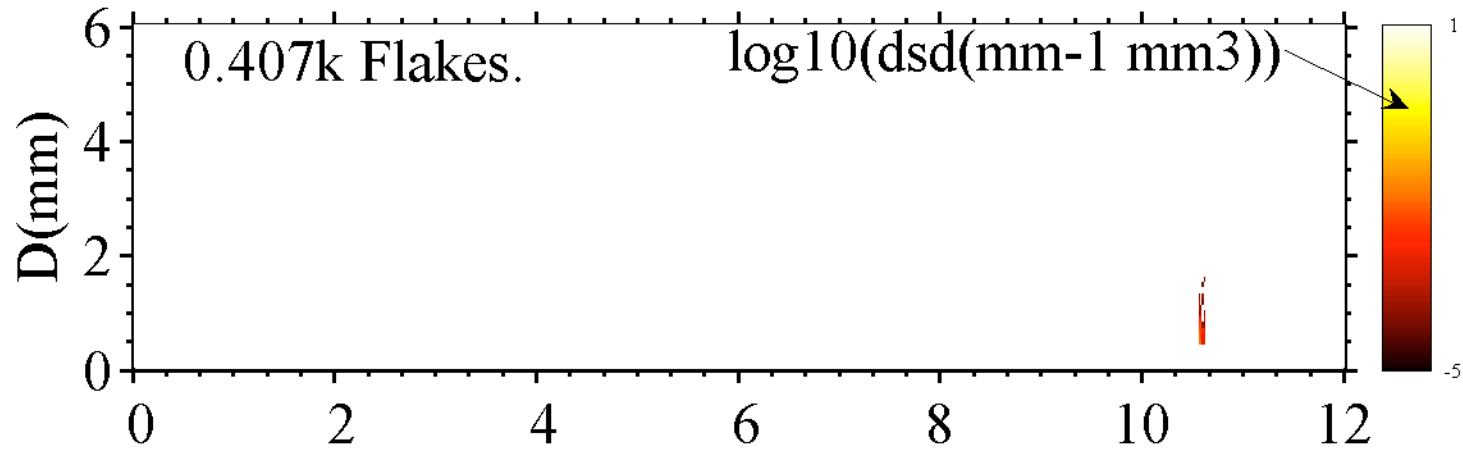
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C3VP. GSFC SVI.



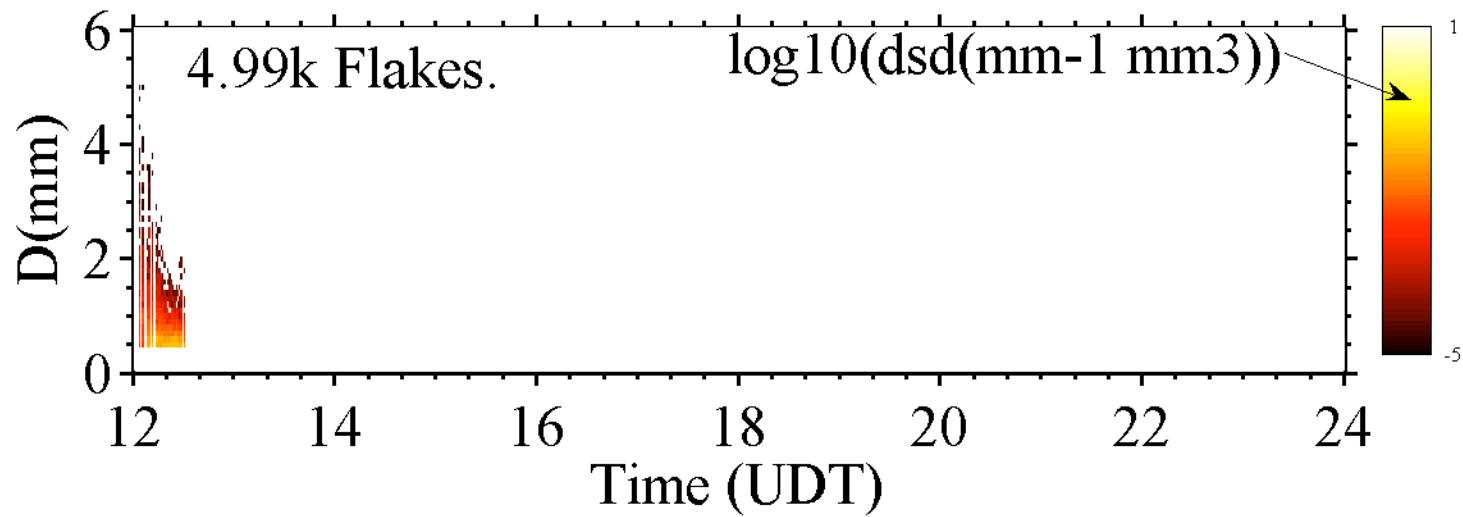
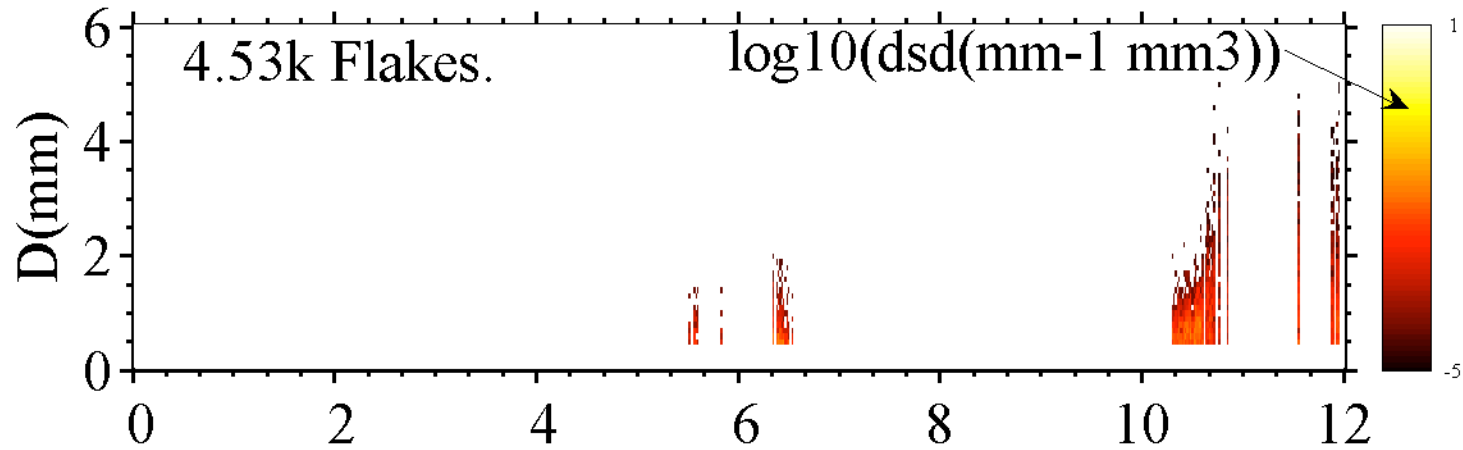
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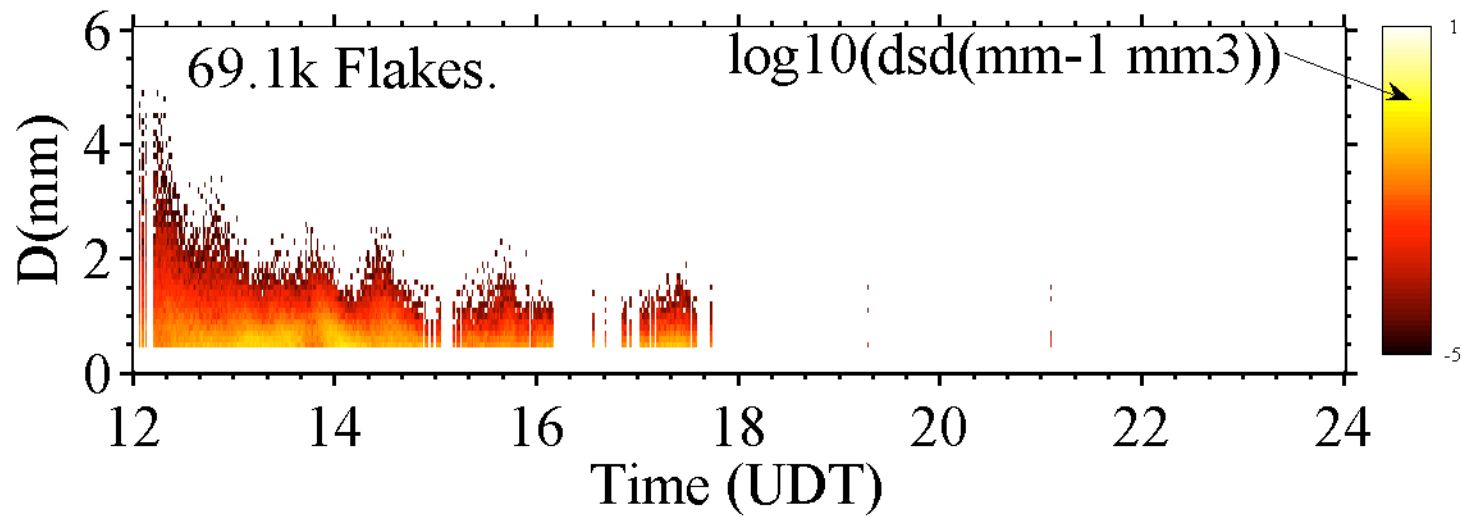
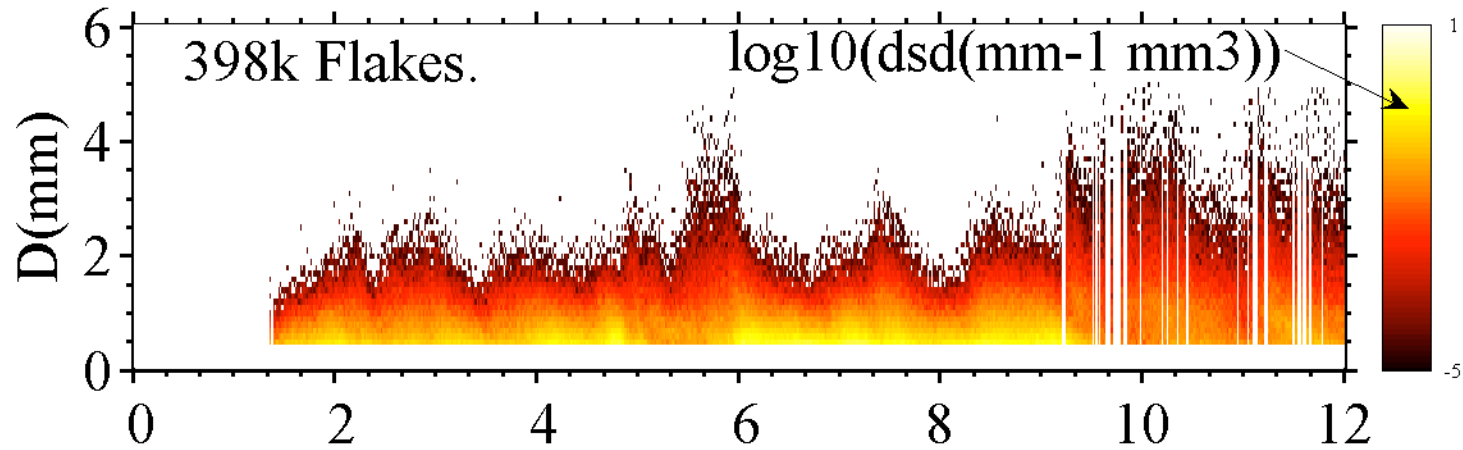
2/12/07*

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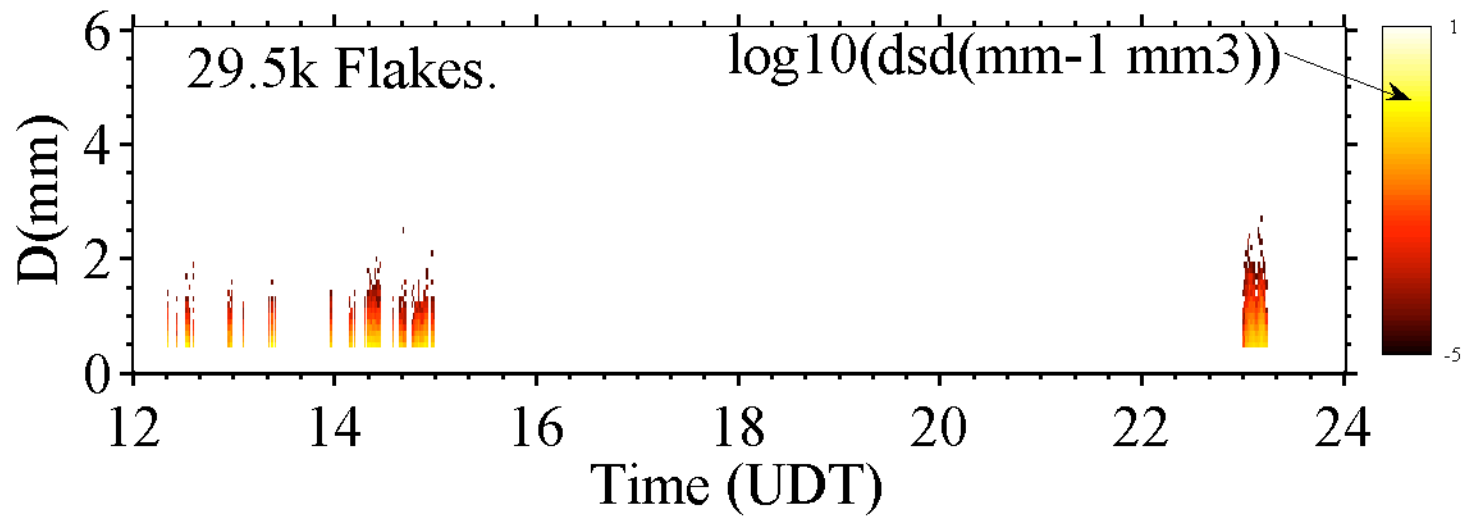
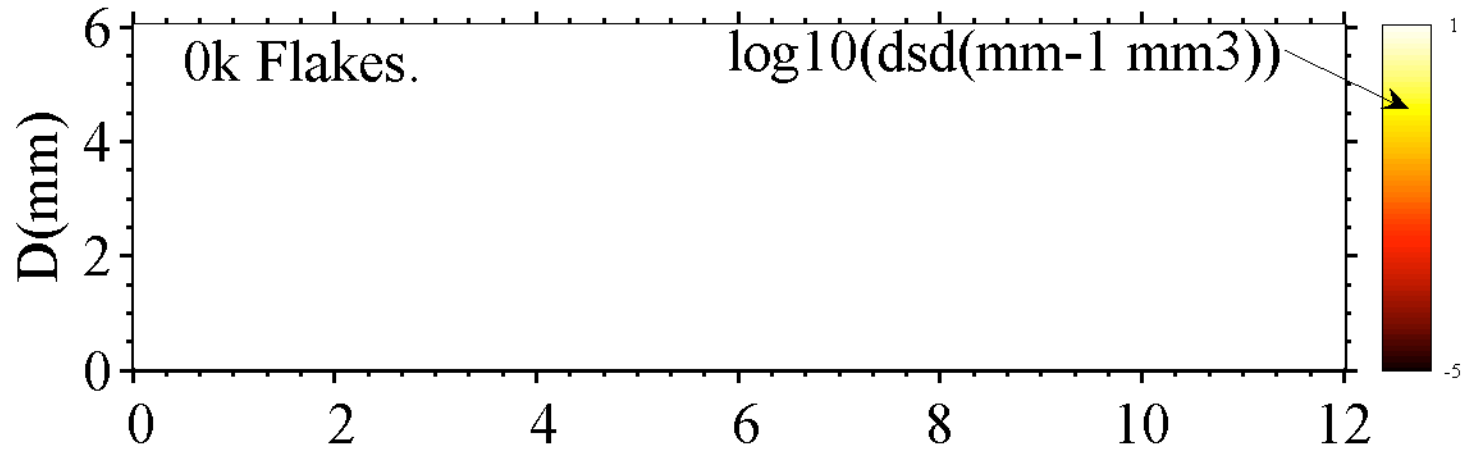
2/14/07****

C3VP. GSFC SVI.



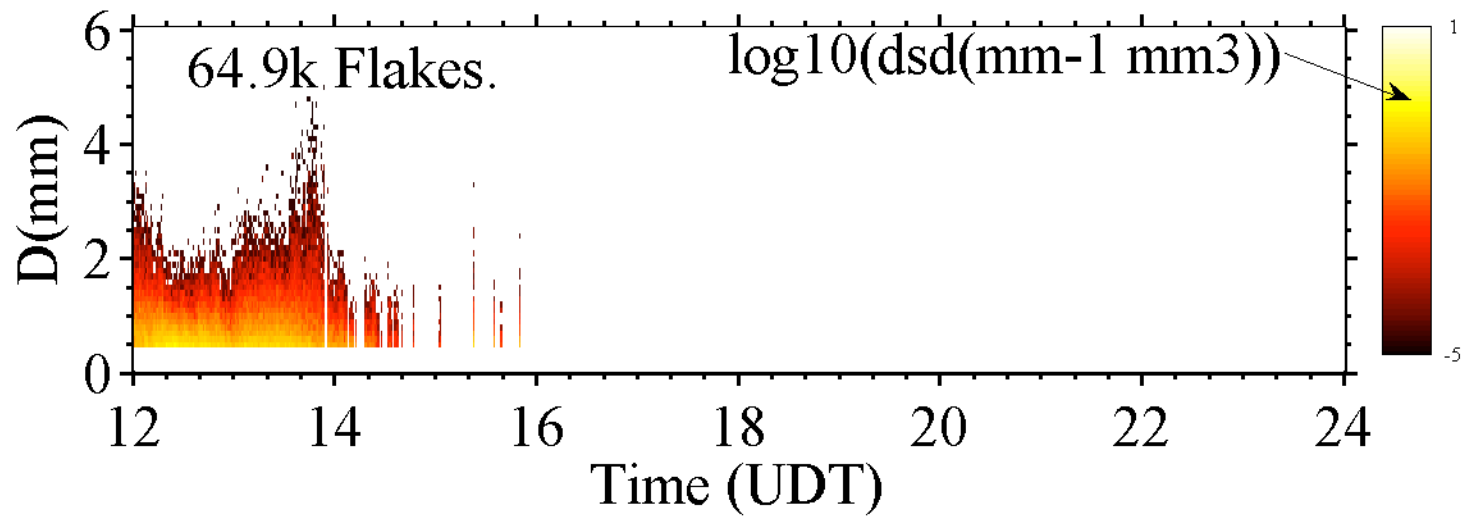
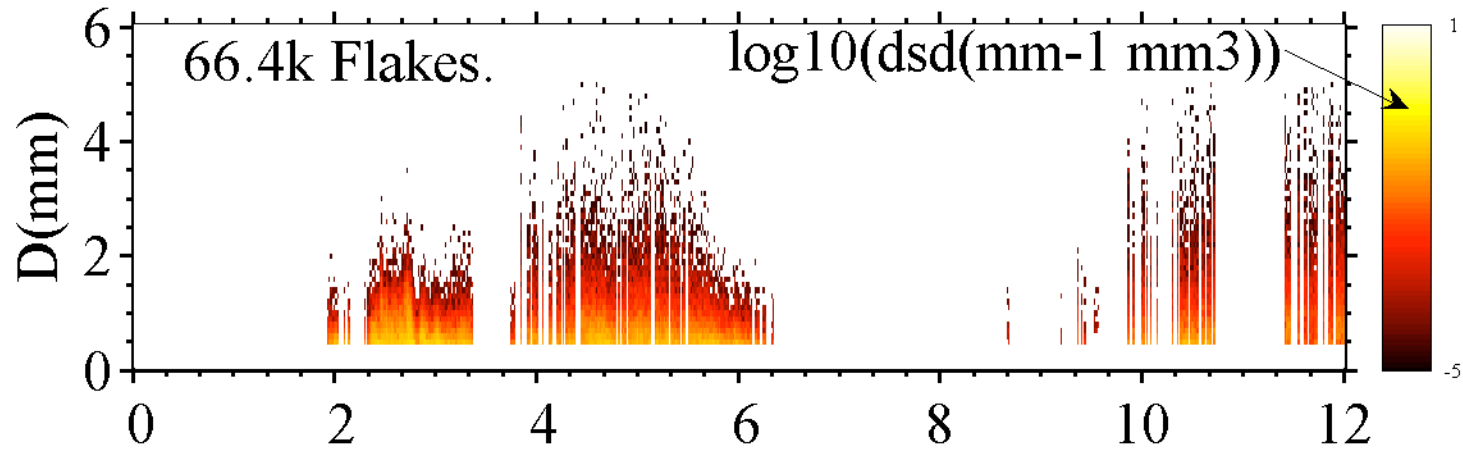
2/15/07*

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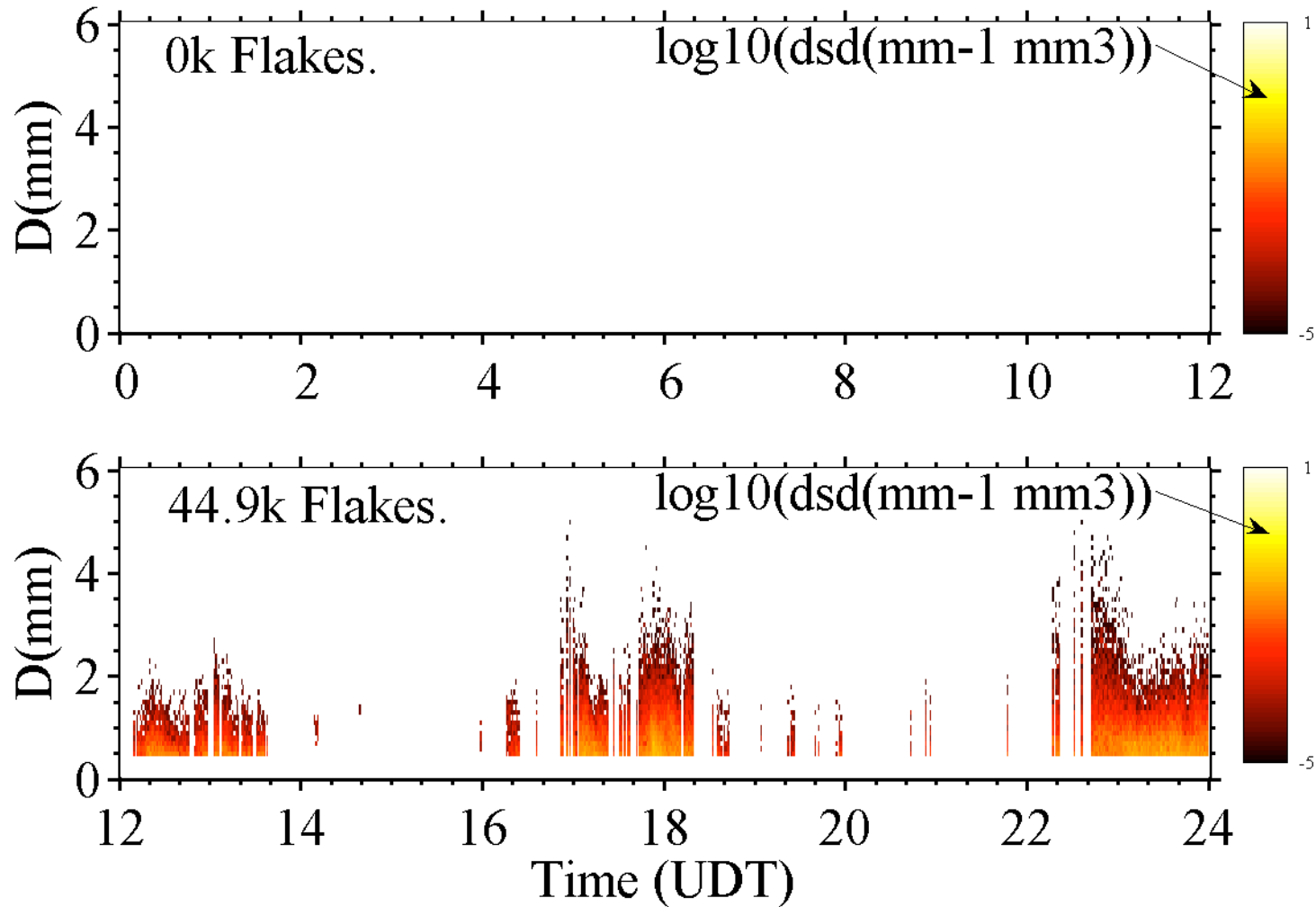
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C3VP. GSFC SVI.



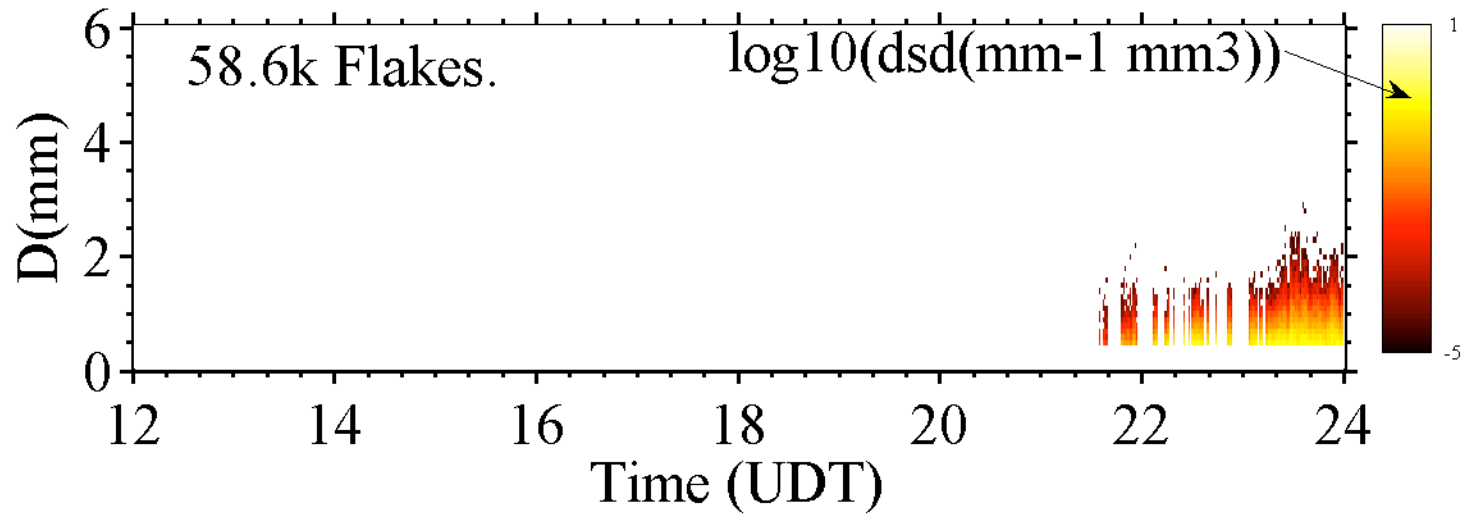
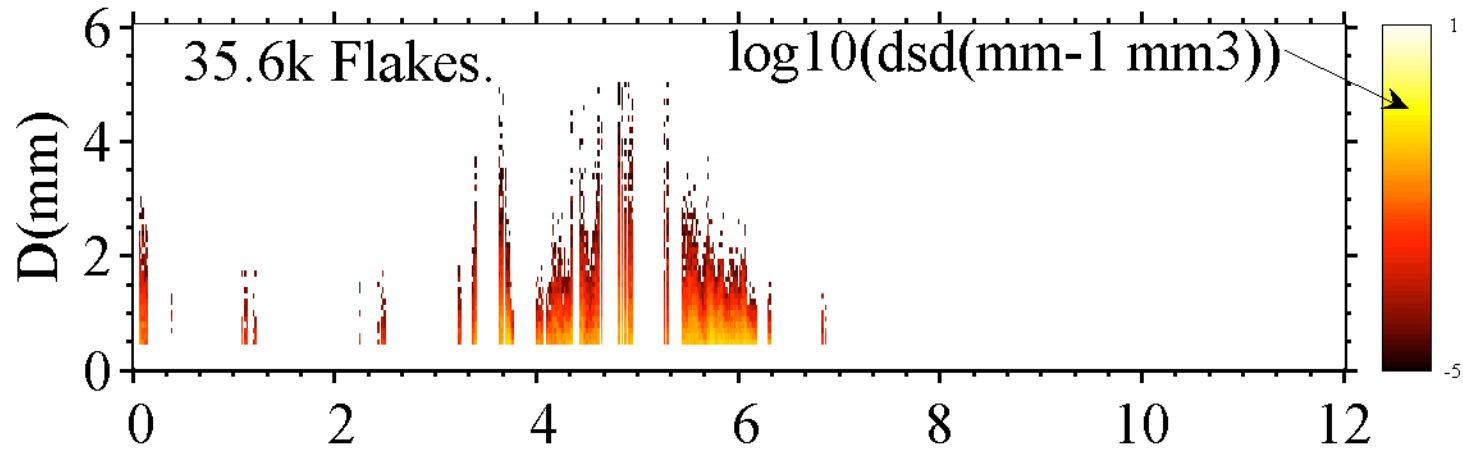
2/17/07*

C3VP. GSFC SVI.



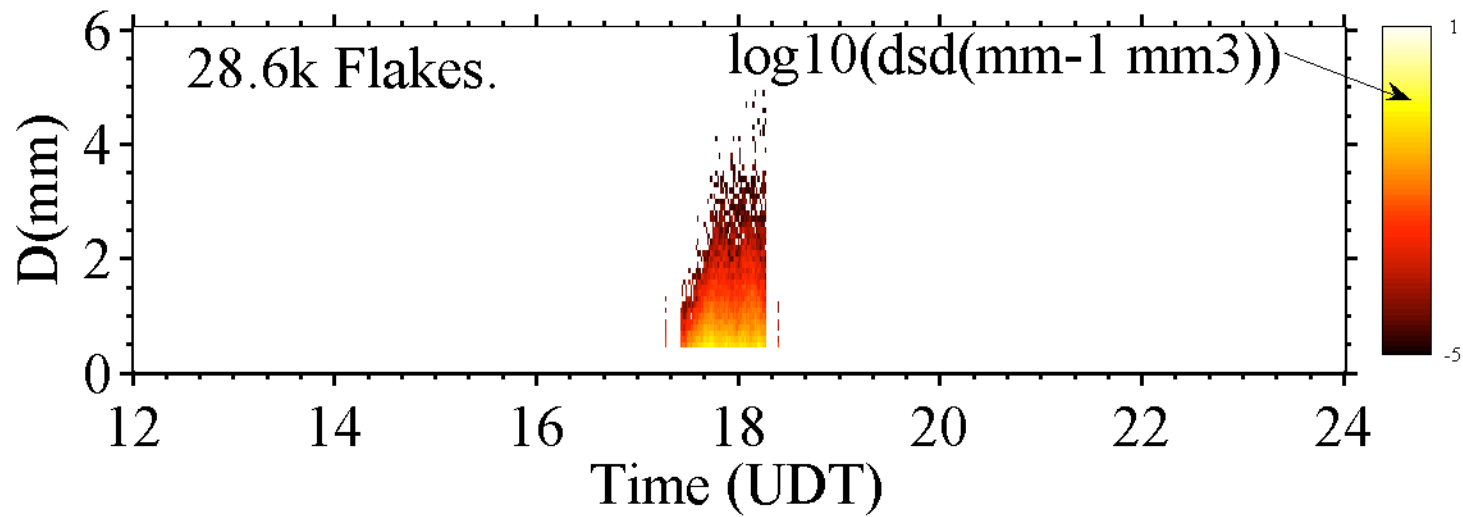
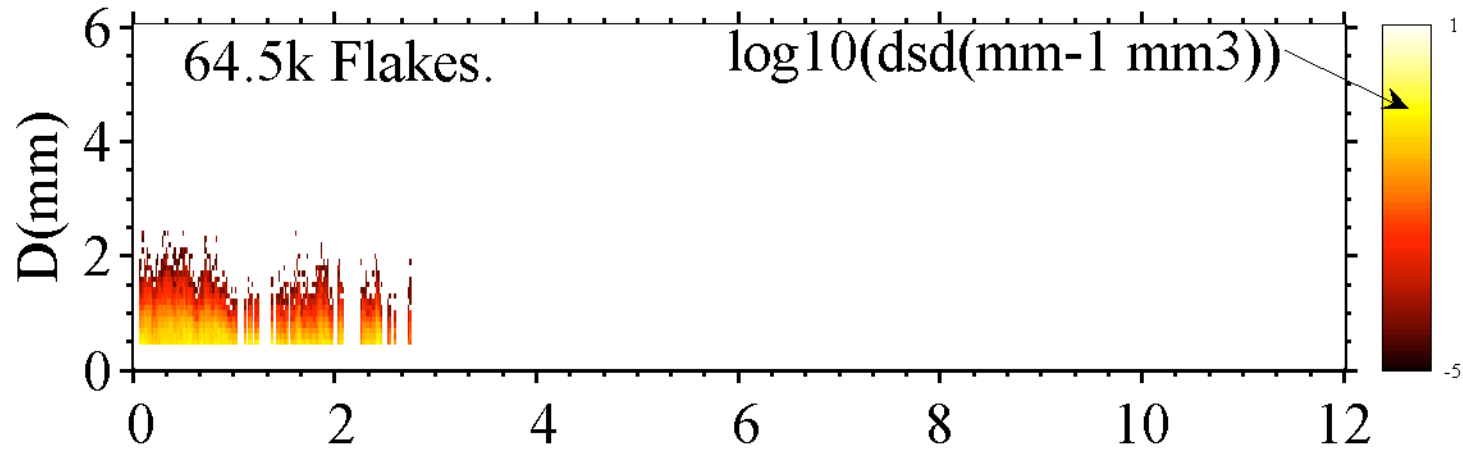
2/18/07**

C3VP. GSFC SVI.



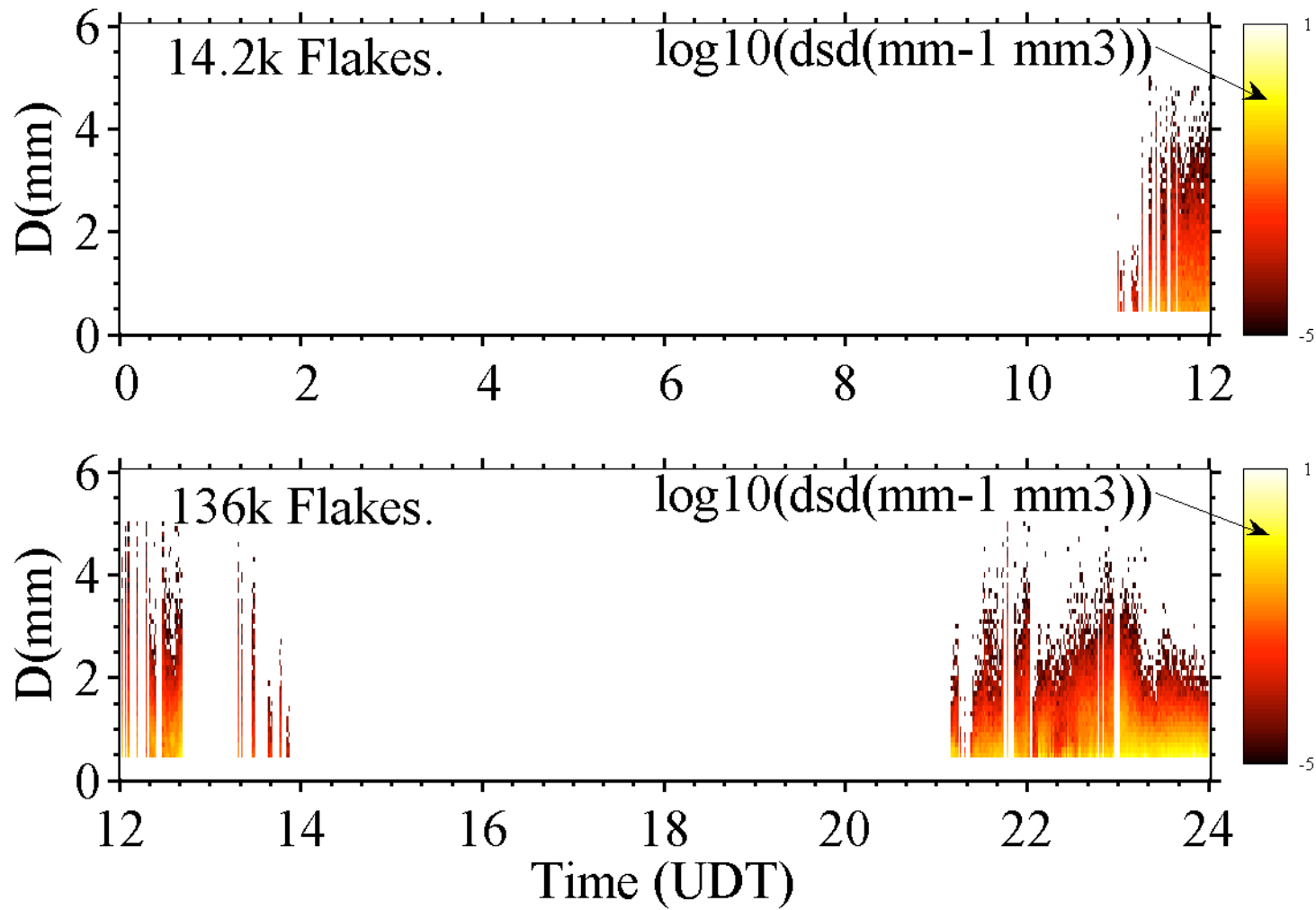
2/19/07**

C3VP. GSFC SVI.



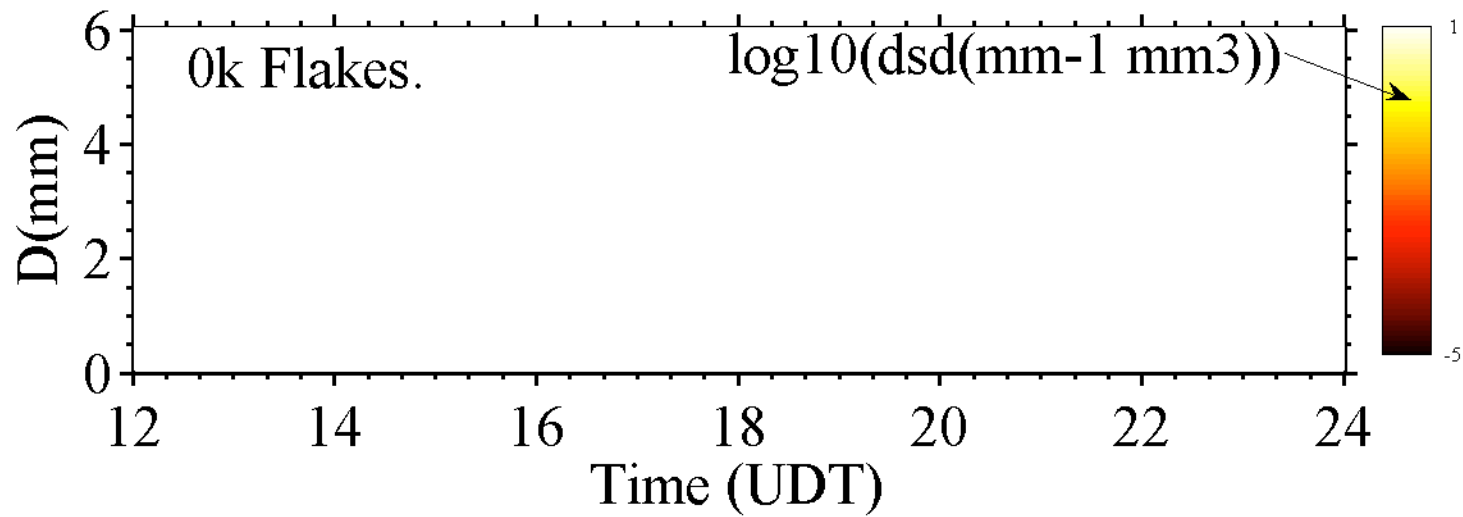
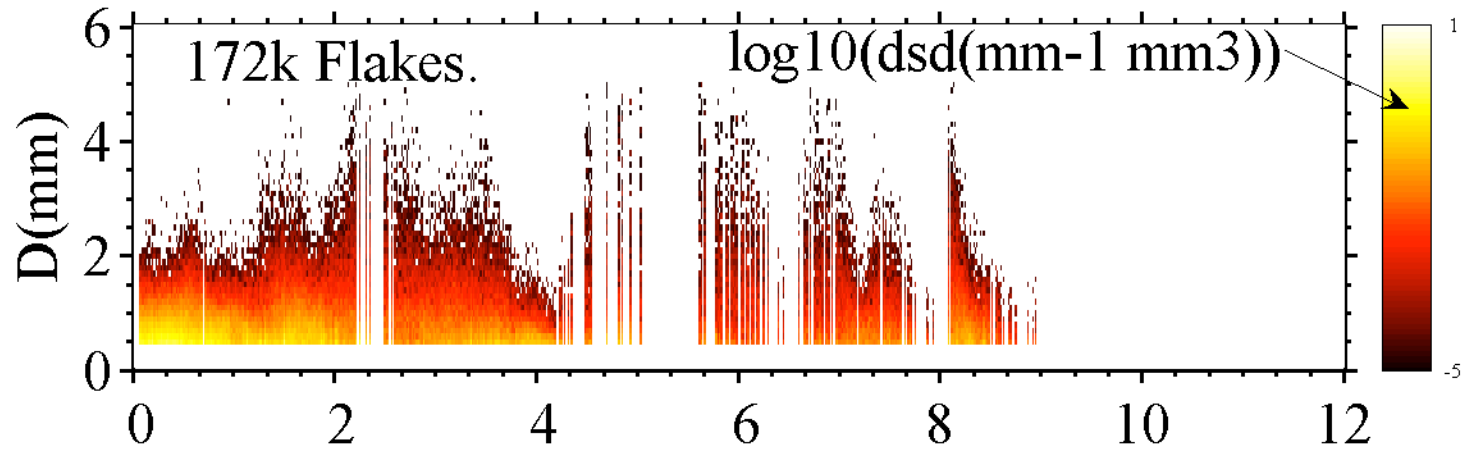
2/22/07***

C3VP. GSFC SVI.



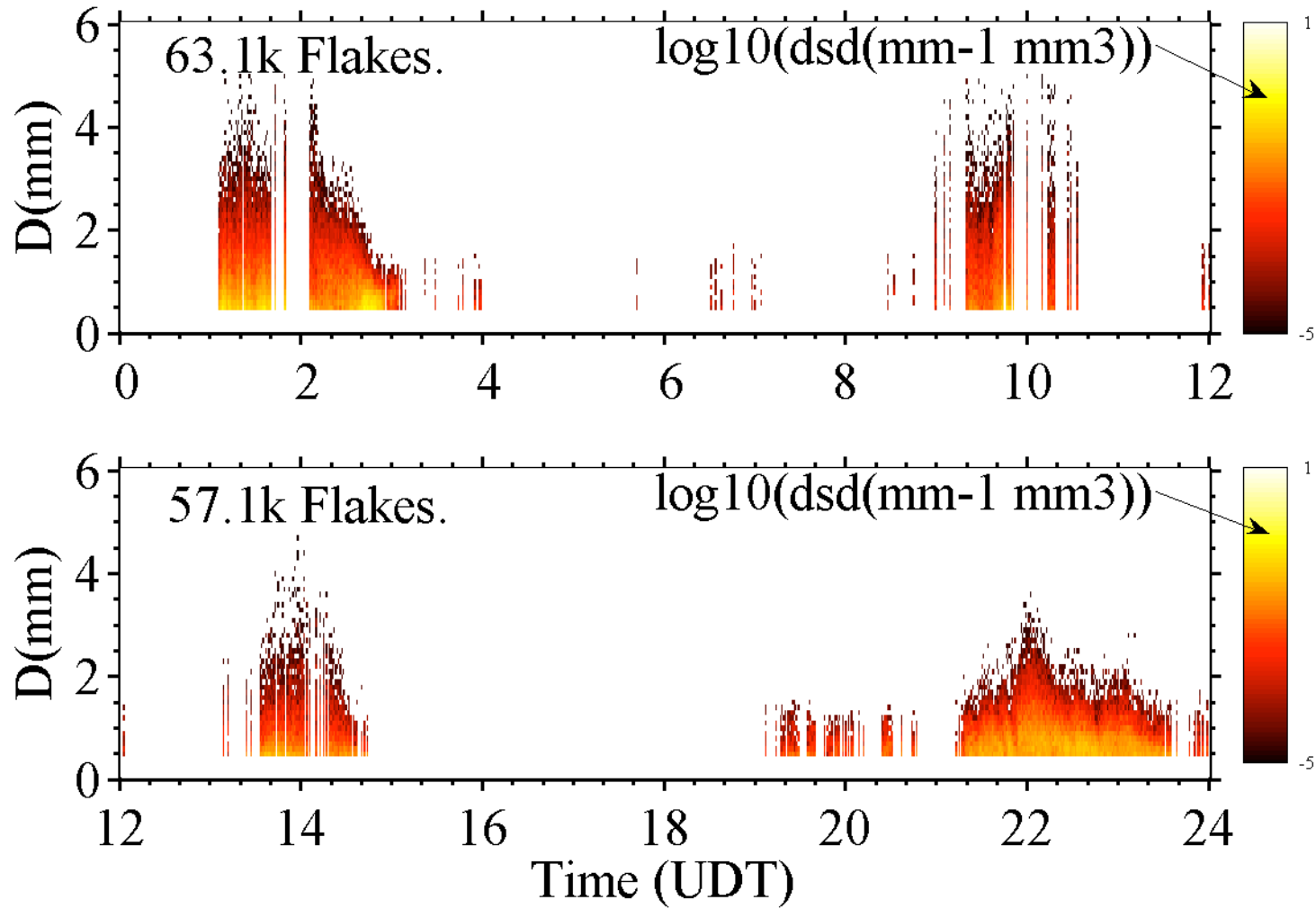
2/23/07***

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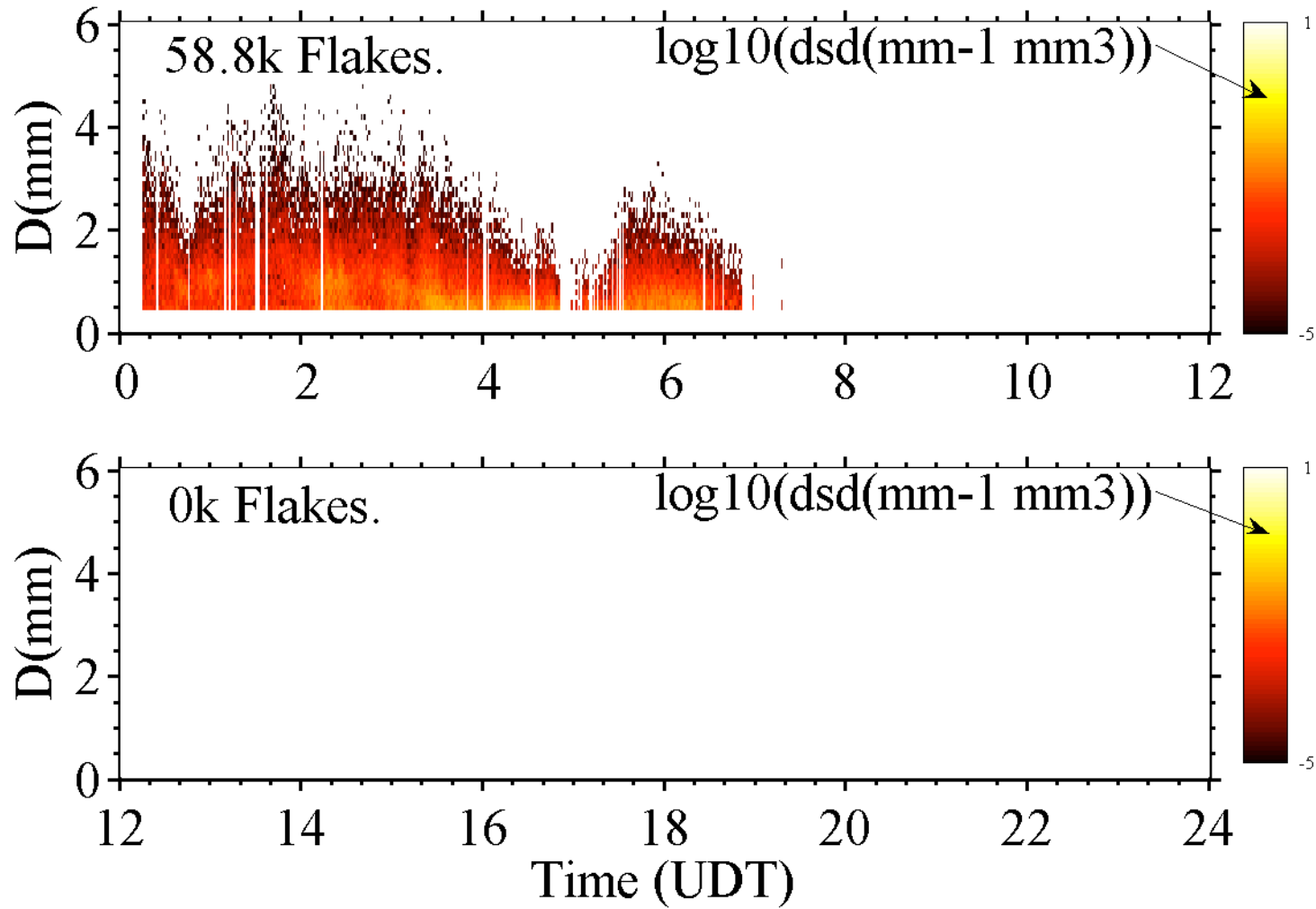
2/26/07***

C3VP. GSFC SVI.



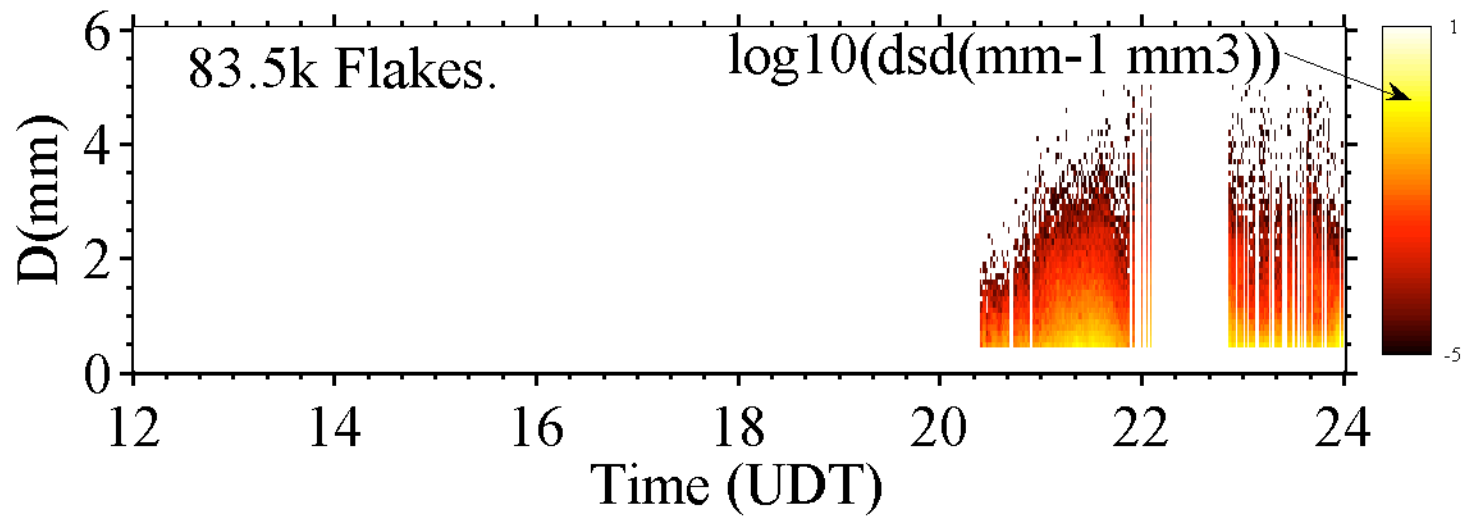
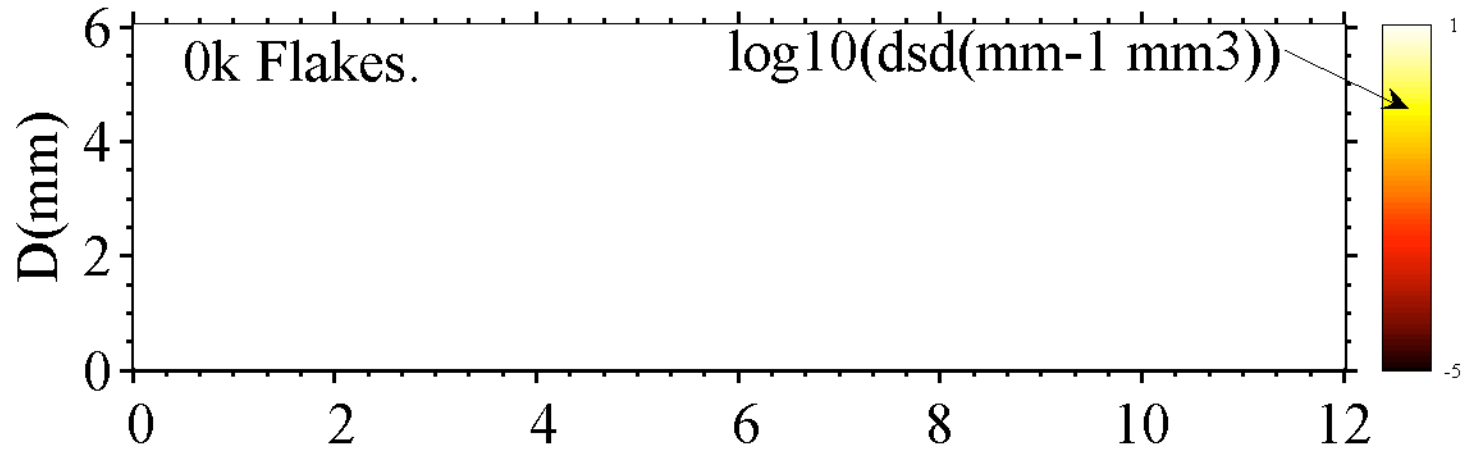
2/27/07**

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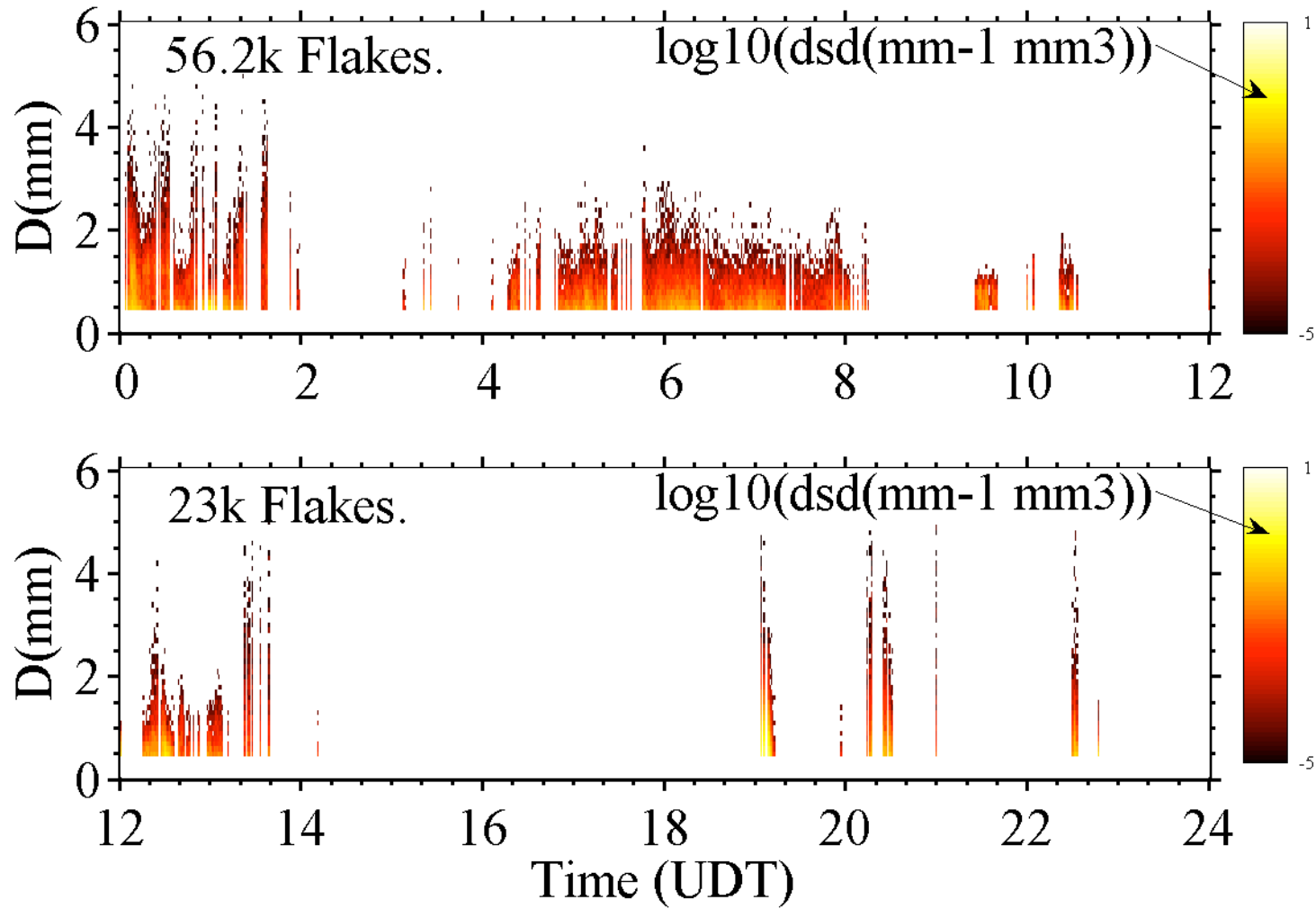
3/1/07**

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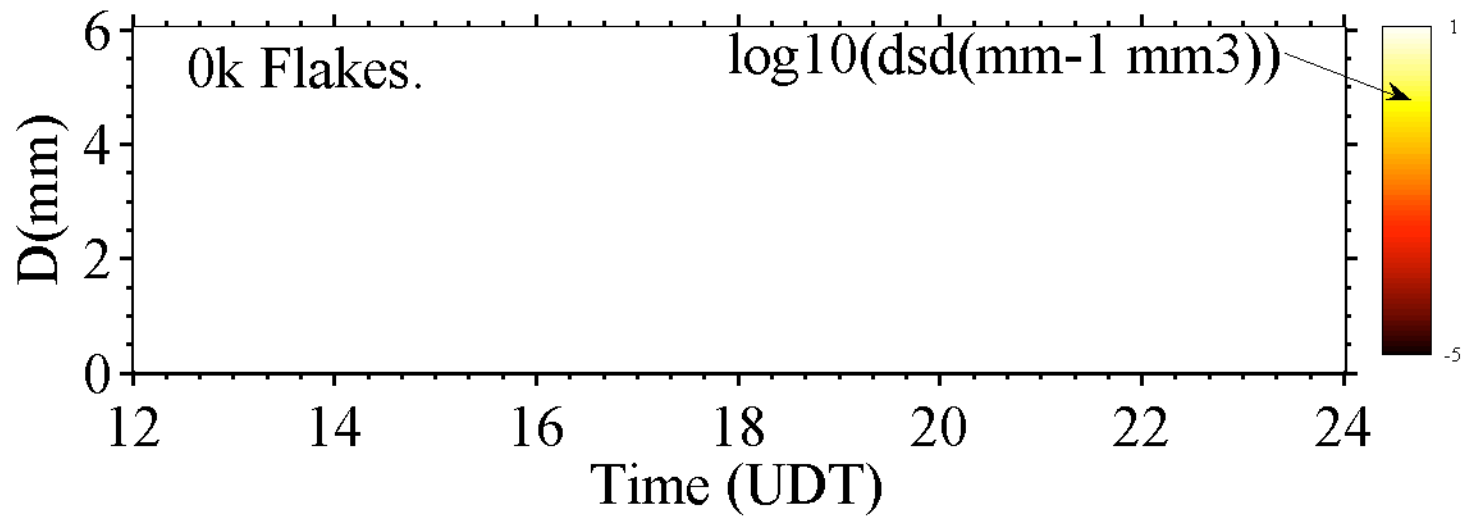
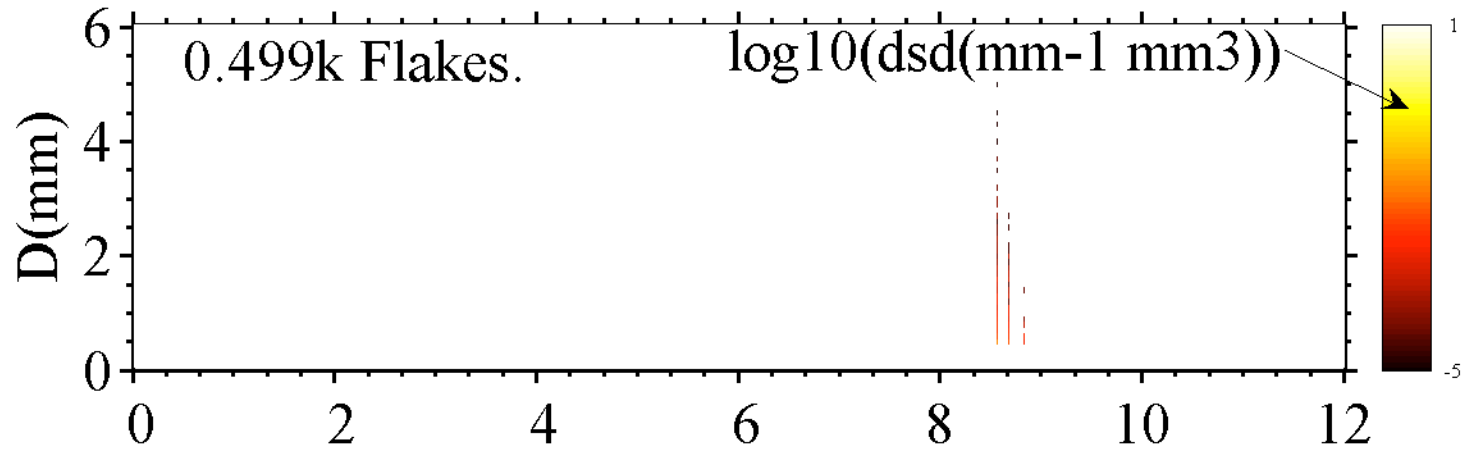
3/2/07**

C3VP. GSFC SVI.



3/3/07*

C3VP. GSFC SVI.



Other Data Products.

The SVI data can be used to obtain other data products.

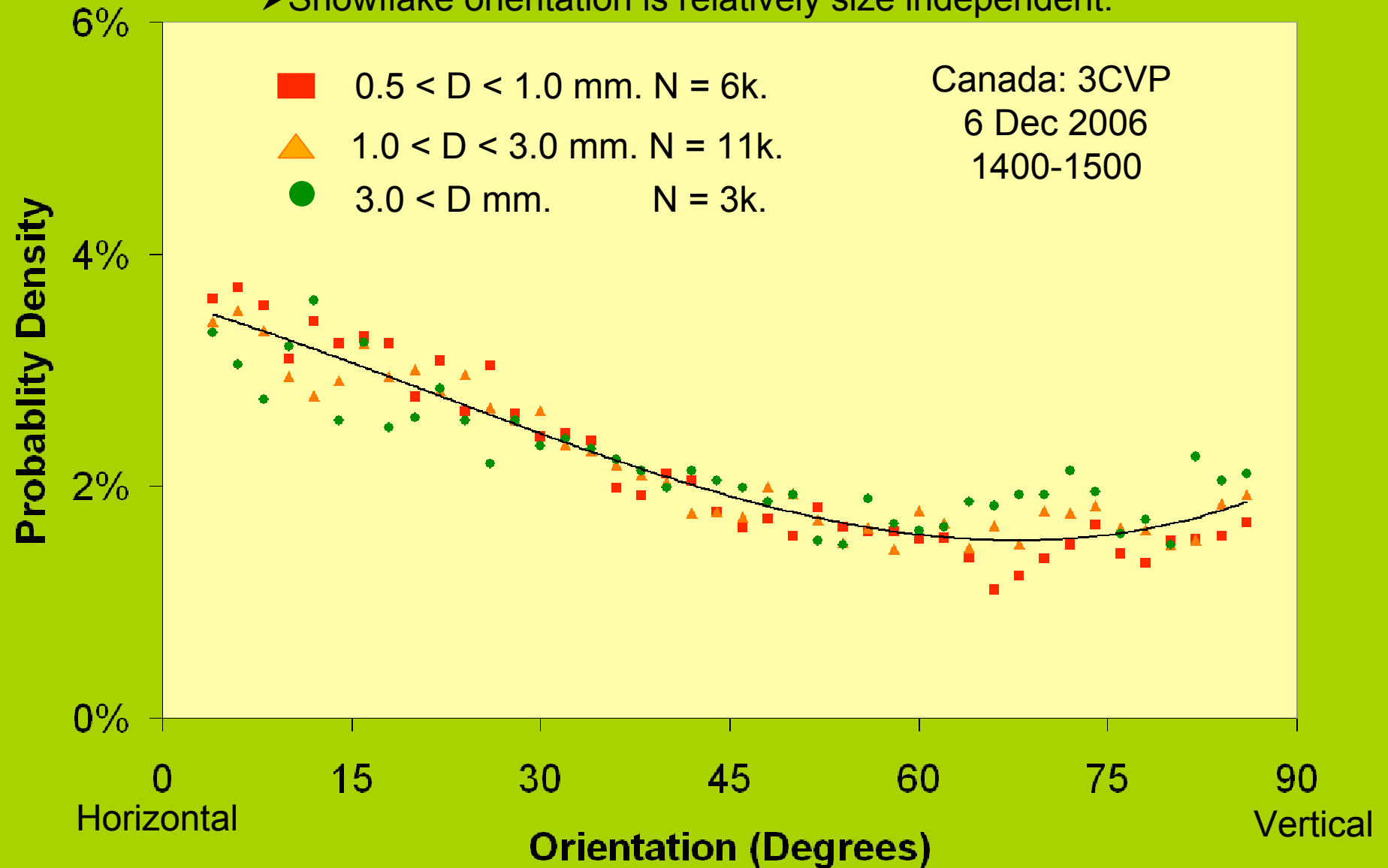
For example:

- (a) Snowflake Orientation
- (b) Size Distributions for various time intervals.

The following figures show a couple of cases.

SVI: Snowflake Orientation Distribution.

- Snowflakes are twice as likely to be horizontally orientated rather than vertically orientated.
- Snowflake orientation is relatively size independent.



SVI: Snowflake Size Distribution.

➤ As size increases, the number of snowflakes decreases.

