

# Updates: MMS in SPEDAS

(IDL and Python)

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# Recent IDL Updates

- New tplot functionality for colorblind friendly figures; see the crib sheet at:

**`projects/mms/examples/basic/mms_colorblind_friendly_colors.pro`**

Notes from Naritoshi Kitamura:

1. "At least Science and journals of Nature portfolio require the use of colorblind-friendly color schemes for figures."
2. Examples of new colorblind-friendly color tables (1075-1080).
3. Use of new color tables for tplot variables. (options, name\_of\_tplot\_variable, color\_table=1080 etc.)
4. Use of new color tables for non-tplot variables (slices etc.) (loadcsv, 1080 etc.)
5. Use of new line colors (loadct2, 43, line\_clr=7 or loadct2, 43, line\_clr=8) Reference of the color of the lines: <https://www.nature.com/articles/nmeth.1618> (Figure 2)
6. [MMS1, MMS2, MMS3, MMS4] colors=[0,1,3,2] (line\_clr=7 or 8)

# Recent IDL Updates

- Updated FEEPS sector masks from the FEEPS team
- Added support for recent Tsyganenko field models (TA15/TA16)
- Many bug fixes
- For a full list of the IDL SPEDAS changes, please see:

<https://spedas.org/changelog/>

# Recent Python Updates

- Added 2D slices of FPI and HPCA distribution functions ([examples](#))
- Added mms\_part\_getspec functionality (energy, theta, phi, pitch-angle, gyro phase spectrograms and moments from FPI and HPCA distribution functions; [examples](#))
- Added FPI angle-angle / pitch angle-energy routines ([examples](#))
- Added minimum variance analysis routines (examples pending a bug fix)
- Added MMS coordinate transformations with MEC quaternions (using SpacePy; [examples](#))

# Recent Python Updates

- Added support for data rate bars ([examples](#)), FPI errorflag/compressionloss bars (examples coming)
- Large test suite updates (now at >90% test coverage for the MMS plug-in)
- Large update to the plotting routines inside PyTplot; internally PyTplot is now using matplotlib; significant improvements to the figures and the functionality ([examples](#)); note that all of the MMS examples located at:

<https://github.com/spedas/mms-examples>

Now use this matplotlib version of PyTplot. If you install PySPEDAS v1.3 or later, you'll get this version automatically

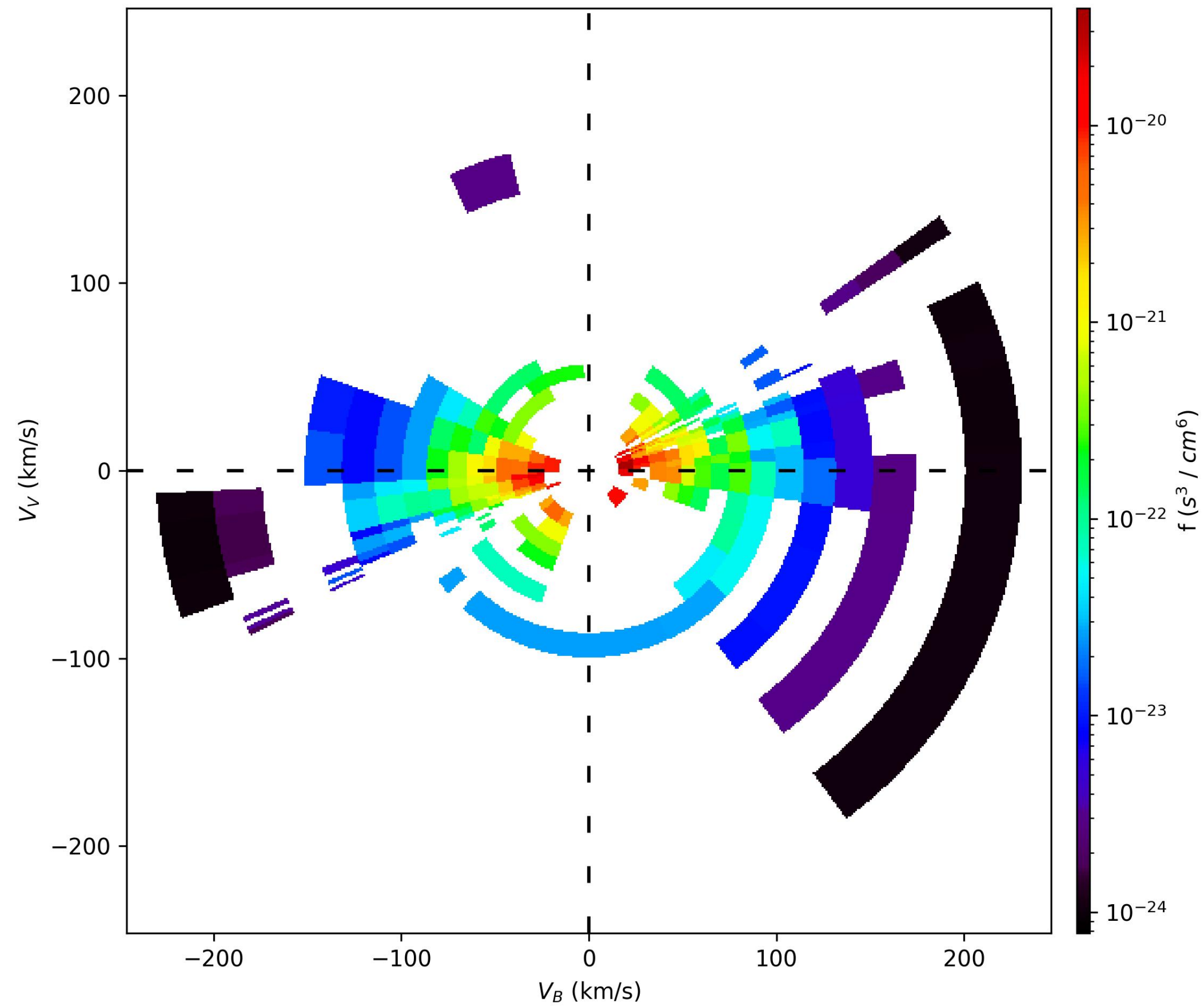
- **Published PySPEDAS paper:**

Grimes, Eric W., et al. "The Space Physics Environment Data Analysis System in Python (PySPEDAS)." *Frontiers in Astronomy and Space Sciences*: 285.

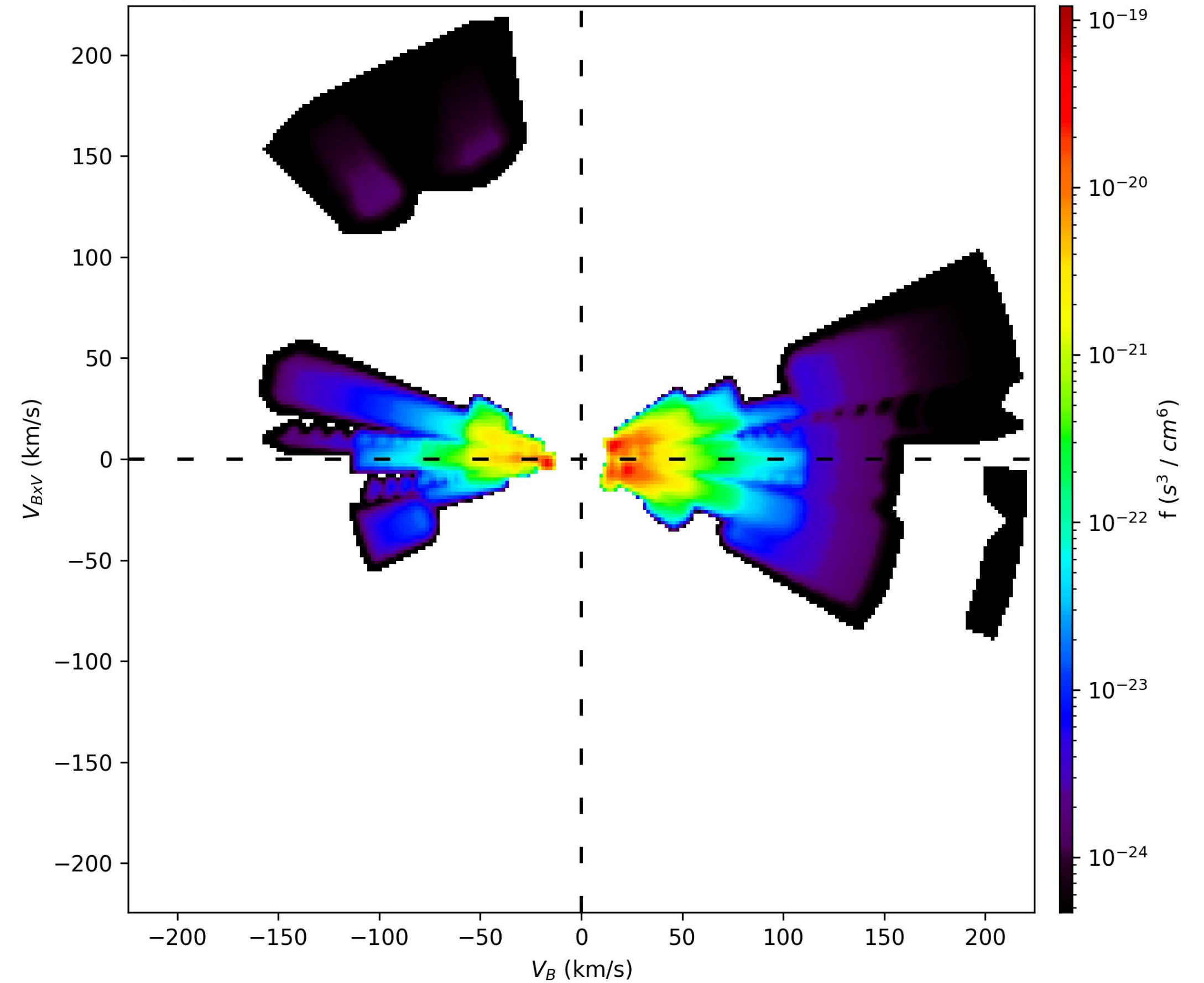
doi: 10.3389/fspas.2022.1020815

with numerous MMS examples, e.g., 2D slices:

MMS 1 FPI Ion (bv) 2017-09-10 09:32:19.446664 -> 2017-09-10 09:32:23.946664 (1)



MMS 1 HPCA hplus (be) 2017-09-10 09:32:17.059004 -> 2017-09-10 09:32:27.058825 (1)

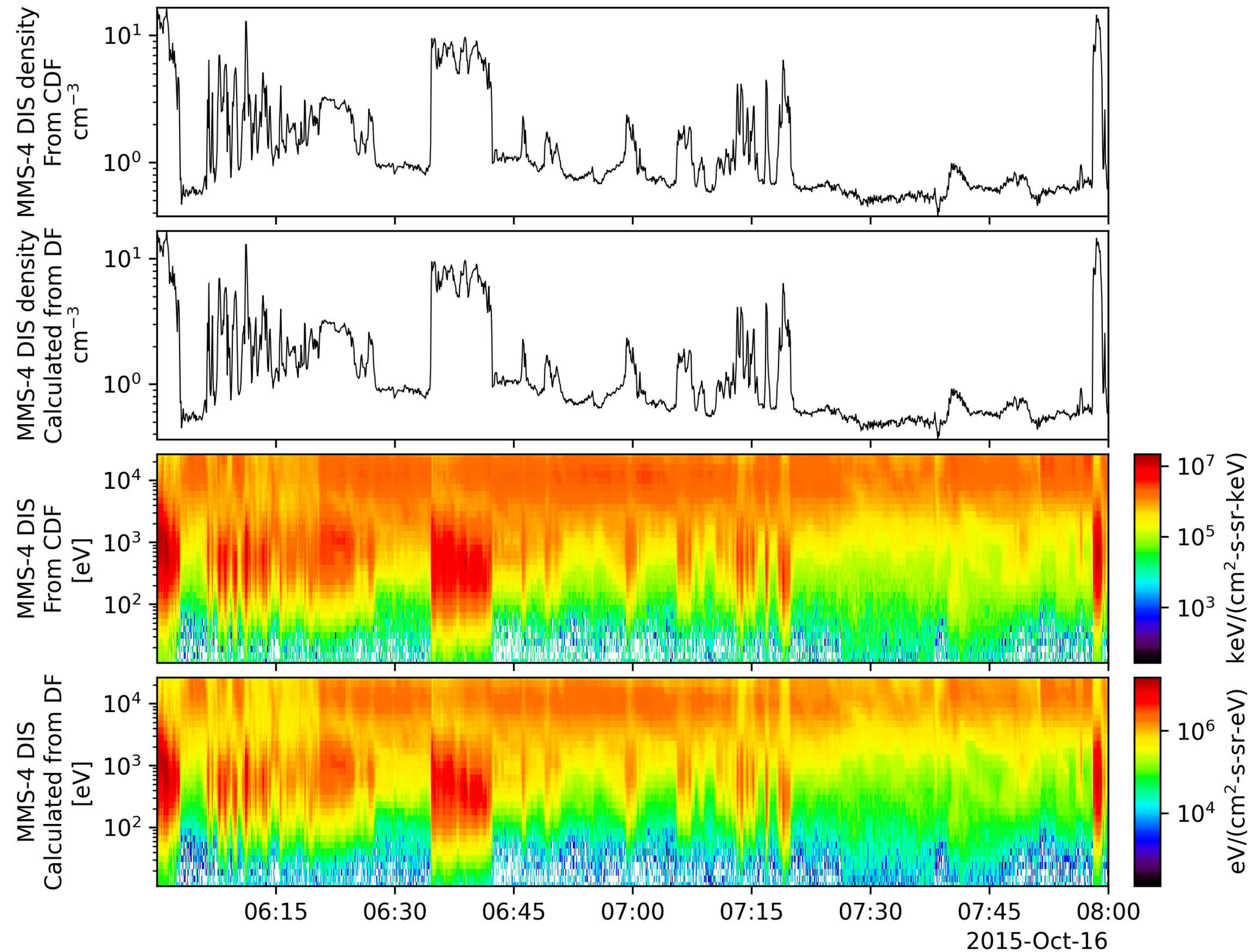


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e.g., `mms_part_getspec`:

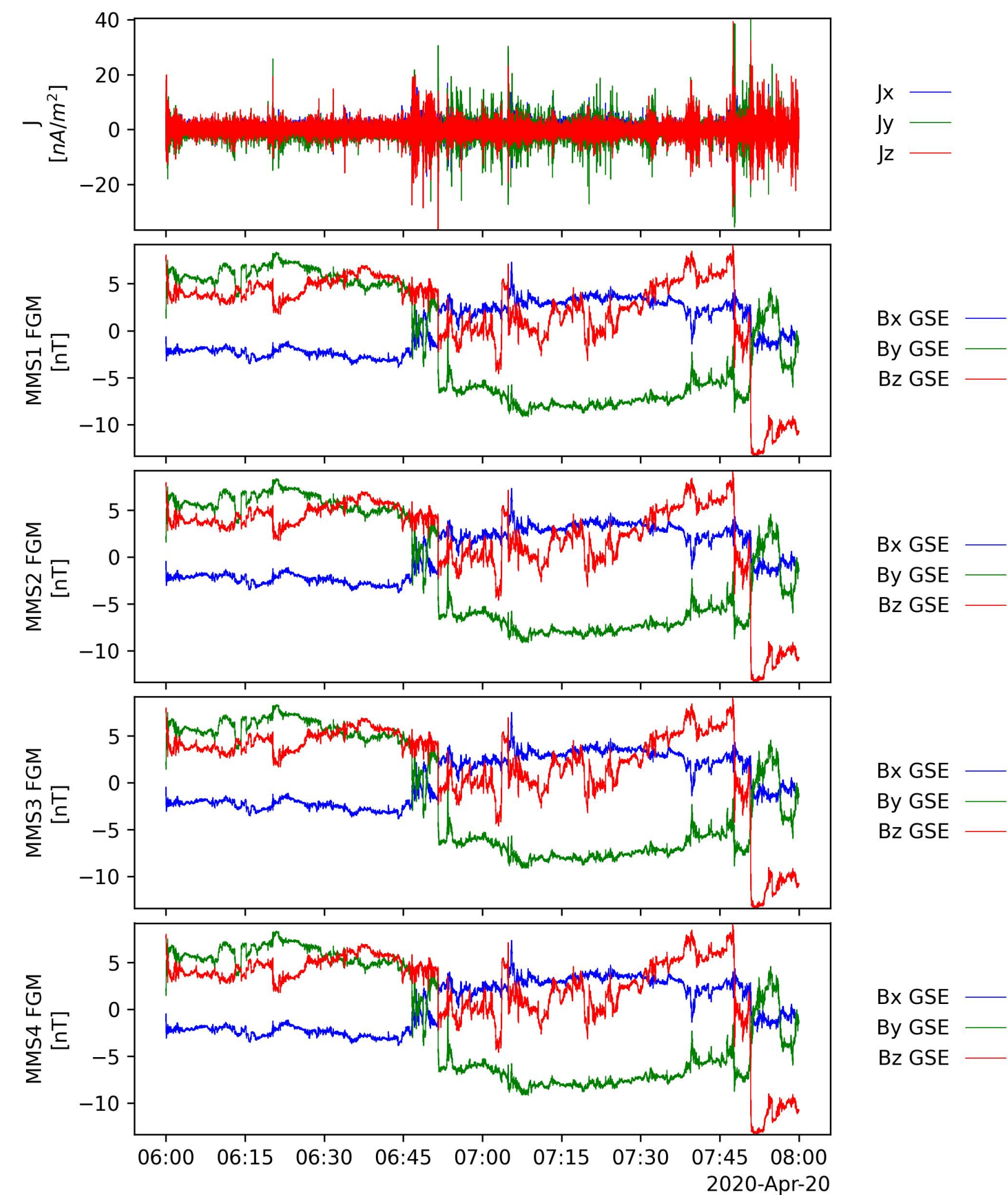


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e.g., curlometer technique:





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e.g., wave calculations:

