

# Supporting Information for "Modulation of magnetospheric substorm frequency: Dipole tilt and IMF $B_y$ effects"

A. Ohma<sup>1</sup>, J. P. Reistad<sup>1</sup>, S. M. Hatch<sup>1</sup>

<sup>1</sup>Birkeland Centre for Space Science, University of Bergen, Bergen, Norway

## Contents of this file

1. Figure S1

2. Figure S2

**Introduction** In this Supporting Information we provide two figures that explore potential biases in the solar wind distribution, which could affect the substorm onset distributions reported in Figure 2 of the main Letter. Figure S1, which is in the same format as Figure 2, explores the role of solar wind forcing as estimated using the coupling function presented by Milan, Gosling, and Hubert (2012). For each substorm, we estimate the average rate of flux opened by dayside reconnection in the hour before onset via the Milan et al. (2012) coupling function. We then calculate the bin averages in the same bins used

---

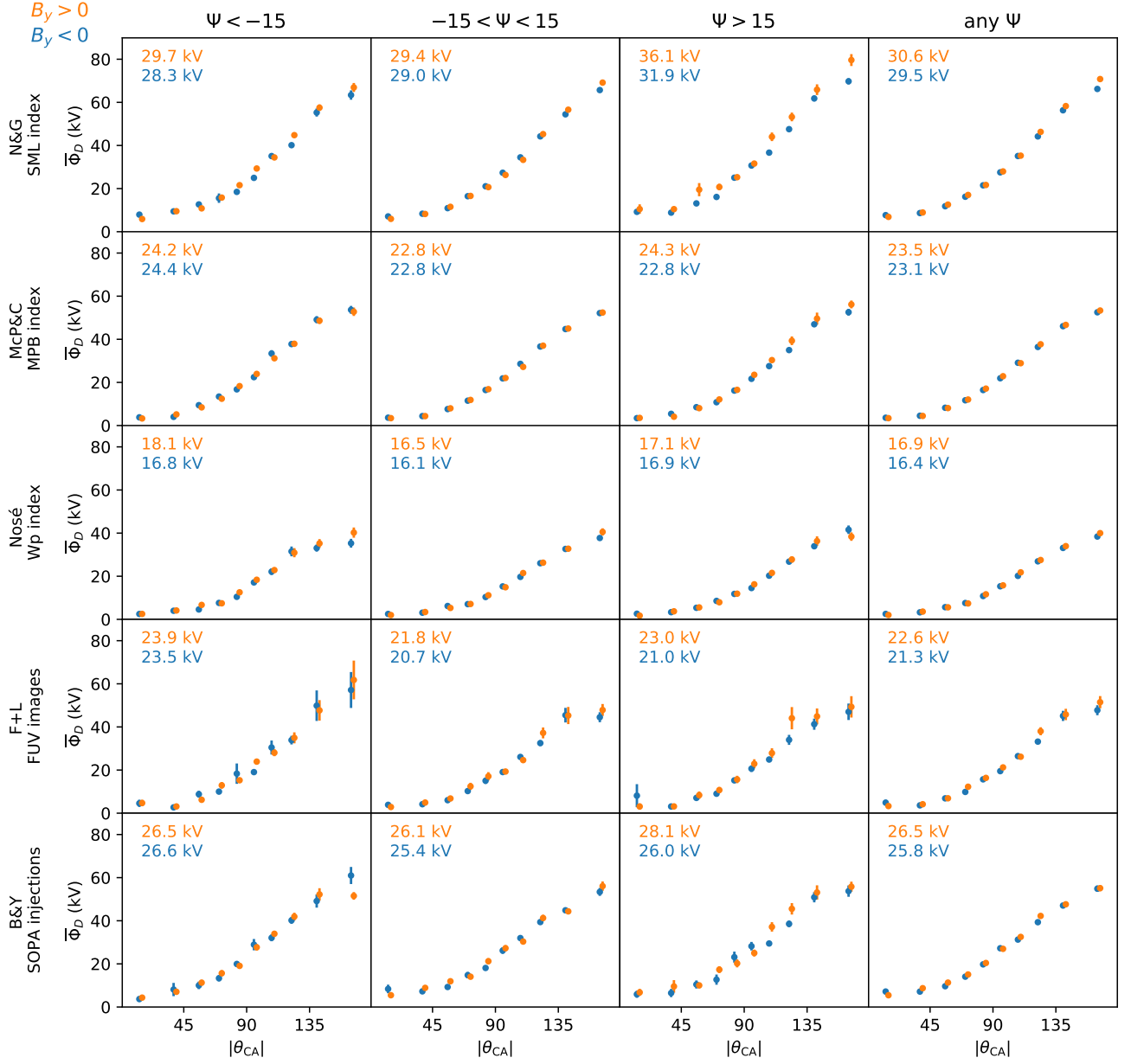
Corresponding author: A. Ohma, Birkeland Centre for Space Science, University of Bergen, Allégaten 55, Bergen, Norway. (Anders.Ohma@uib.no)

July 27, 2020, 10:01pm

in Figure 2. Blue colors indicate IMF  $B_y < 0$  and orange colors indicate IMF  $B_y > 0$ . The numbers in each panel indicate the average of the data points in each panel. The error bars display the standard error of the mean. Figure S2, which is in the same format as Figure S1, explores the role of solar wind speed. For each substorm, we estimate the mean solar wind speed in the hour before substorm and then calculate the bin averages.

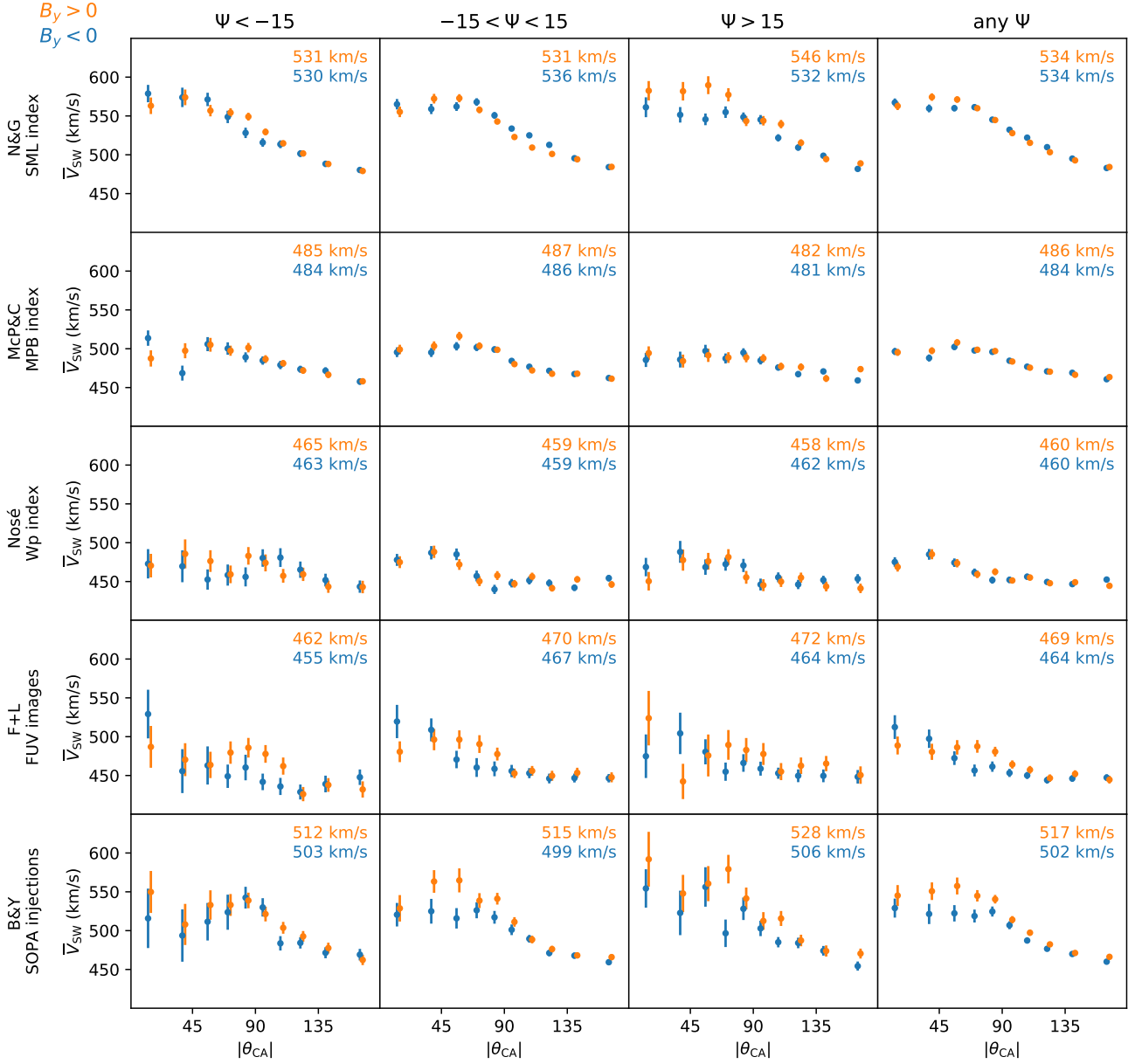
## References

- Milan, S. E., Gosling, J. S., & Hubert, B. (2012). Relationship between interplanetary parameters and the magnetopause reconnection rate quantified from observations of the expanding polar cap. *Journal of Geophysical Research: Space Physics*, *117*(A3), A03226. doi: 10.1029/2011JA017082



**Figure S1.** The mean solar wind forcing  $\bar{\Phi}_D$  in each IMF clock angle bin used in Figure 2 based on the mean solar wind forcing in the hour before each onset. Blue colors indicate IMF  $B_y < 0$  and orange colors indicate  $B_y > 0$ . The numbers are the average of the points in each panel for  $\pm B_y$  and the error bars indicate the standard error of the mean.

July 27, 2020, 10:01pm



**Figure S2.** The mean solar wind speed  $\bar{V}_{SW}$  in each IMF clock angle bin used in Figure 2 based on the mean solar wind speed in the hour before each onset. Blue colors indicate IMF  $B_y < 0$  and orange colors indicate  $B_y > 0$ . The numbers are the average of the points in each panel for  $\pm B_y$  and the error bars indicate the standard error of the mean