SOUTH AFRICAN NATIONAL SPACE AGENCY

The ionospheric response to CME- and CIR-driven storms

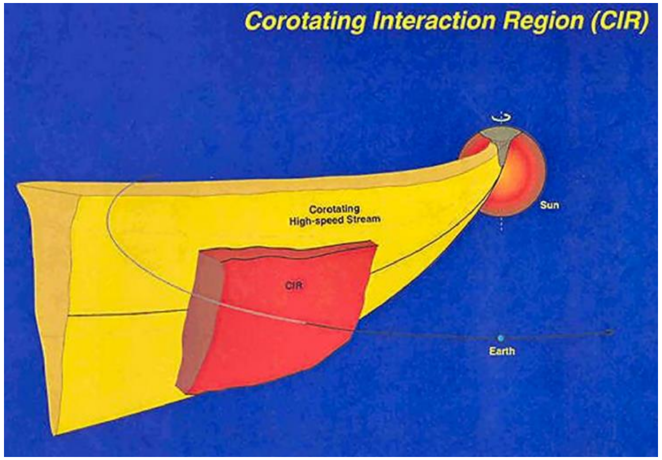
T.M. Matamba and J.B. Habarulema

15 August 2018

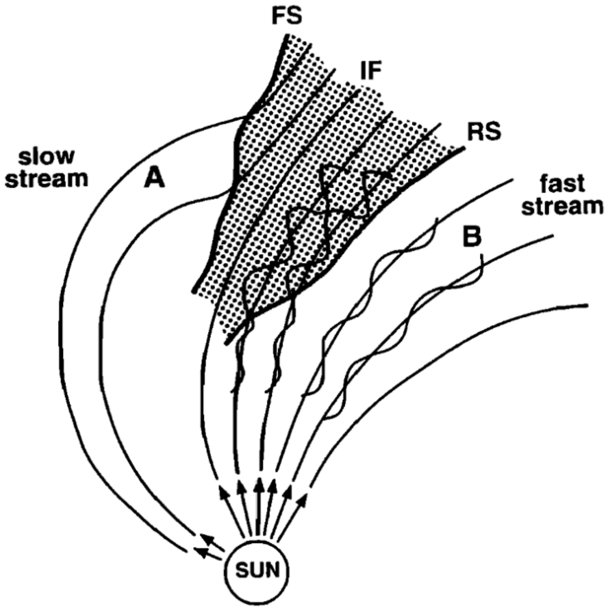
Hermanus,7200

South African National Antarctic Programme SANAP understand, develop, conserve

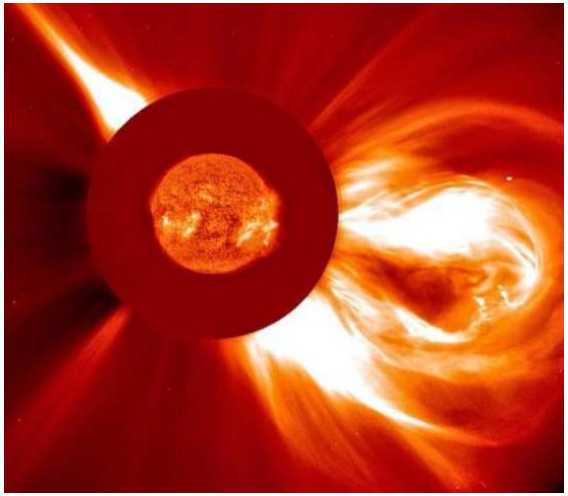
Graphical representation of CIR and CME



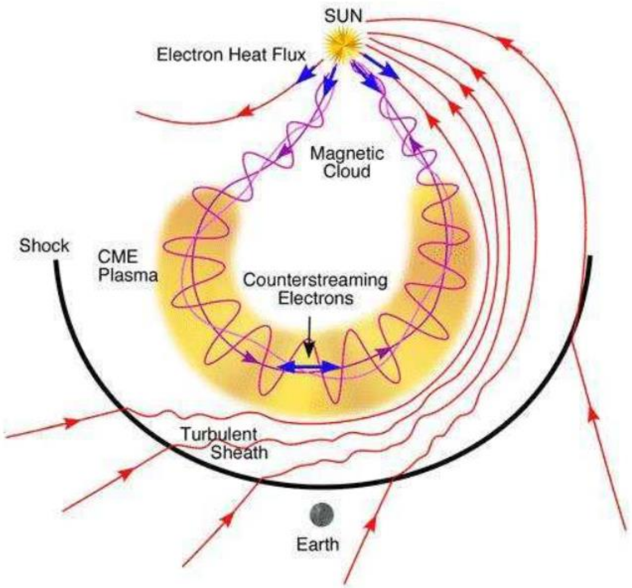
Credit: Tsurutani et al., 2006



Credit: Kamide et al.,1998



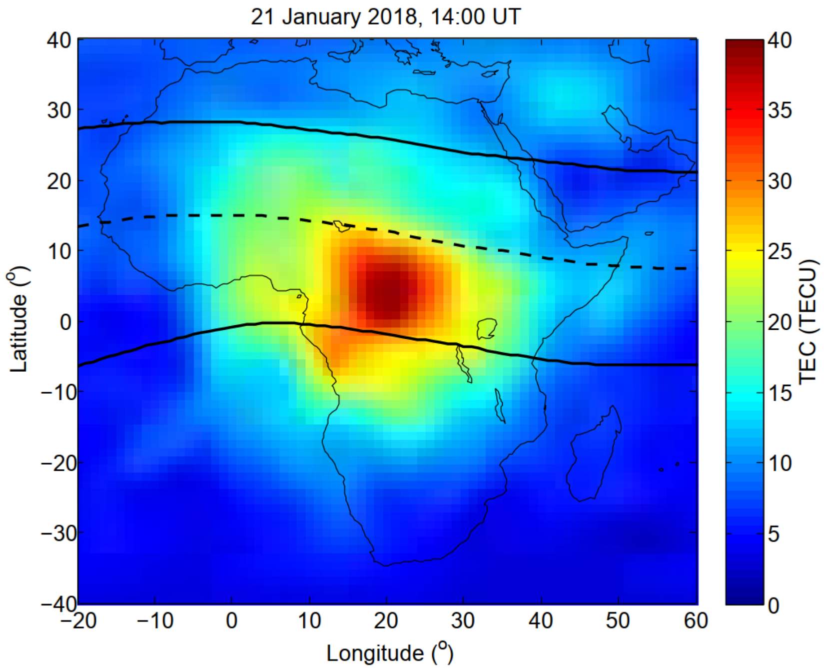
Credit: NASA



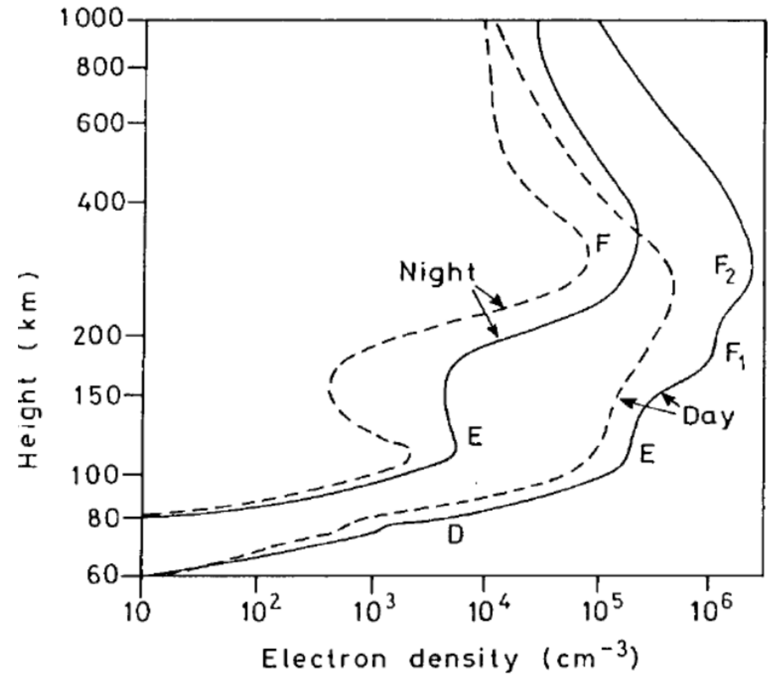
Credit: Richardson and Cane, 2010

- CIR-driven storms are generally weak (-50 nT < Dst < -25 nT) to moderate (-100 nT < Dst < -50 nT) in intensity.
- CME-driven storms are often associated with the intense (Dst < -100 nT) geomagnetic storms.
- CIR-driven storms have long recovery phase as compared to CME-driven storms.

Ionospheric Response



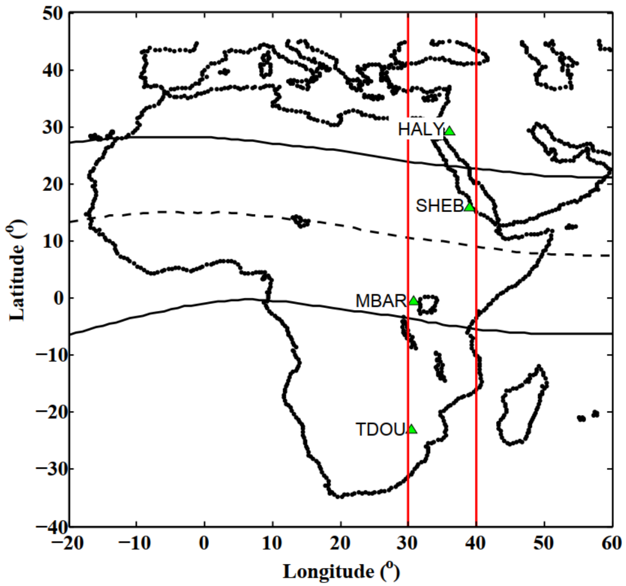
IONEX data from
ftp://cddis.gsfc.nasa.gov/gnss/products/ionex/2018/

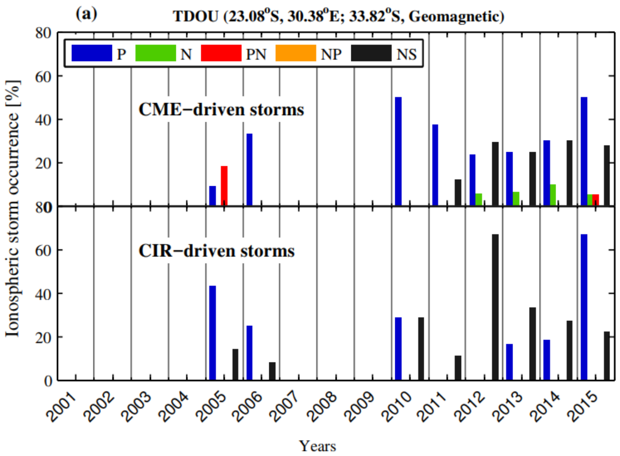


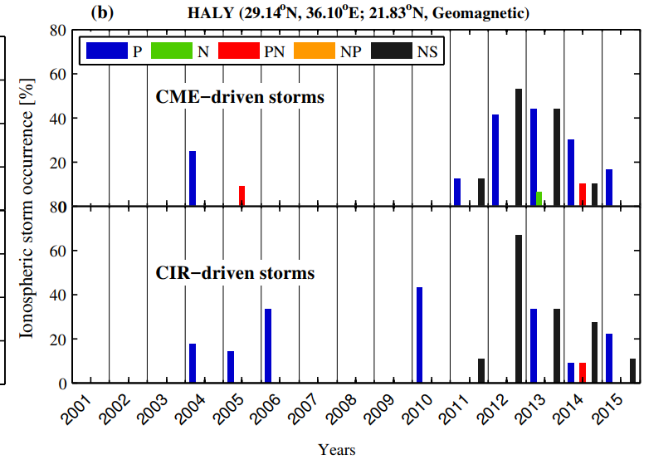
Credit: Hunsucker and Hargreaves, 2003

SANSA SOUTH AFRICAN NATIONAL SPACE AGENCY

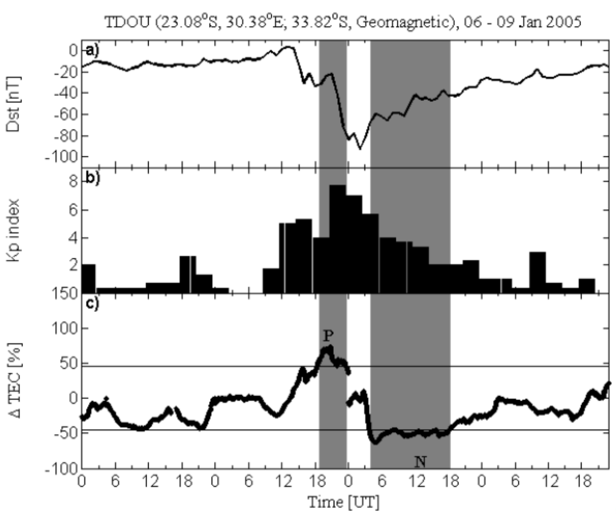
Mid-Latitude stations

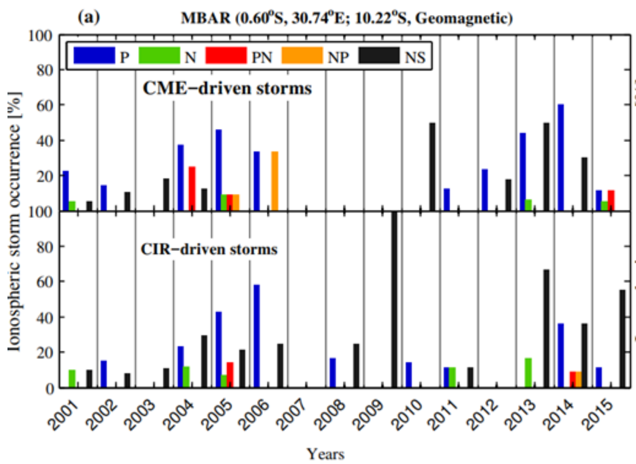


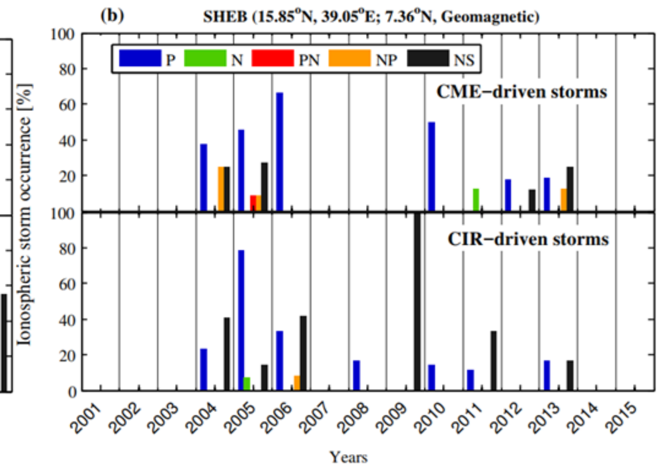




Low-Latitude Stations







Matamba and Habarulema, 2018

Mid Latitude Stations

GNNS Location	Geom. Lat	Ionospheric storm effects (%)									
		CME-driven storms					CIR-driven storms				
		P	N	PN	NP	NS	P	N	PN	NP	NS
TDOU, South Africa	33.82°S	35.3	7.8	5.9	0	51.0	57.1	0	0	0	42.9
HALY, Saudi Arabia	21.83°N	52.3	2.3	4.5	0	40.9	63.0	0	3.7	0	33.3

Low Latitude Stations

GNNS Location	Geom. Lat	Ionospheric storm effects (%)									
		CME-driven storms					CIR-driven storms				
		P	N	PN	NP	NS	P	N	PN	NP	NS
MBAR, Uganda	10.22°S	52.86	5.71	7.14	2.86	31.43	38.36	8.22	4.11	1.37	47.95
SHEB, Eritrea	7.36°N	48.57	2.86	2.86	14.29	31.43	53.33	2.22	0	2.22	42.22

Reference: Matamba, T. M., & Habarulema, J. B. (2018). Ionospheric responses to CME- and CIR-driven geomagnetic storms along 30°E–40°E over the African sector from 2001 to 2015. *Space Weather*, 16, 538–556. https://doi.org/10.1029/2017SW001754

SOUTH AFRICAN NATIONAL SPACE AGENCY

Thank You