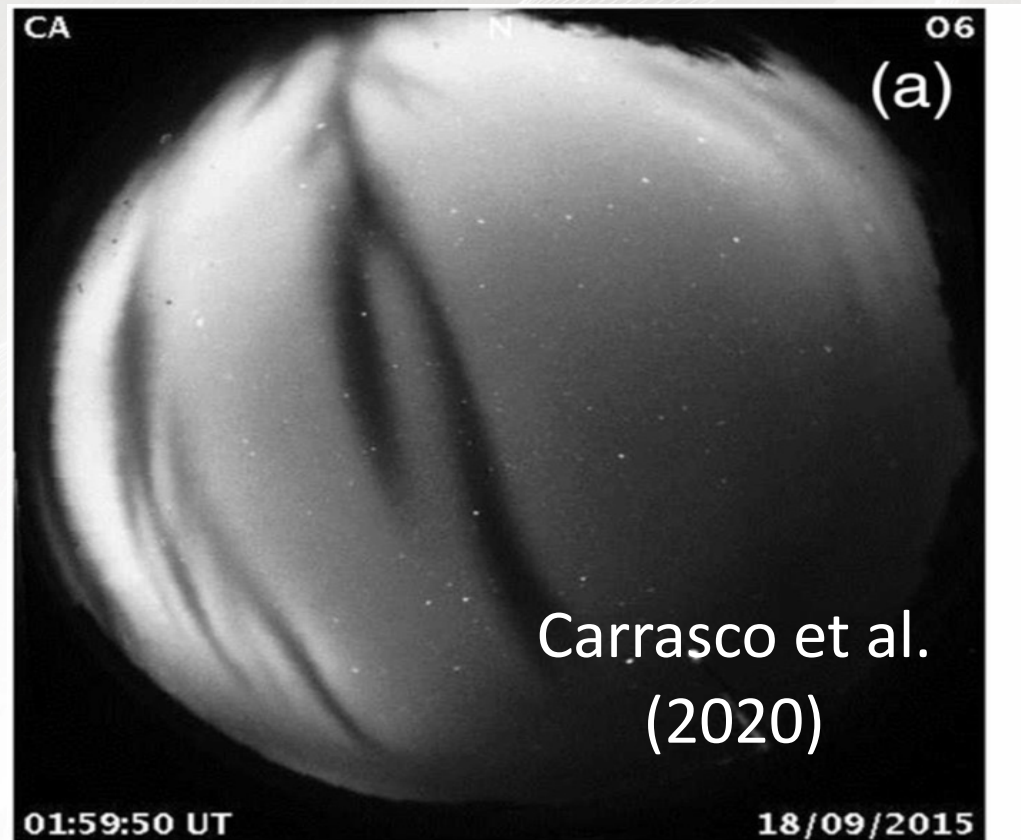


Bifurcation of equatorial plasma bubbles observed by Swarm

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UNIVERSITY OF
CALGARY

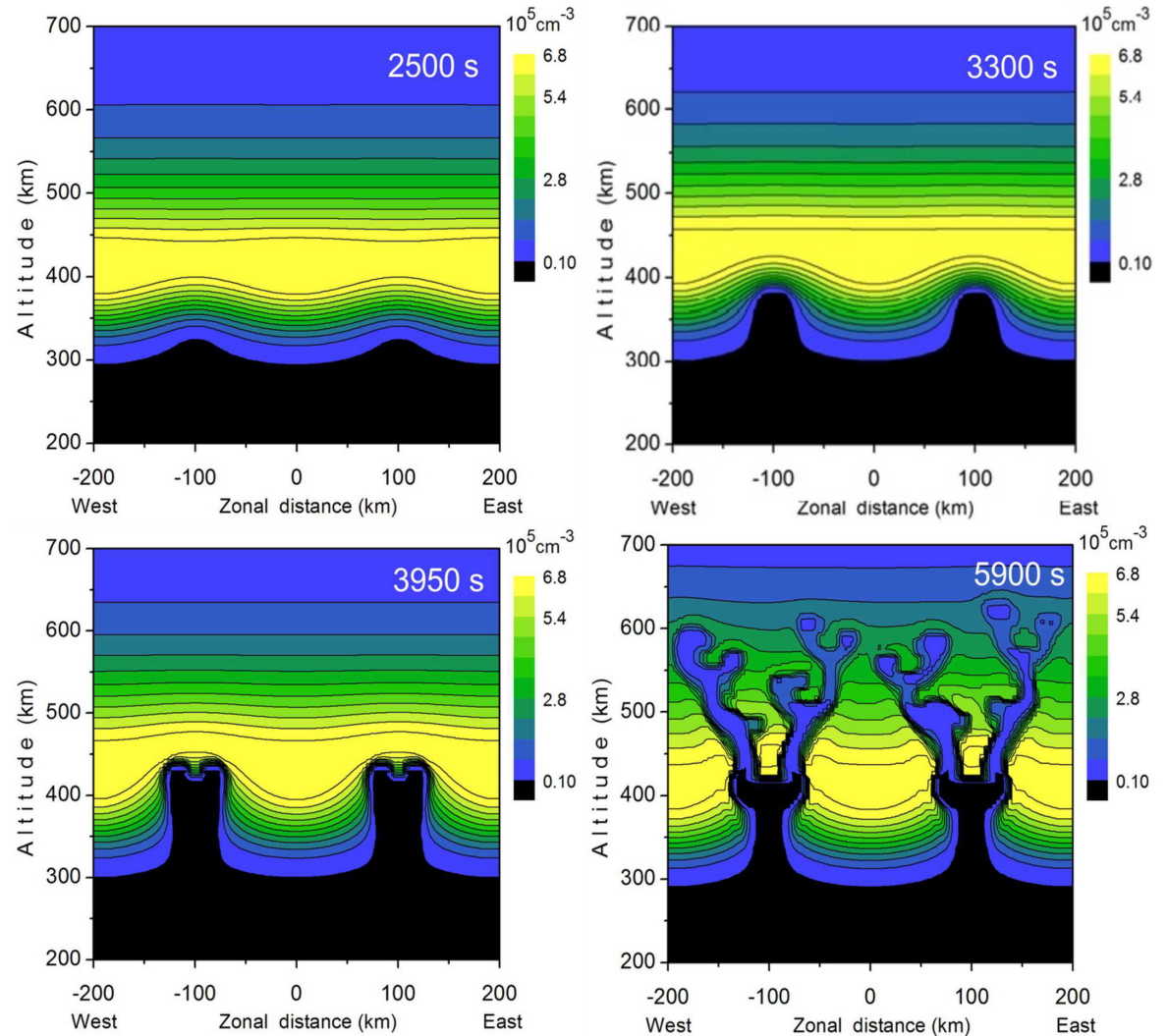


ESA LPS
25 May 2022

Simulation

Principal mechanism:
generalized Rayleigh-
Taylor instability
(Dungey, 1956)

Bifurcation leads to
structure, then
secondary instability,
and, ultimately, small-
scale irregularities



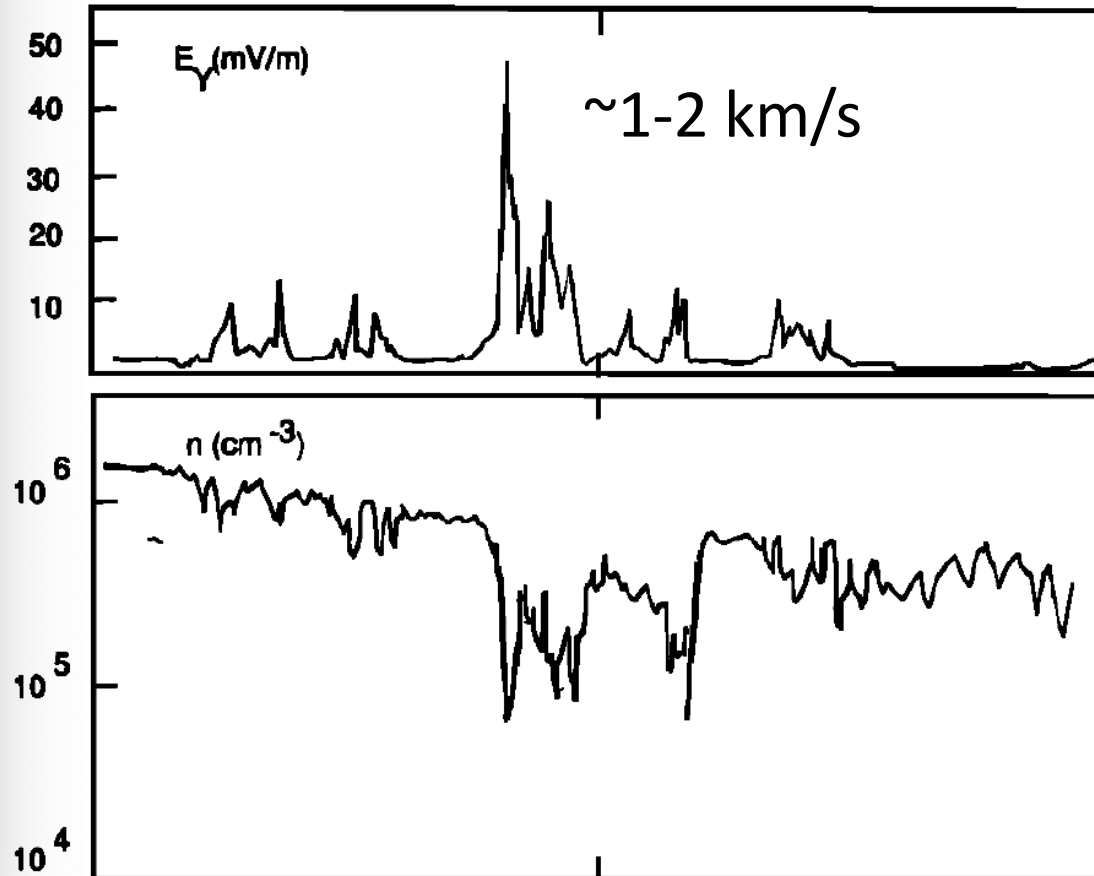
Carrasco et al. (2020)



Aggson et al. (JGR, 1992)

San Marco D

21 July 1988

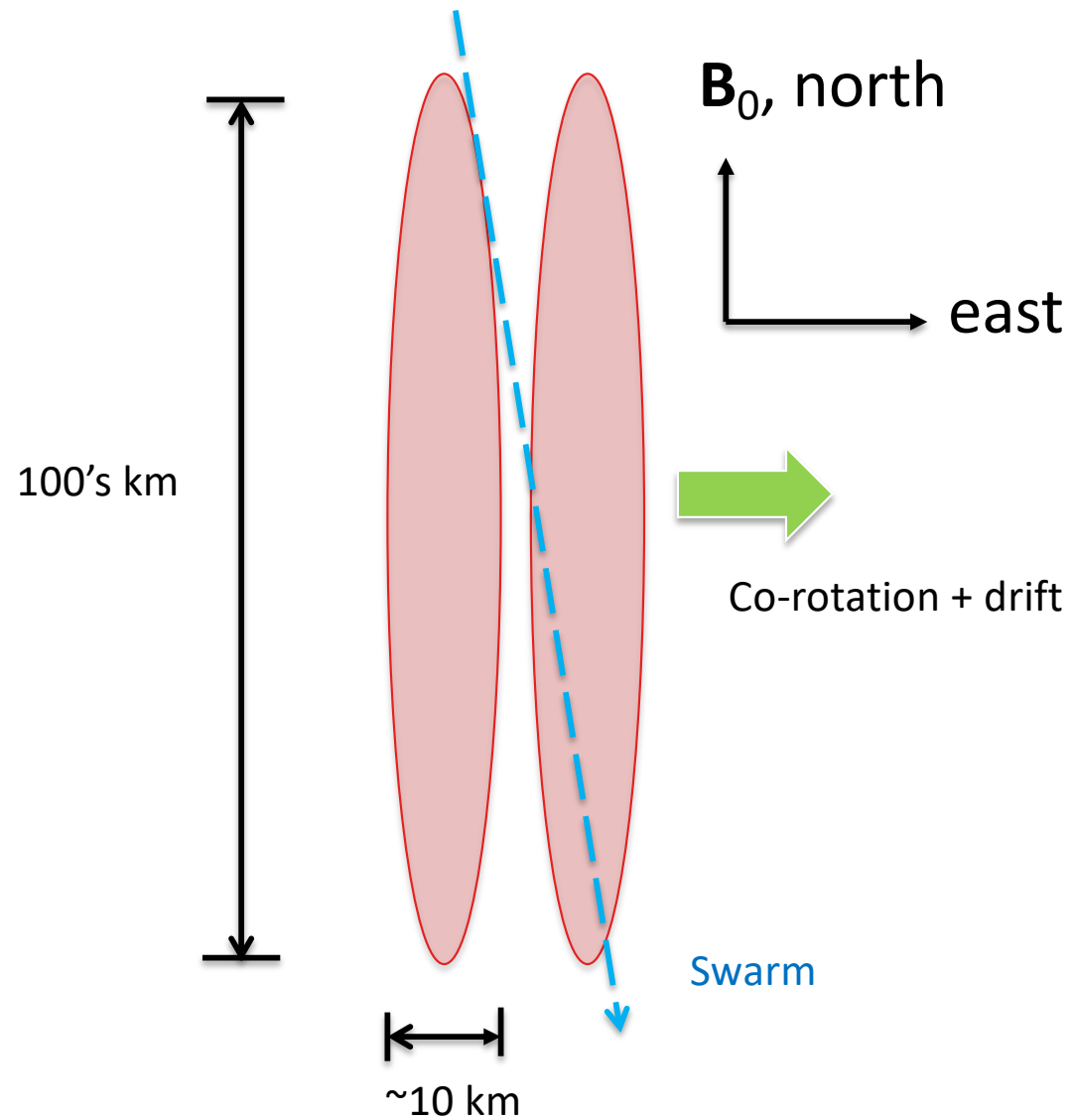


Supersonic upflows

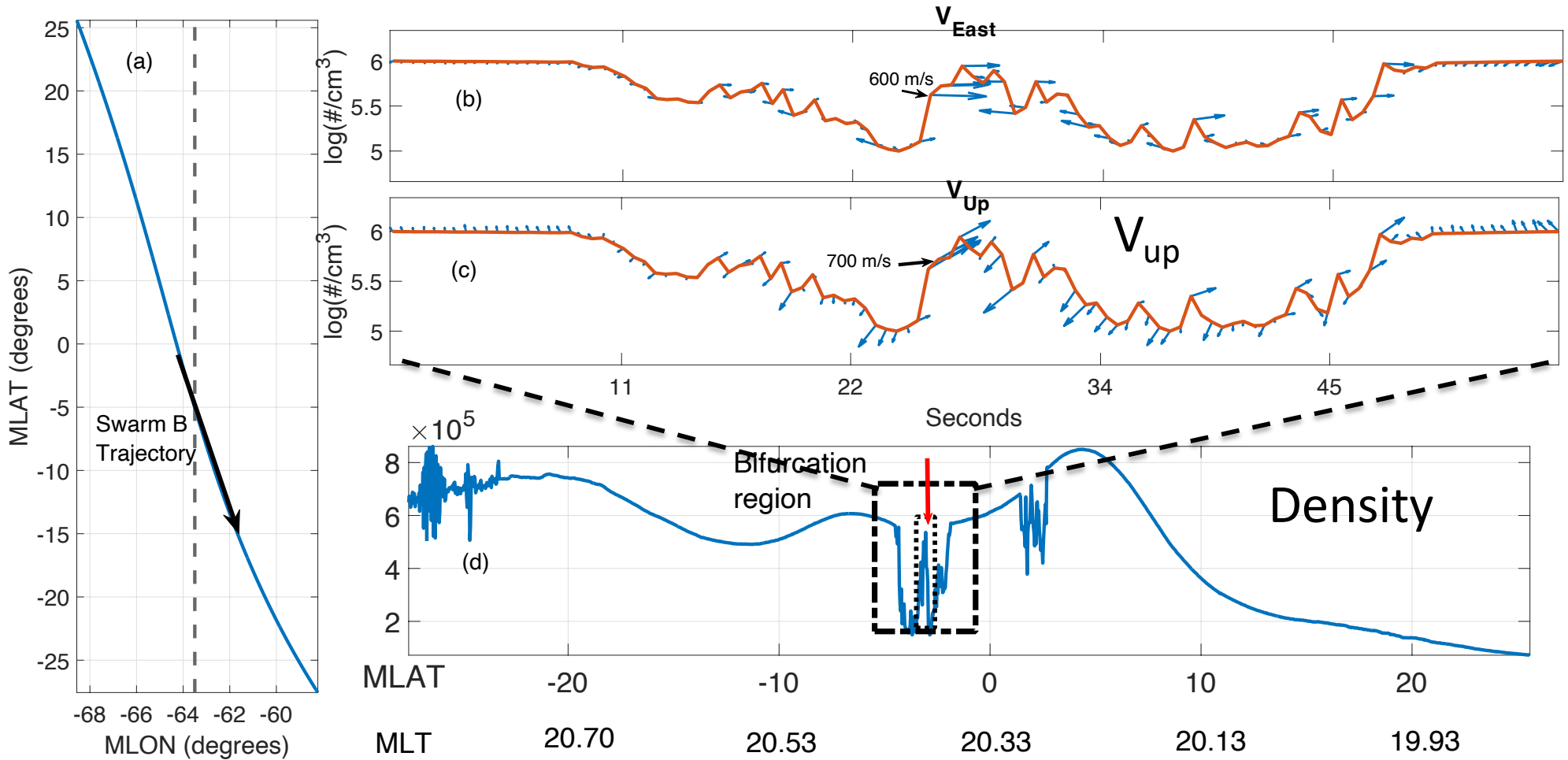
- $> 1 \text{ km/s}$
- within bubbles
- Equatorial orbit

UT	0854:45	0857:53	0900:00
GLAT	- 1.7	- 2.1	- 2.4
GLNG	166	174	- 47
LMT	20.0	20.5	21.3
ALT	537	529	519

Swarm transit geometry

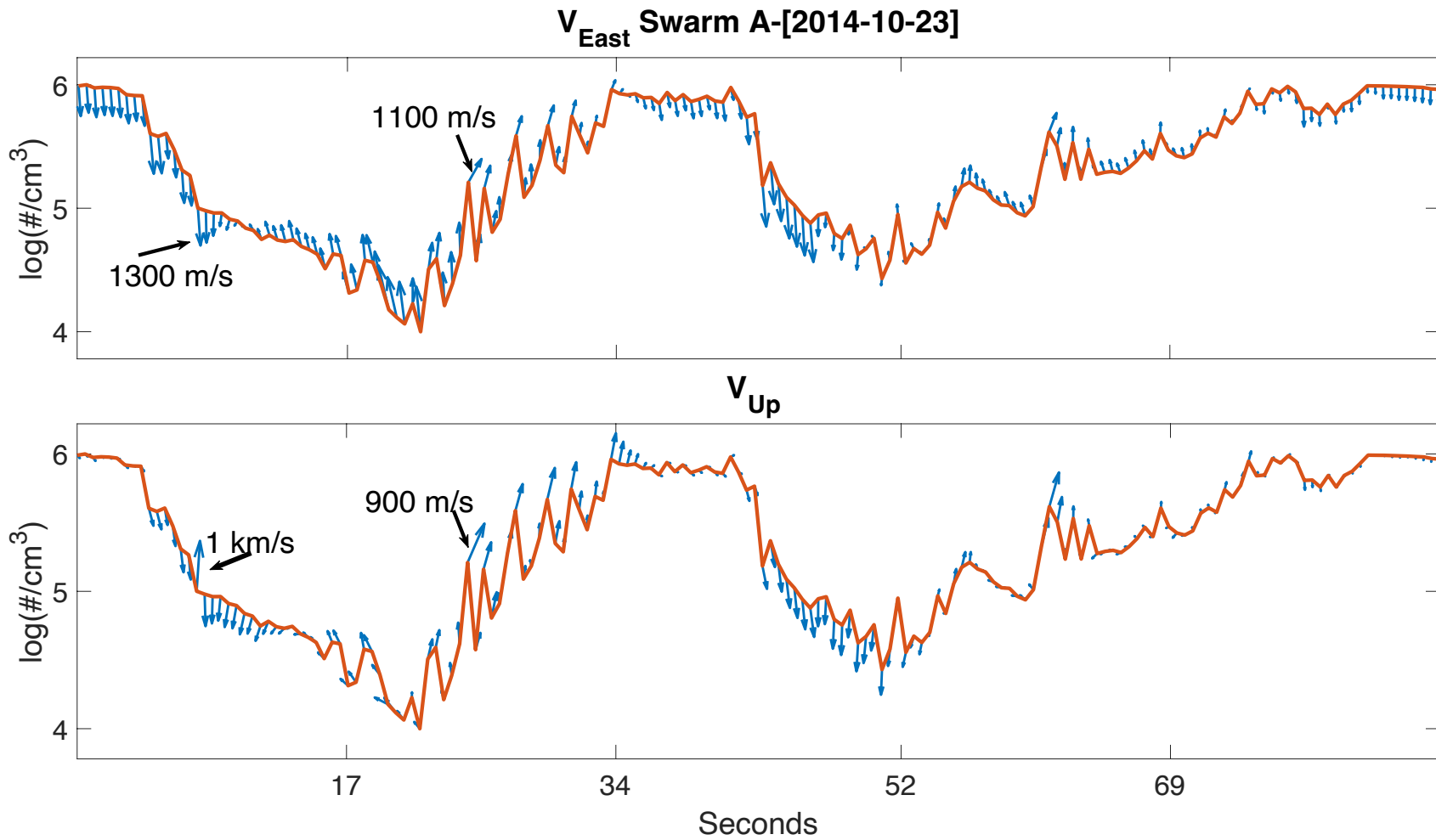


Swarm A transit - southbound

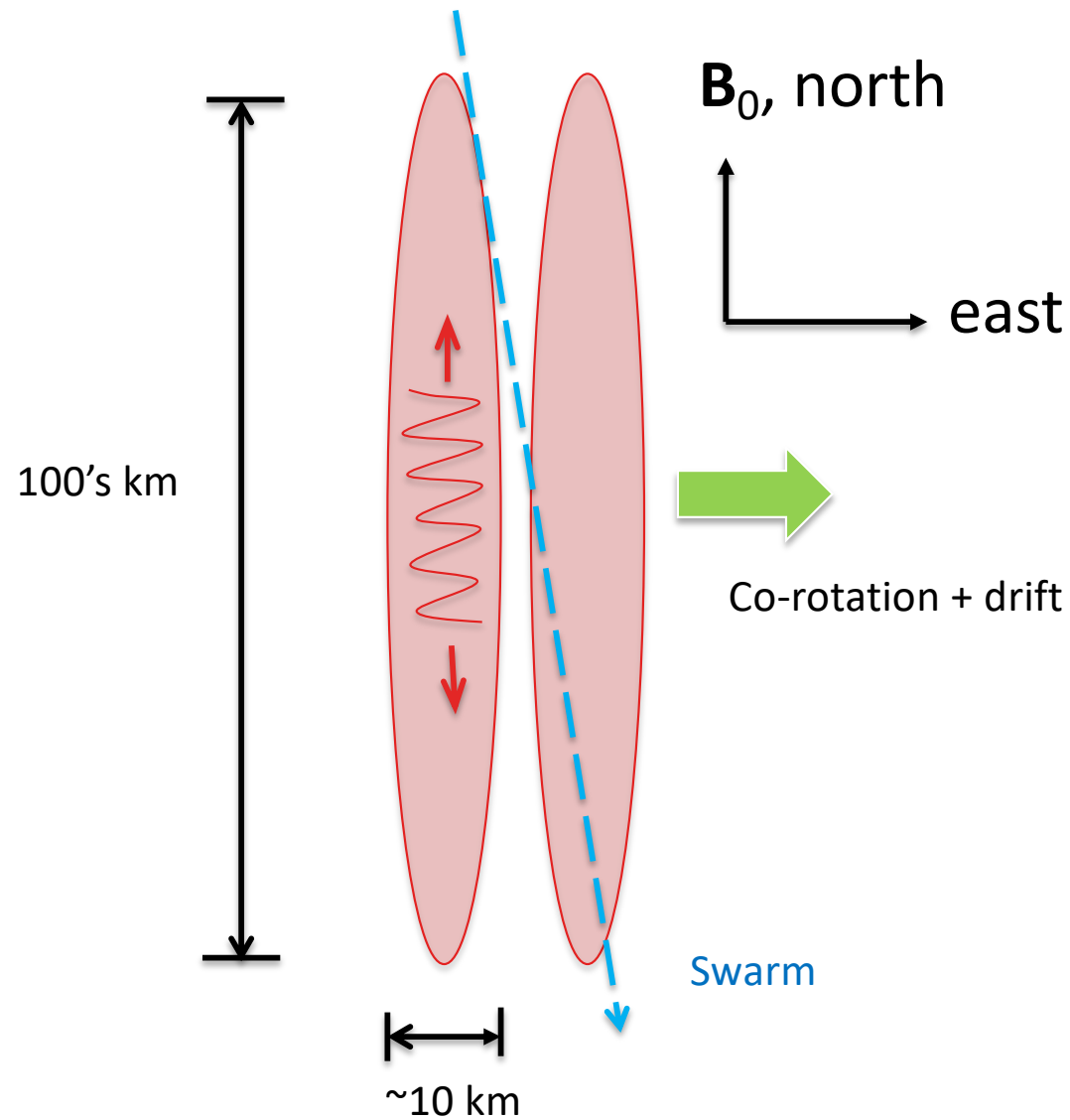




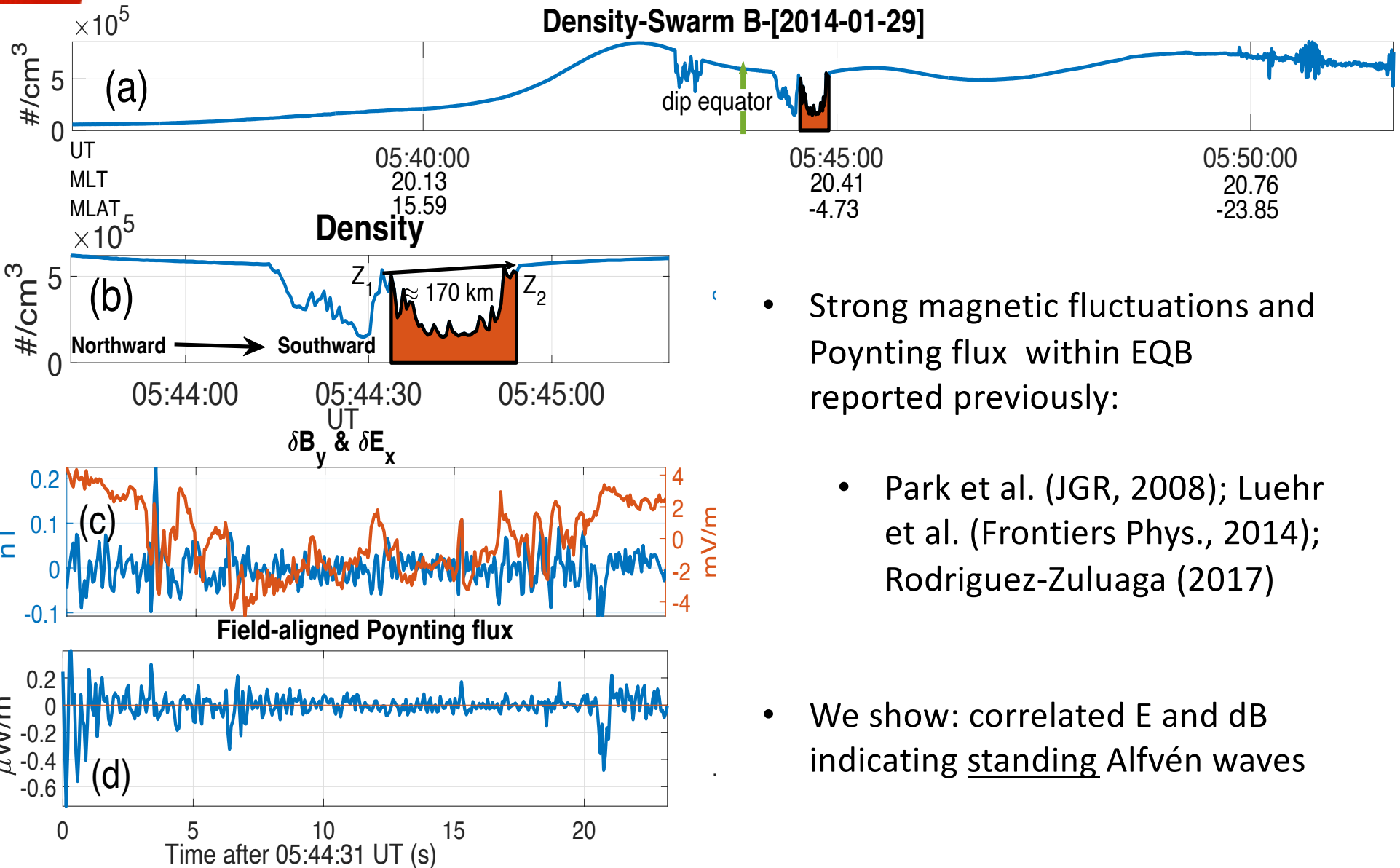
Additional example



Next: Standing Alfvén Waves

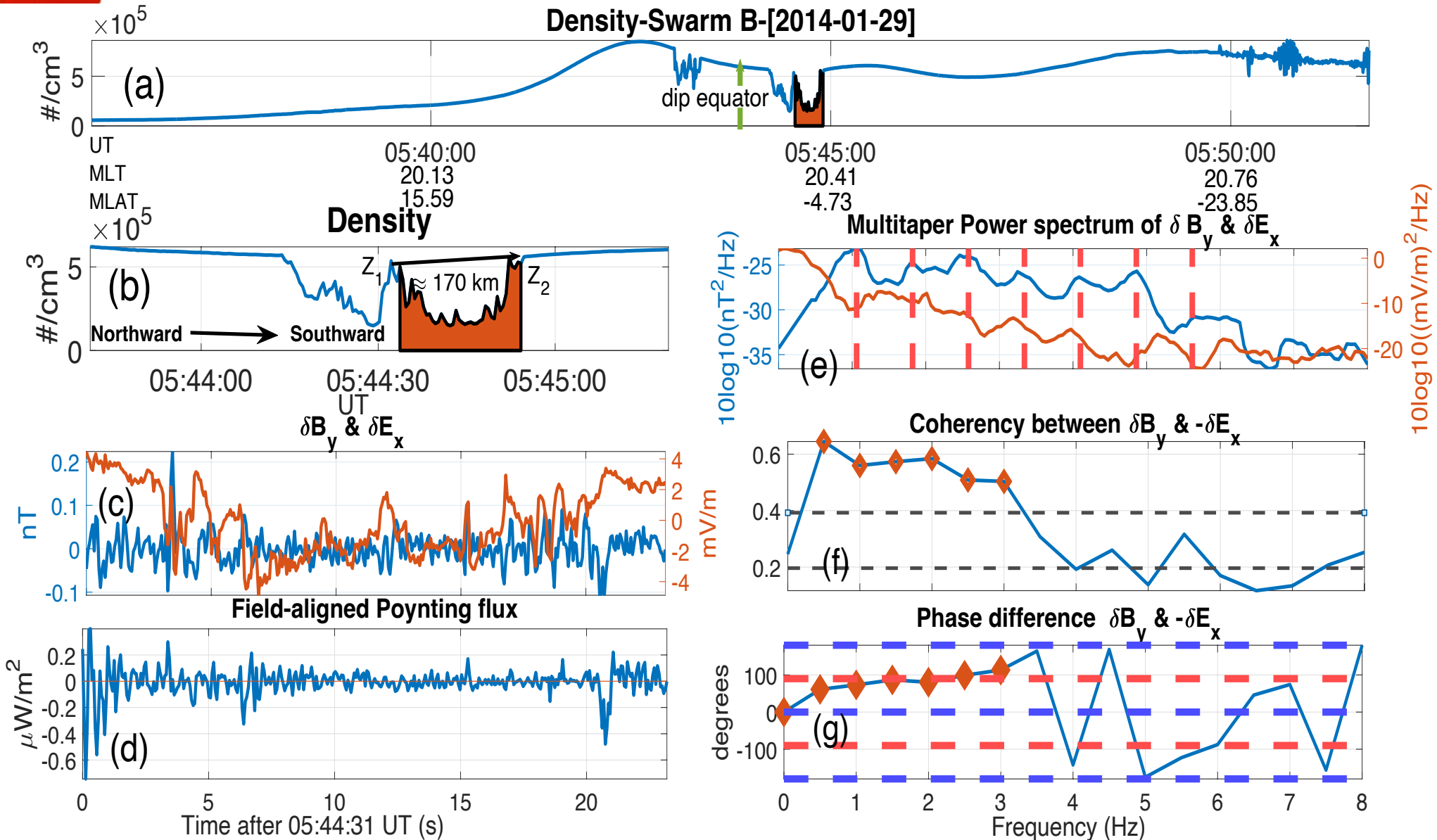


Standing Alfvén Waves Within Plasma Bubbles [Ghadjari et al., GRL, 2022]



- Strong magnetic fluctuations and Poynting flux within EQB reported previously:
 - Park et al. (JGR, 2008); Luehr et al. (Frontiers Phys., 2014); Rodriguez-Zuluaga (2017)
- We show: correlated E and dB indicating standing Alfvén waves

Standing Alfvén Waves Within Plasma Bubbles [Ghadjari et al., GRL, 2022]



Conclusions

- ❑ Swarm observes correlated density, velocity and magnetic fluctuations within equatorial plasma bubbles.
- ❑ Mesoscales: Bubbles are bifurcated by protrusion of higher-density plasma moving upwards at 100's m/s
- ❑ ~1-2 Hz: Evidence of Alfvén eigenmodes within bubbles
- ❑ Eigenmode structure indicates field-aligned bubble lengths of 100-200 km (much less than field line length)

Acknowledgements

- ❑ Swarm EFI data processing and cal/val:
Johnathan Burchill, Alexei Kouznetsov, Levan Lomidze
- ❑ Canadian Space Agency grants 15SUSWARM &
21SUSTSHLE
- ❑ ESA + Swarm DISC



Swarm A – 2014-10-23

