Topside Observations of MSTIDs

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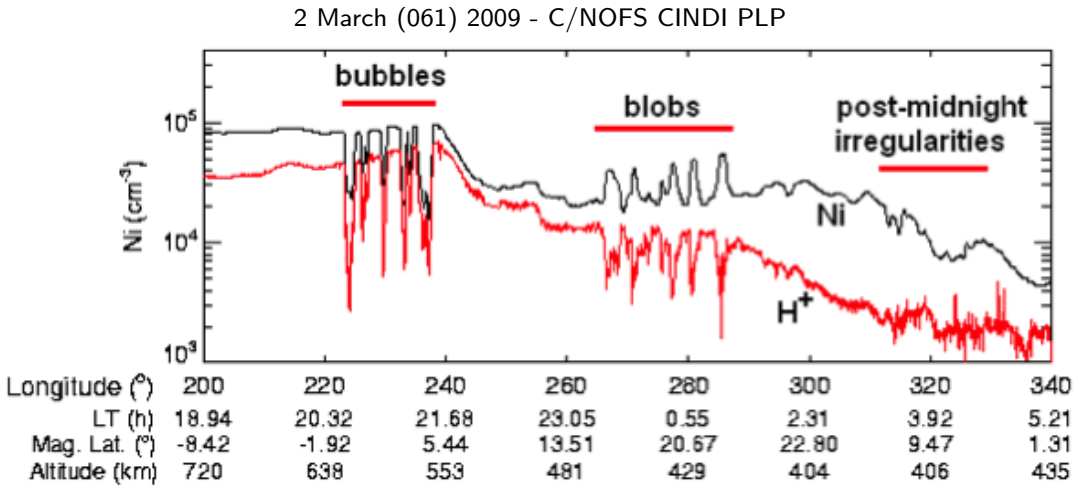
29 June 2012

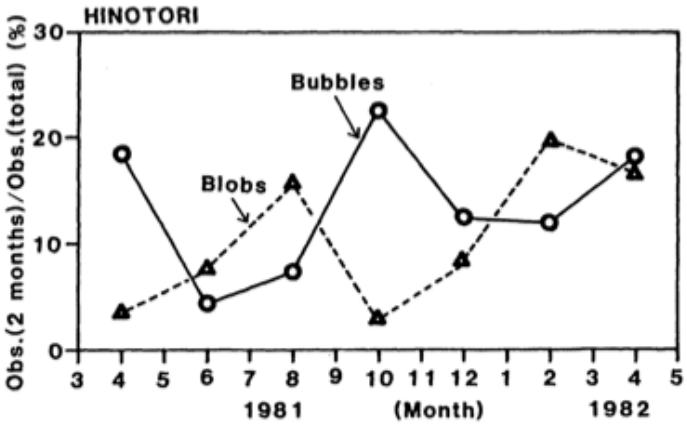
Science Question

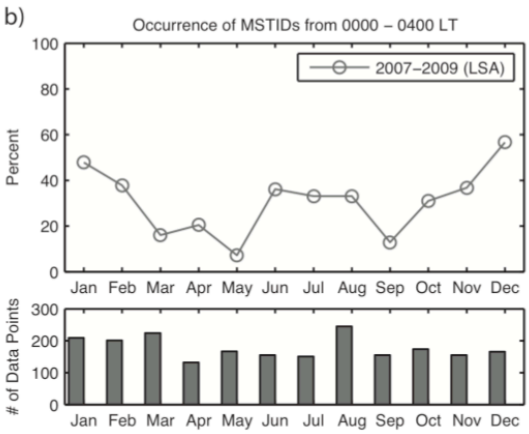
What is the origin of "plasma blobs" observed by in situ plasma probes on the topside ionosphere?



Hypothesis

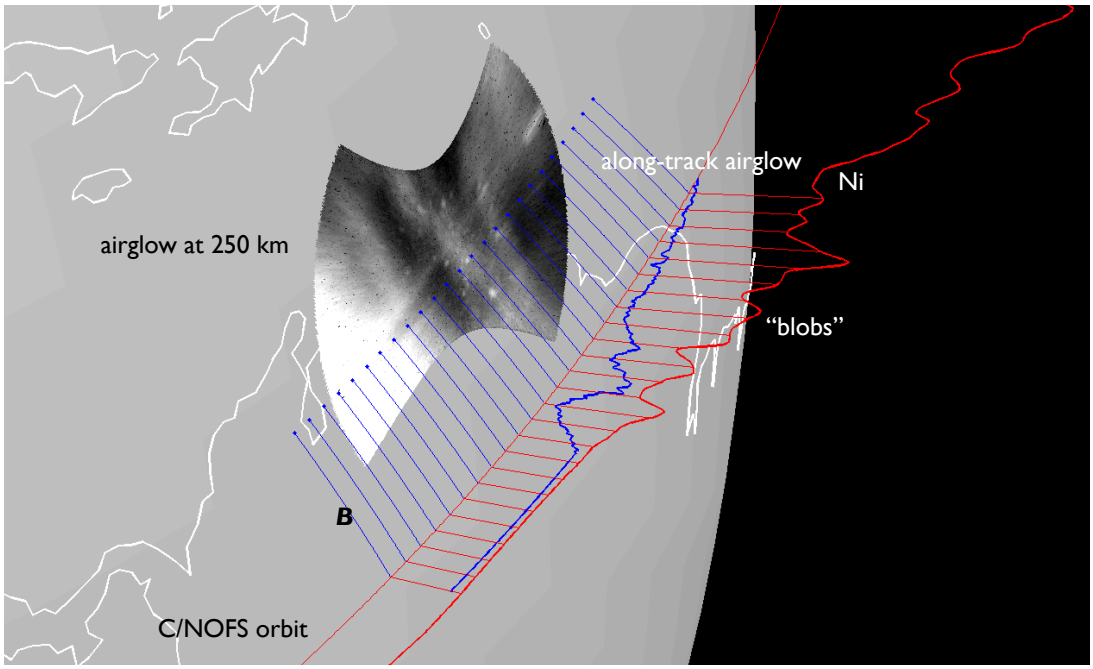
Some (possibly large) fraction of "blob events" are due to MSTIDs.



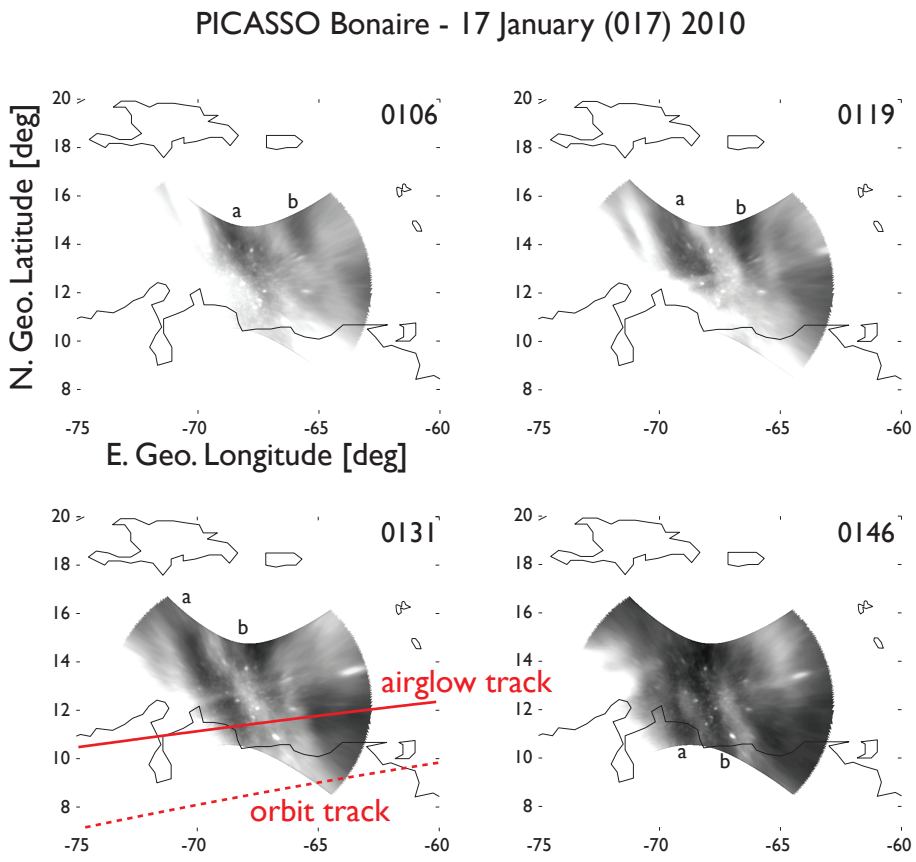


after *Watanabe and Oya*, 1986, and *Makela and Miller*, 2011.

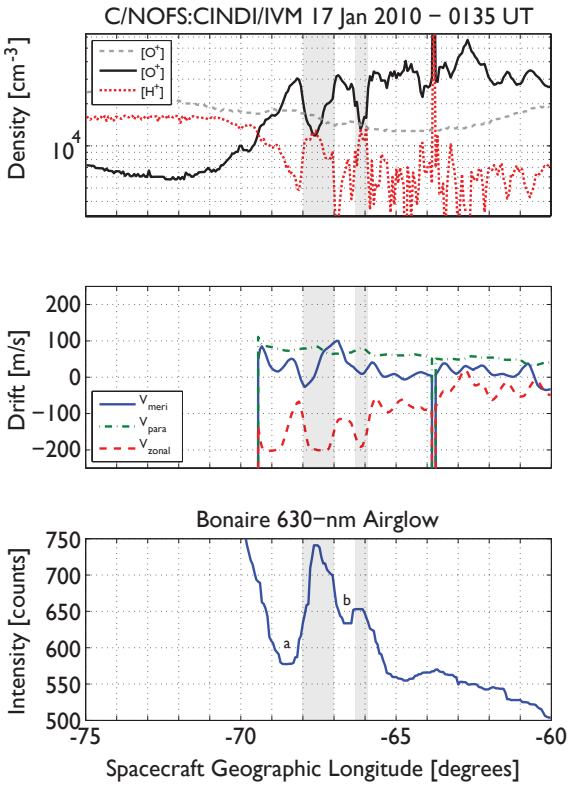
Analysis Technique



Airglow: 17 January 2010



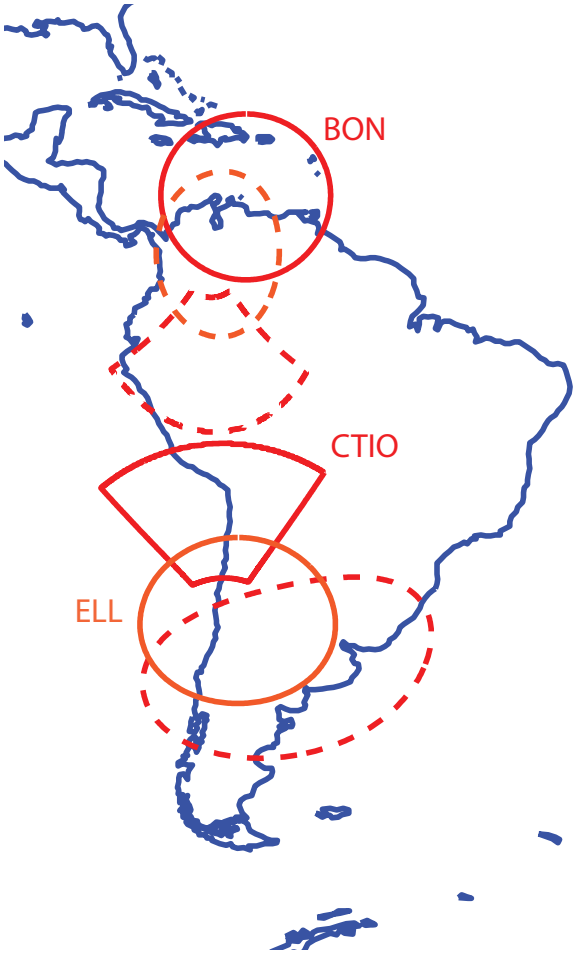
Composite Plot: 17 January 2010



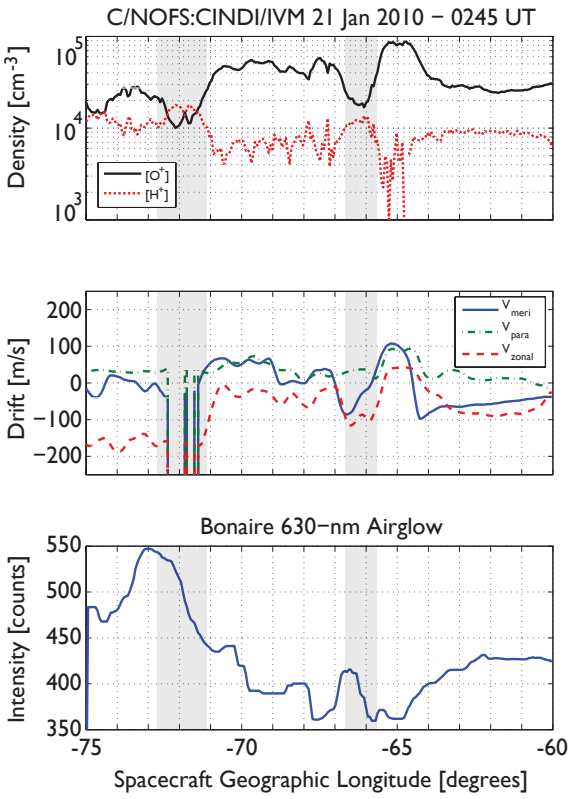
- Increased O^+, decreased H^+ in blobs, decreased O^+, increased H^+ between blobs.
- Meridional drift velocity peaks out of phase with blob peaks.
- Airglow intensity greater on flux tubes associated with blobs, darker between blobs.

Airglow: 21 January 2010

- Conjugate airglow observations in South America
- Instruments:
  - BON - Bonaire (Illinois; color)
  - CTIO - Chile (Illinois; B+W)
  - ELL - Argentina (Boston U; B+W)
- (Show movie).

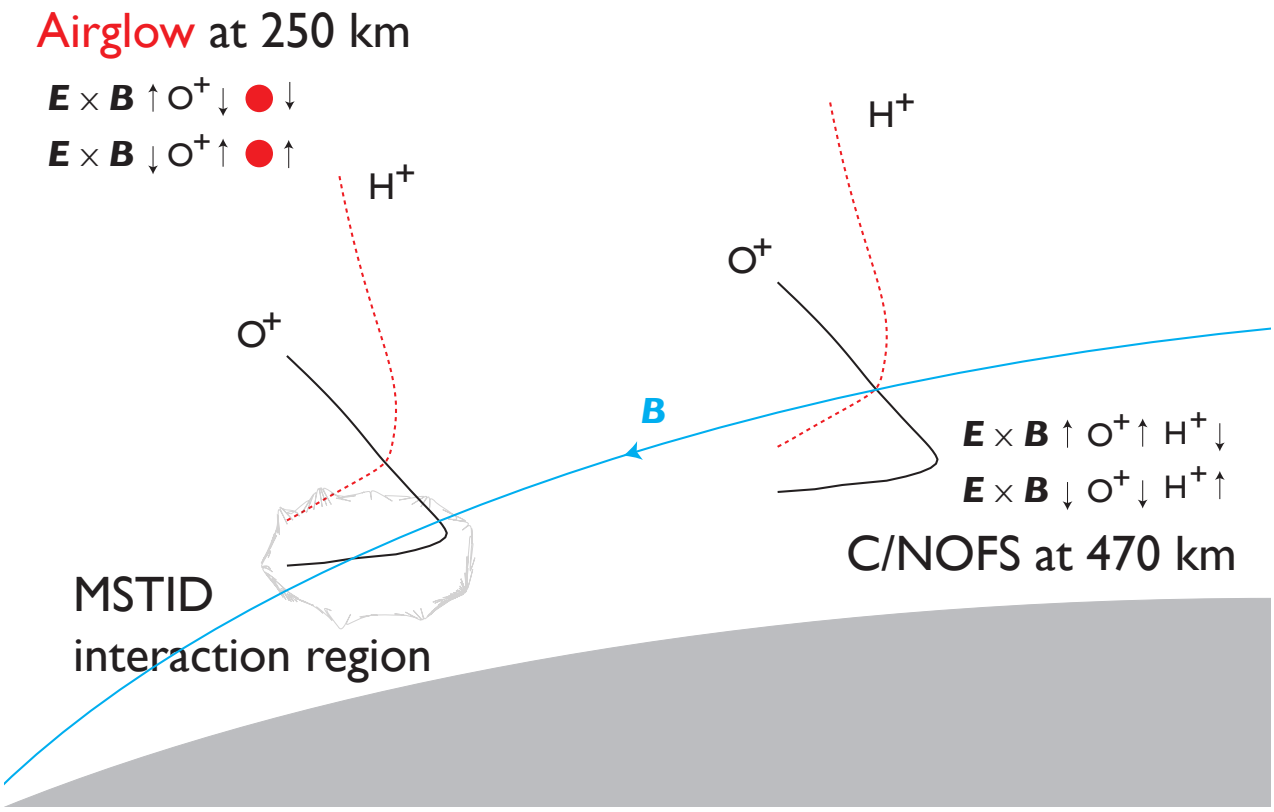


Composite Plot: 21 January 2010



- Increased O^+, decreased H^+ in blobs, decreased O^+, increased H^+ between blobs.
- Substantial parallel drift perturbation $\rightarrow$ field-aligned current flow.
- Airglow intensity not as well-aligned on this example, but close.

Physics Cartoon



Summary

- MSTIDs create the blob signature observed by in situ plasma probes.
  - Electrodynamic uplift in MSTIDs occurs along the (entire) flux tube.
  - Suggests potentially large MSTID dataset from C/NOFS.
  - May not be the only mechanism.
- IVM parallel drifts $\sim$ field-aligned currents in MSTIDs.
  - These currents must close (and have a source) affirming the importance of sporadic-E layers in MSTID formation/life cycle.