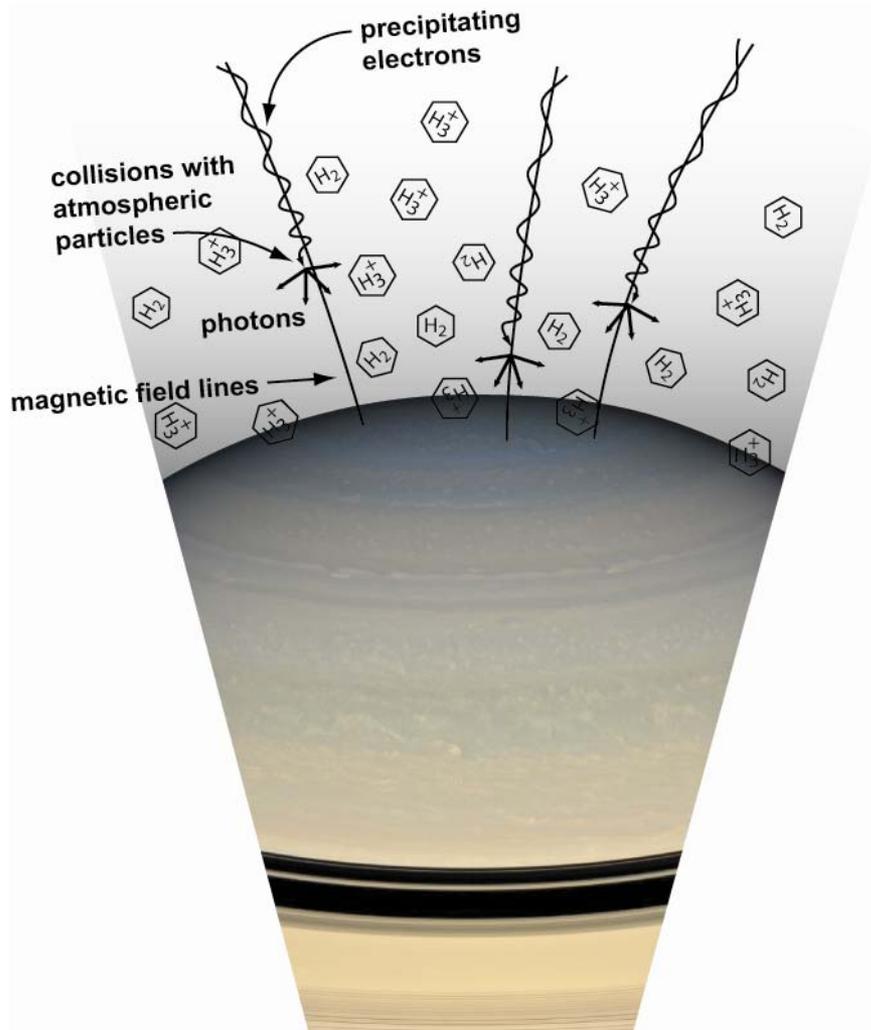


## Saturn Aurora:

The ionospheric and magnetospheric fingerprint, and a manifestation of interactions beyond.



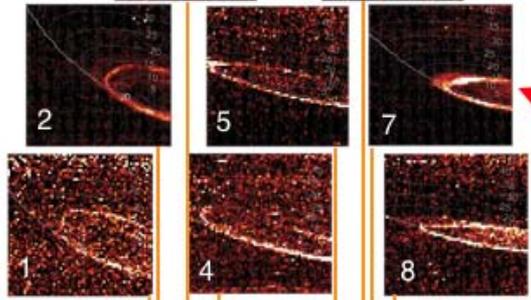
# Aurora: what is it about?



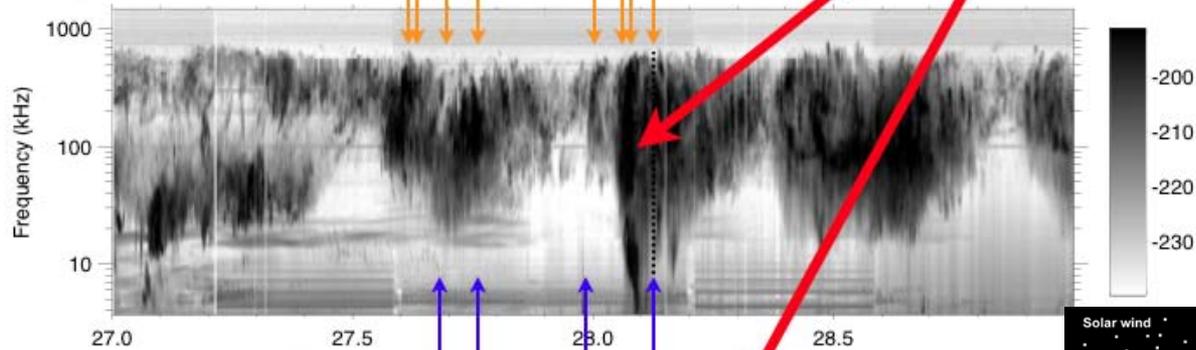
- Auroral emissions indicate the existence of certain molecular/atom and its density.
- The emission intensity and format indicate electron energies and their origin.

# Multi-instrument auroral studies follow the physics

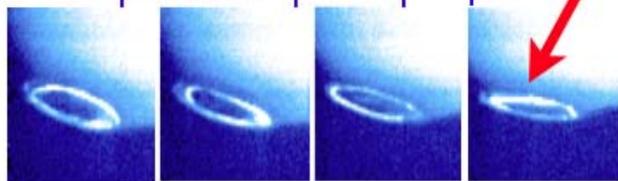
VIMS



RPWS

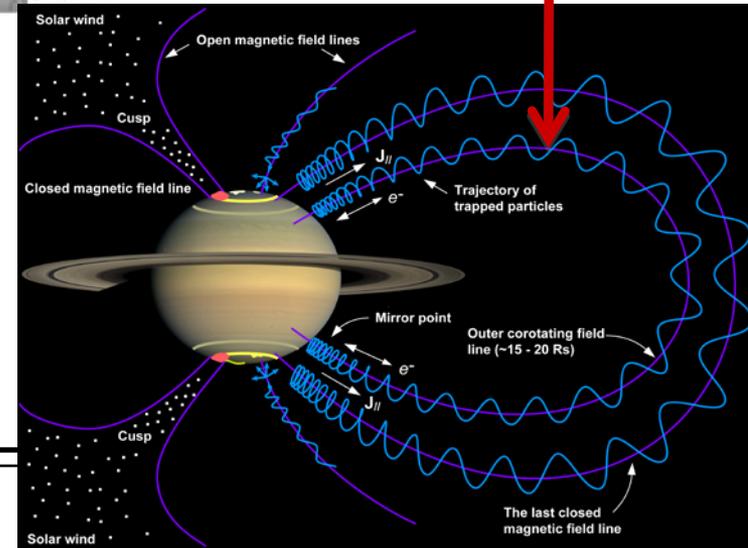


UVIS



Simultaneous enhancement

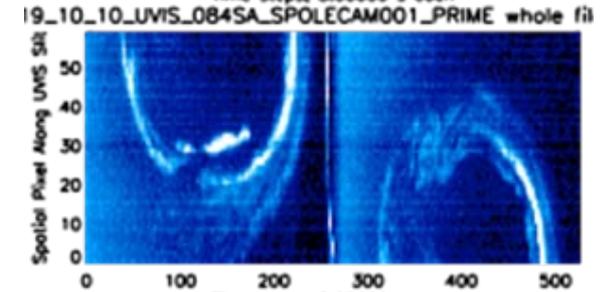
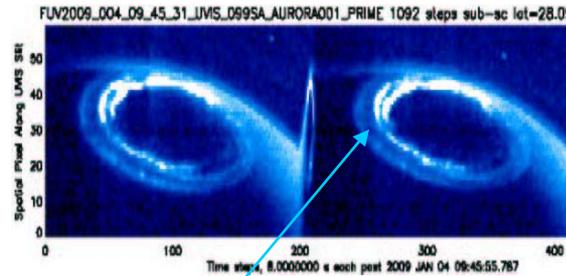
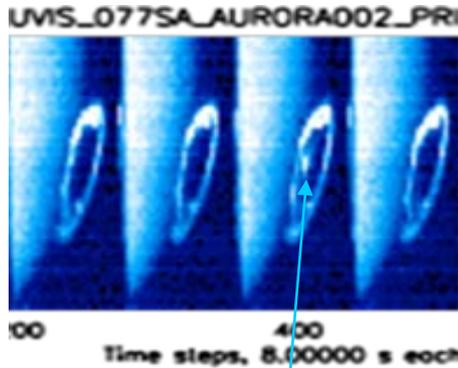
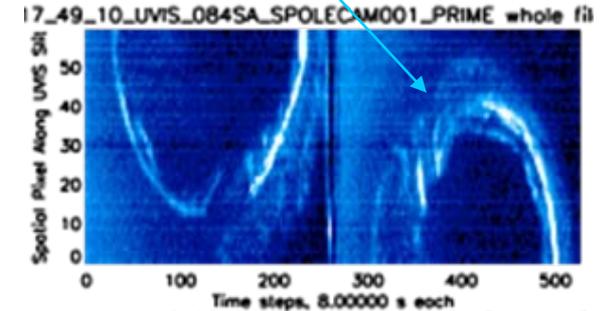
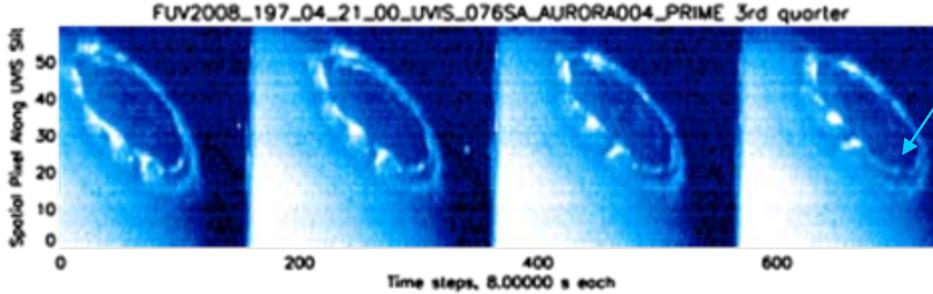
- Earth and probably Saturn show correspondence among radio, UV, IR, and visible auroral emissions
- Spacecraft sits a distance away and records simultaneous enhancements



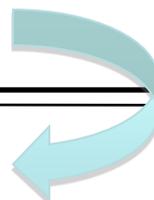
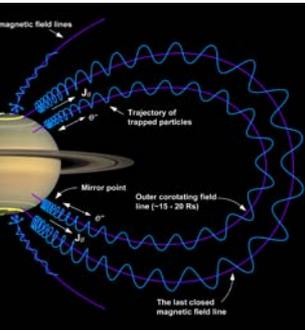
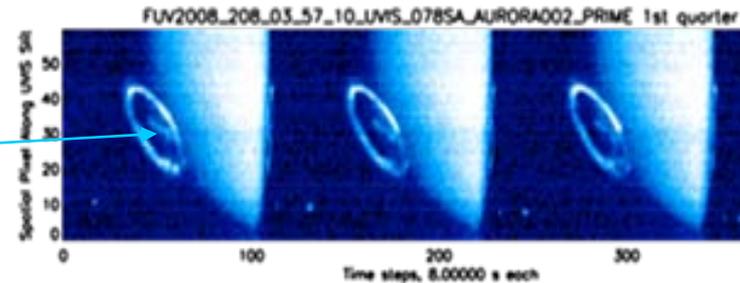


# Various Saturn UV Auroral Features

- Spiral oval and fine auroral structure in the **southern** hemisphere.



- Auroral flare, spiral oval and transpolar arc in the **northern** hemisphere.

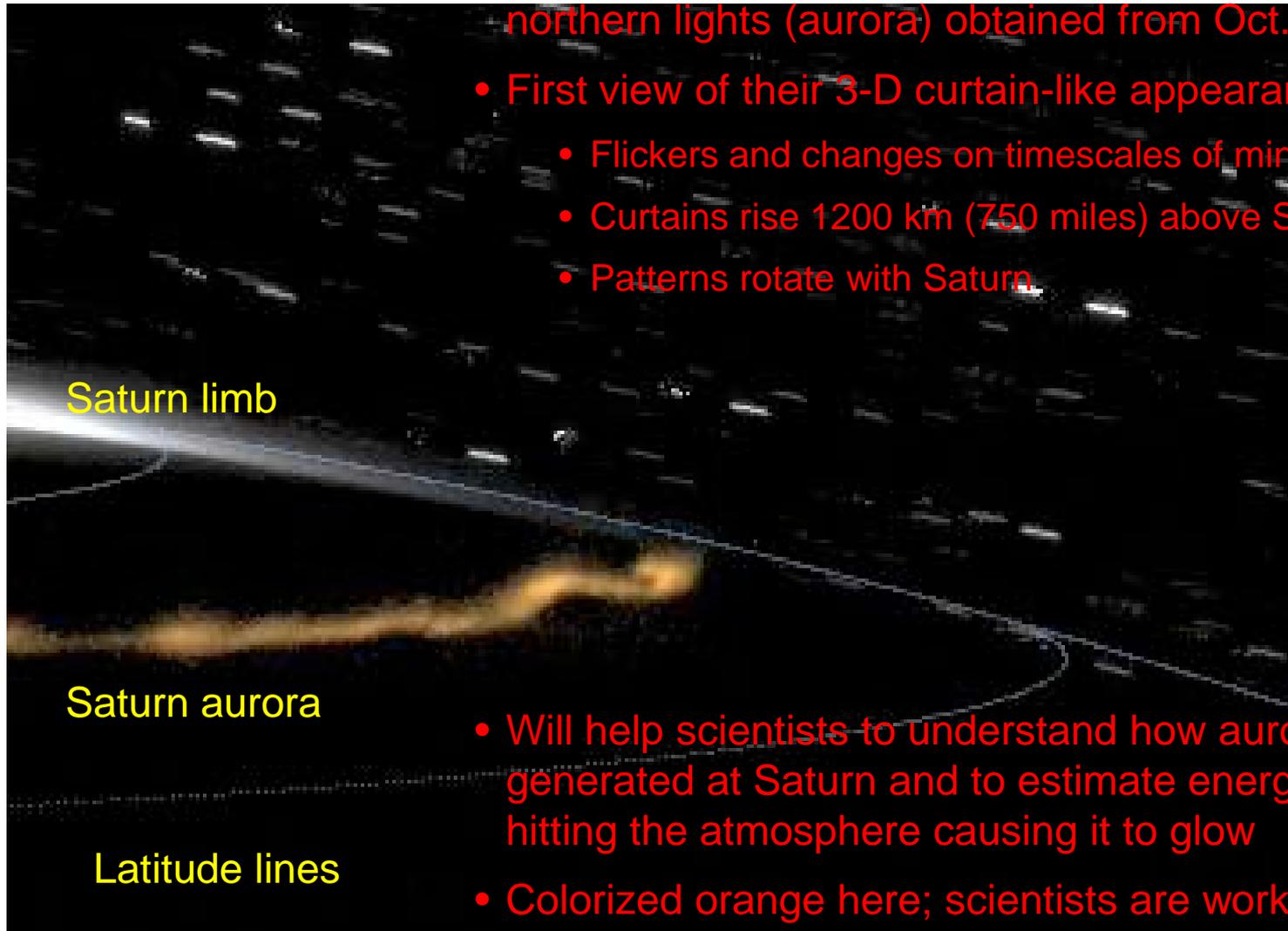


Particles & field lines move in 3-D: into and out of the page.  
Small-scale features in the auroral oval tell us about movement of field lines in 3-D.



# ISS: Detailed Images of Saturn's Aurora

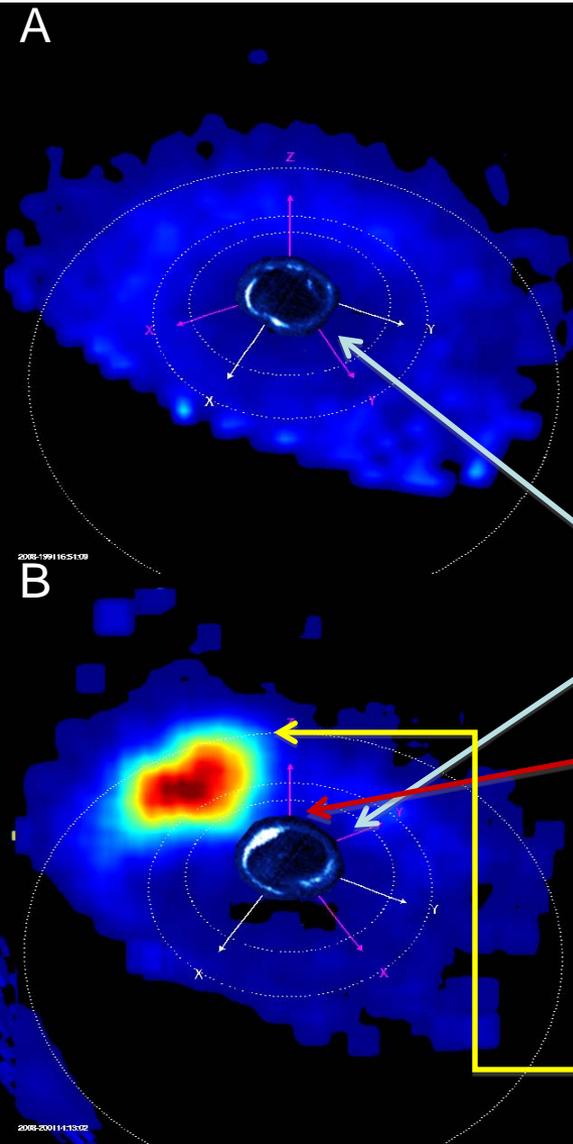
- First significant visible-light photos of Saturn's faint northern lights (aurora) obtained from Oct. 5 to 8, 2009
- First view of their 3-D curtain-like appearance
  - Flickers and changes on timescales of minutes
  - Curtains rise 1200 km (750 miles) above Saturn at  $\sim 70^\circ$  lat
  - Patterns rotate with Saturn



- Will help scientists to understand how auroras are generated at Saturn and to estimate energy of electrons hitting the atmosphere causing it to glow
- Colorized orange here; scientists are working to understand the true color of Saturn's northern lights



# Combined Cassini UVIS and MIMI ENA imaging

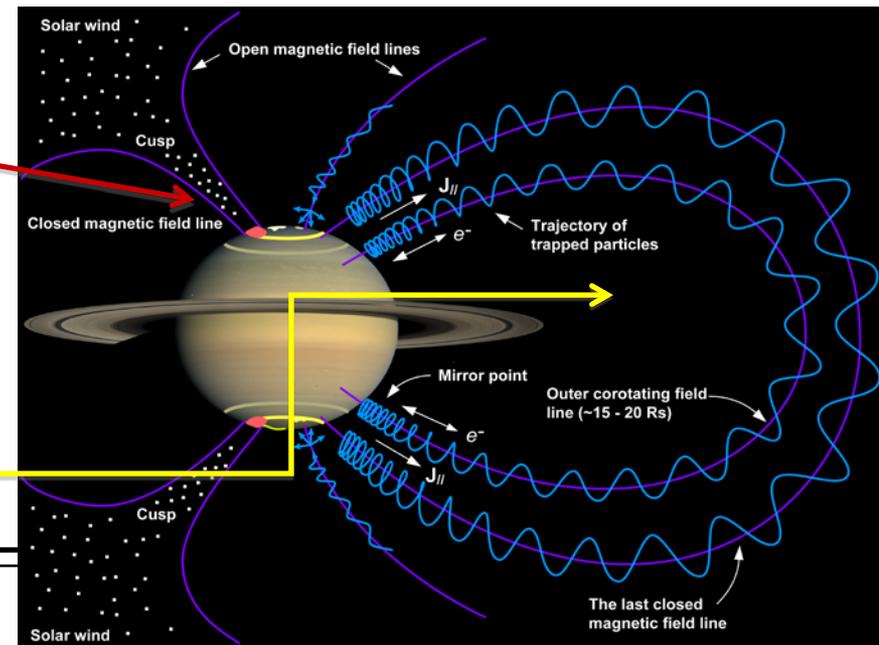


- Strong correlations among: a solar wind pressure pulse resulting in magnetospheric compression, a ring current event, sudden SKR power increase, and dawn side auroral brightening
- Recurrent ring current enhancement begins near midnight and increases in intensity as it rotates toward noon
- Bright auroral bulge tracks the ring current enhancement
- Suggests link between ring current enhancement and a rotating field-aligned current system that drives both SKR enhancement and aurorae

Saturn

Dawn side  
auroral  
brightening

Ring current  
enhancement





# Saturn Aurora

- After  $\sim 5 \frac{1}{2}$  years of the Cassini mission, we have many outstanding observations of Saturn's aurora, related field-aligned currents and plasma/radio signatures.
- Northern auroras are coming into view by Hubble Space Telescope
- Potential for coordinated ground-based Hubble and Cassini UVIS auroral observations

