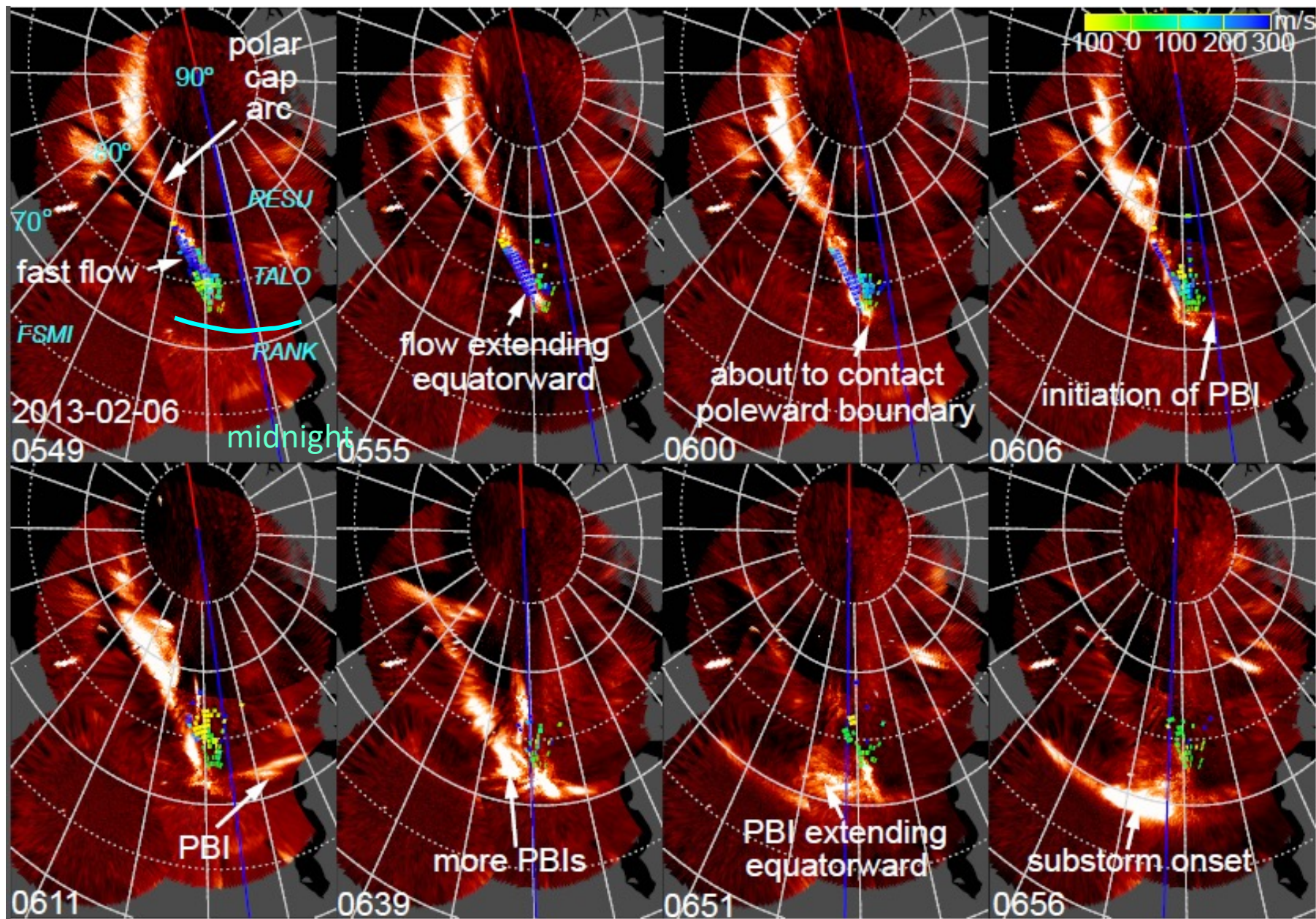


Polar cap precursor of nightside auroral oval disturbances using polar cap arcs

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Science question: What determines when and where a meso-scale auroral enhancement occurs?

Case 1



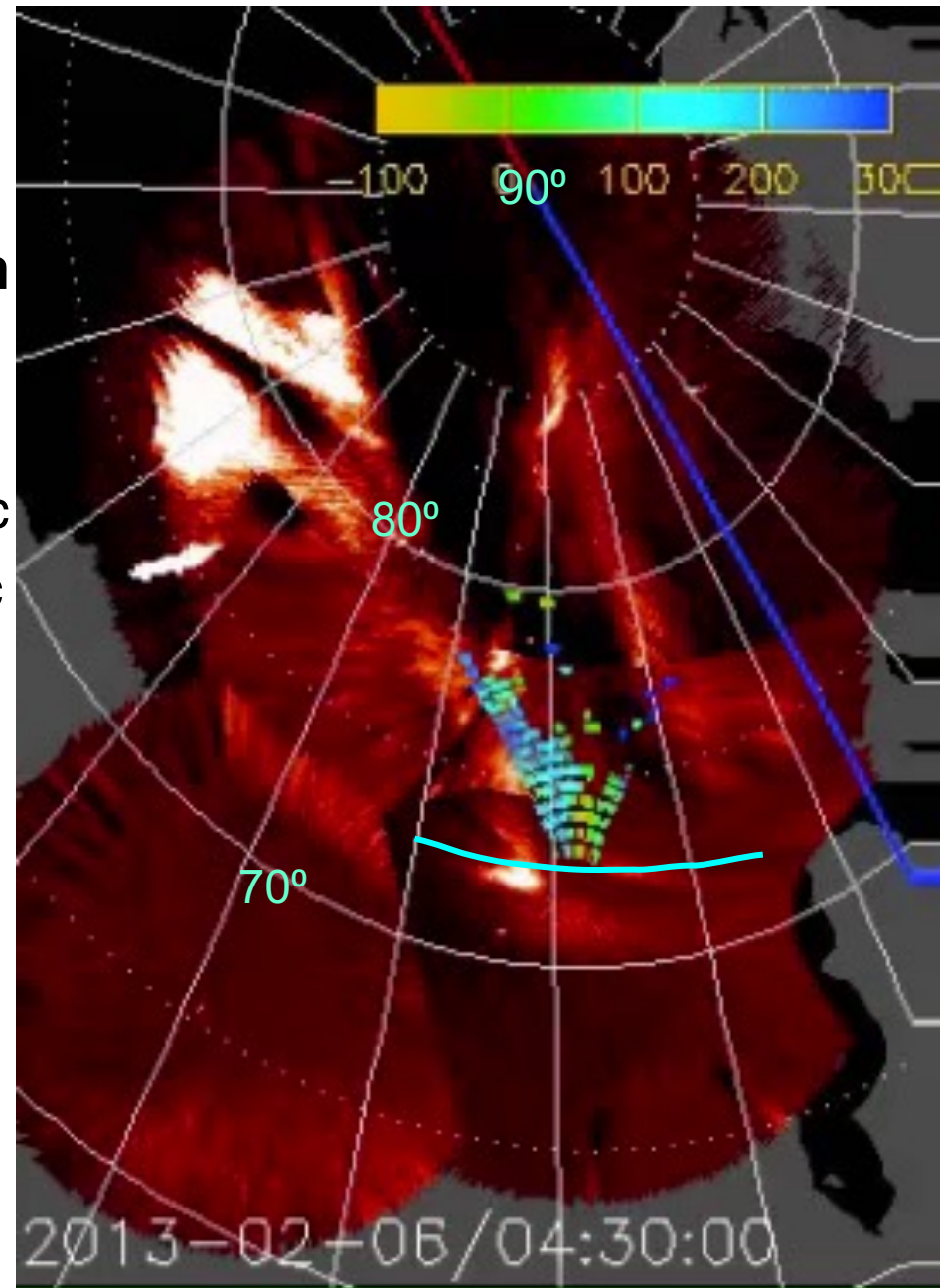
Polar cap arc/flow → PBI → substorm

Overview of 3-h interval

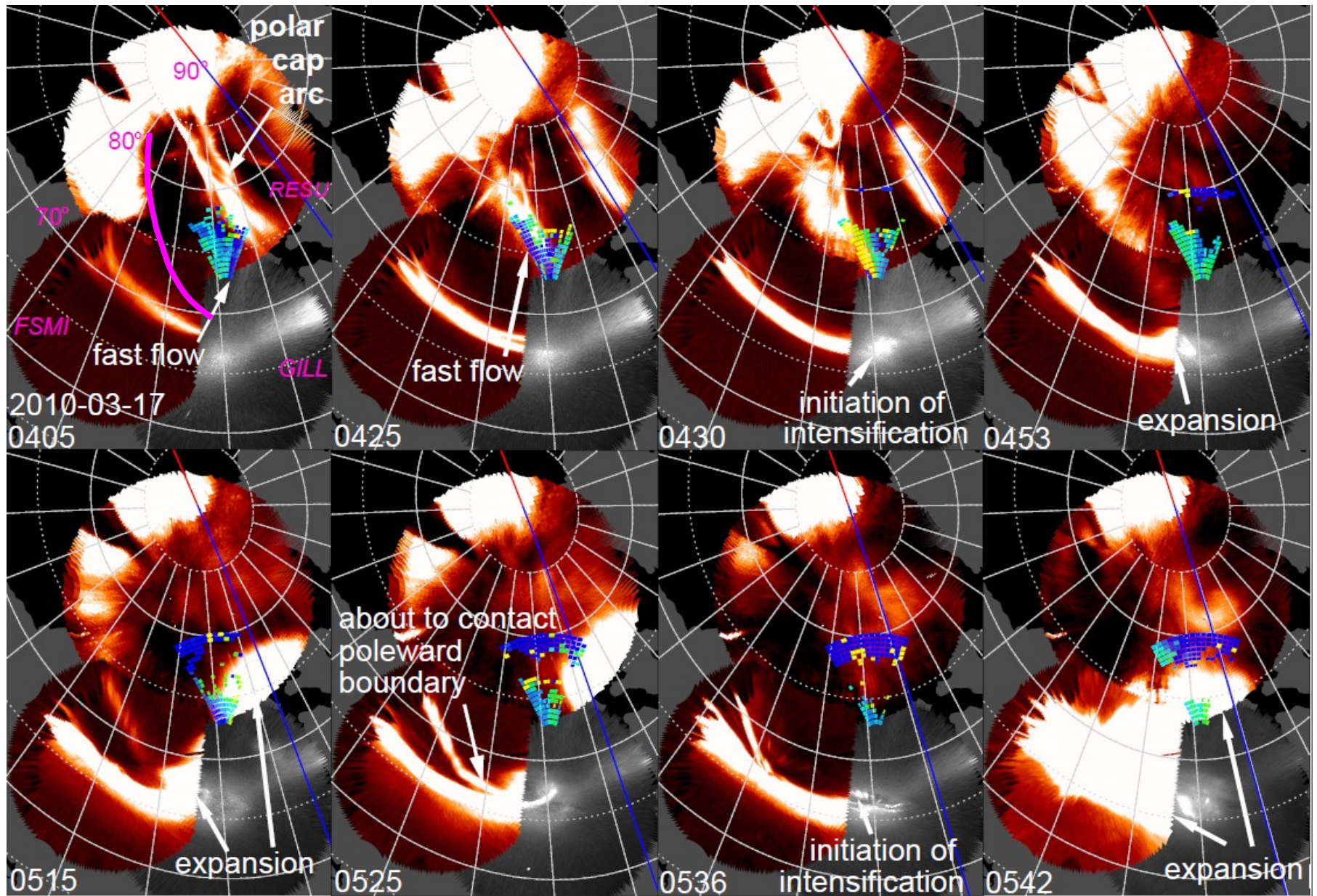
Polar cap arc → PBI → substorm



- Major intensifications
- Spatially connected to polar cap arc
- Did not occur until the polar cap arc contacted the auroral poleward boundary



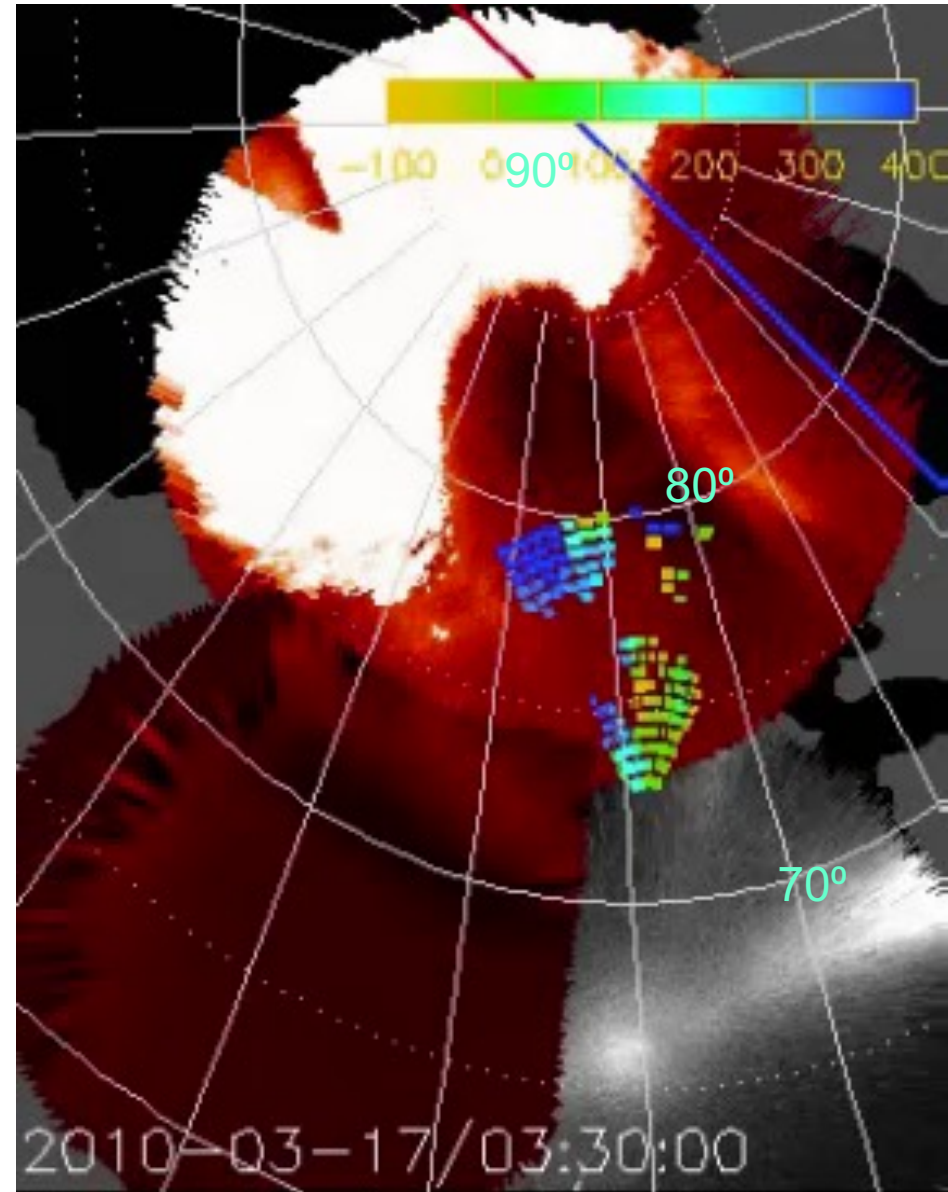
Case 2



Polar cap arc/flow → poleward-expanding intensification

Overview of 3-h interval Polar cap arc → poleward- expanding intensification:

- Major intensifications
- Visually connected to the polar cap arc
- Did not occur until the polar cap arc contacted the auroral poleward boundary



Statistics of Association

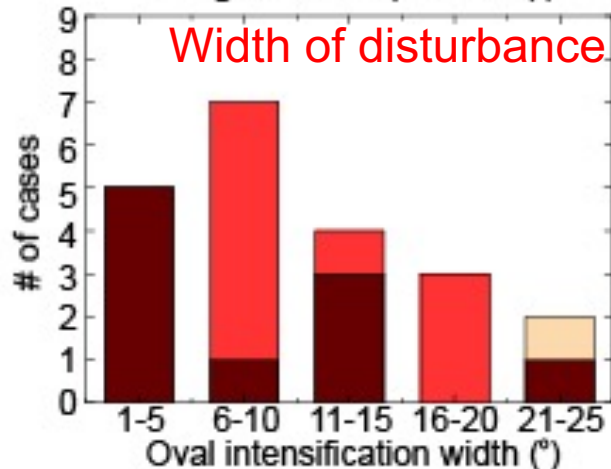
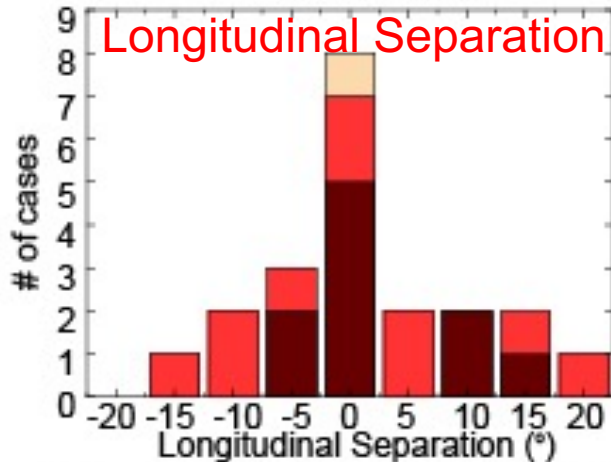
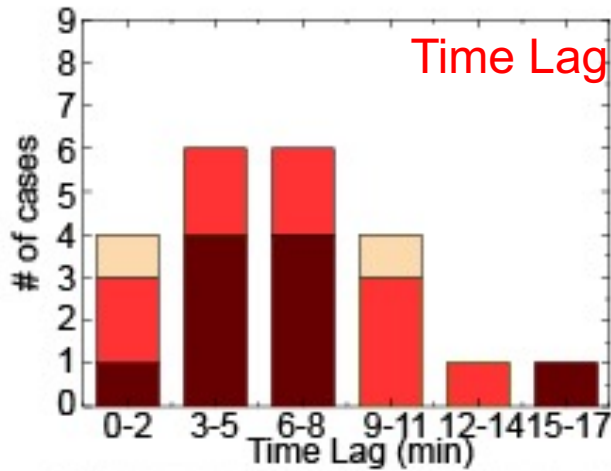
Polar cap arcs: steady for $>\sim 1$ h

Nightside auroral oval intensifications as being related: spatial connection to polar cap arcs

Common association: 85%!

Initiation of oval disturbances relative to contact

- $<\sim 11$ min time lag
- Almost no longitudinal separation
- Initiation width of oval disturbance: <1 h MLT



Summary

- Polar cap arcs well mark localized fast flows.
- Upon contacting nightside auroral poleward boundary, polar cap arcs lead to oval intensifications ~85% of the time.
- Oval intensification happens $< \sim 10$ min and almost the same longitude of the contact.

The observed association suggests that localized polar cap flows can substantially influence activity within auroral oval.