

2008 SPD AGU paper abstract

The Foggy EUV Corona and Coronal Heating by MHD Waves From Explosive Reconnection Events

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In 0.5 arcsec/pixel TRACE coronal EUV images, the corona rooted in active regions that are at the limb and are not flaring is seen to consist of (1) a complex array of discrete loops and plumes embedded in (2) a diffuse ambient component that shows no fine structure and gradually fades with height. For each of two not-flaring active regions, Cirtain et al (2006, Sol. Phys., 239, 295) found that the diffuse component is (1) approximately isothermal and hydrostatic and (2) emits well over half of the total EUV luminosity of the active-region corona. Here, from a TRACE Fe XII coronal image of another not-flaring active region, the large sunspot active region AR 10652 when it was at the west limb on 30 July 2004, we separate the diffuse component from the discrete-loop component by spatial filtering, and find that the diffuse component has about 60% of the total luminosity. If under much higher spatial resolution than that of TRACE (e.g., the 0.1 arcsec/pixel resolution of the Hi-C sounding-rocket experiment proposed by J. W. Cirtain et al), most of the diffuse component remains diffuse rather than being resolved into very narrow loops and plumes, this will raise the possibility that the EUV corona in active regions consists of two basically different but comparably luminous components: one being the set of discrete bright loops and plumes and the other being a truly diffuse component filling the space between the discrete loops and plumes. This dichotomy would imply that there are two different but comparably powerful coronal heating mechanisms operating in active regions, one for the distinct loops and plumes and another for the diffuse component. We present a scenario in which (1) each discrete bright loop or plume is a flux tube that was recently reconnected in a burst of reconnection, and (2) the diffuse component is heated by MHD waves that are generated by these reconnection events and by other fine-scale explosive reconnection events, most of which occur in and below the base of the corona where they are seen as UV explosive events, EUV blinkers, and type II spicules. These MHD waves propagate across field lines and dissipate, heating the plasma in the field between the bright loops and plumes.

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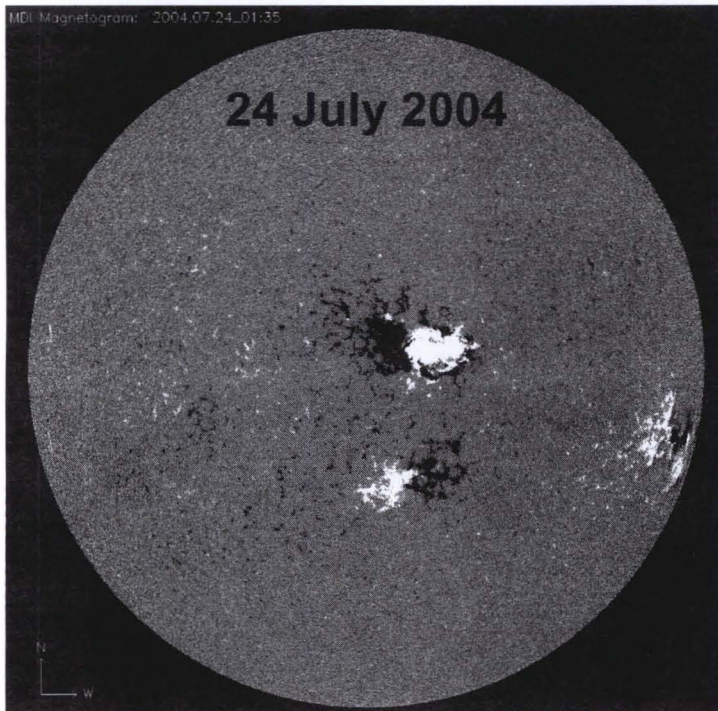
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National Space Science and Technology Center
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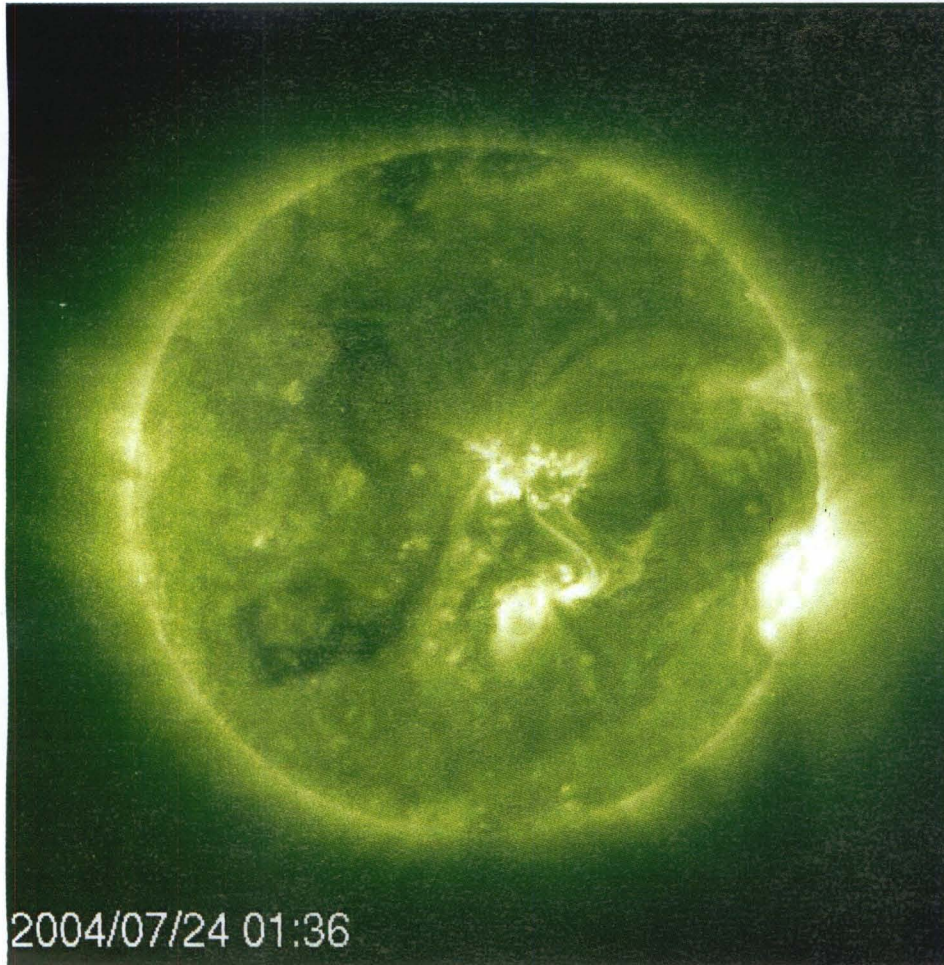
Main Points

- At 1 arcsec resolution (**TRACE**), less than half of the EUV corona in active regions is bright loops:
 - More than half is “fog” between the loops (Cirtain et al 2006).
- 5 times higher resolution (**Hi-C**) will reveal whether the fog is
 - (1) Mostly very narrow loops, or
 - (2) Remains mostly unresolved.
- **Smooth fog** would imply:
 - Coronal heating by a different mode than for the discrete loops.
- Plausible Scenario:
 - Bursts of reconnection**
 - (1) **Directly heat the bright loops** as at Parker or Longcope et al.
 - (2) **Indirectly heat the fog** by MHD waves.

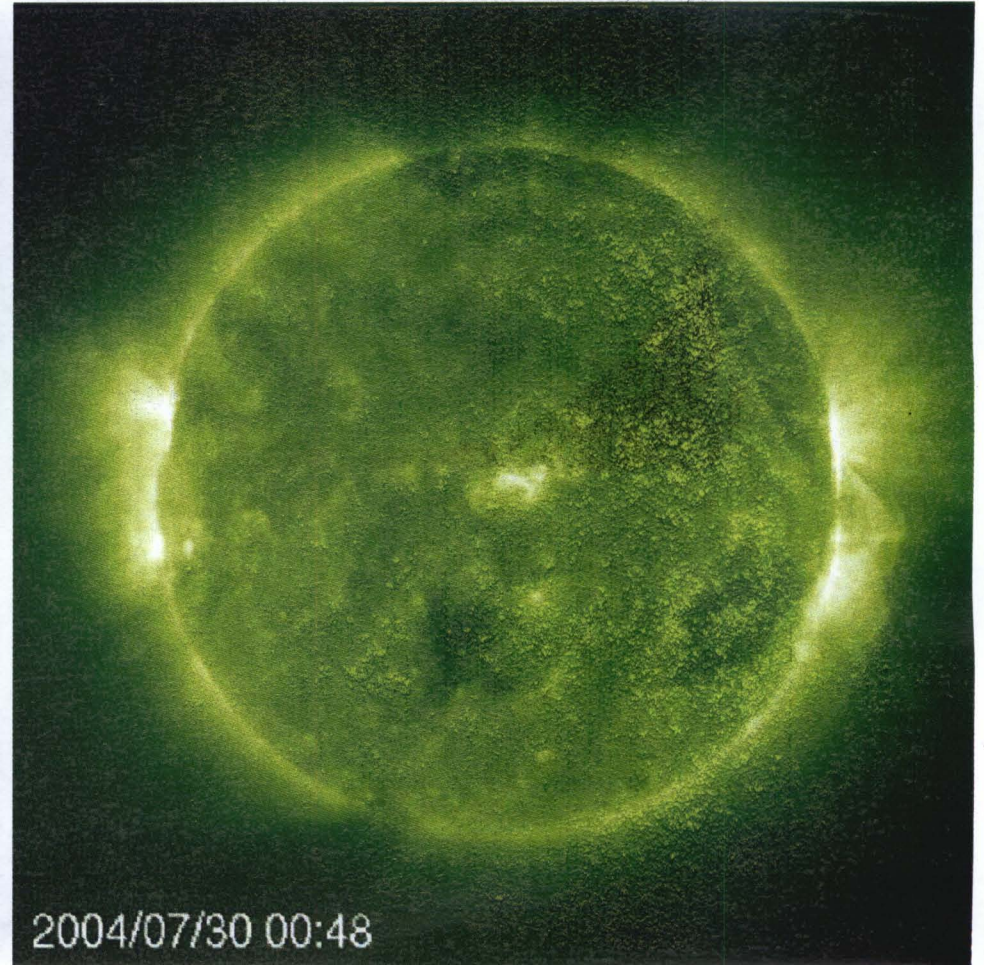


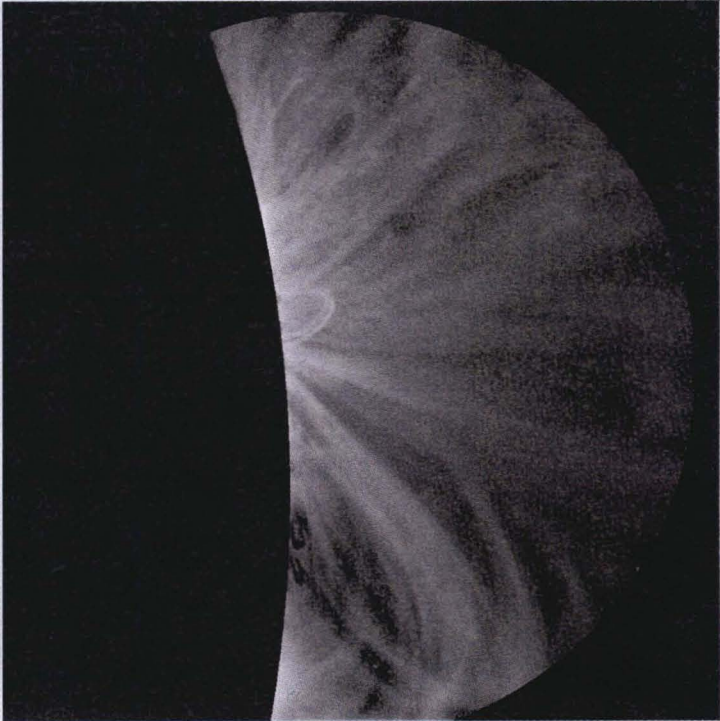
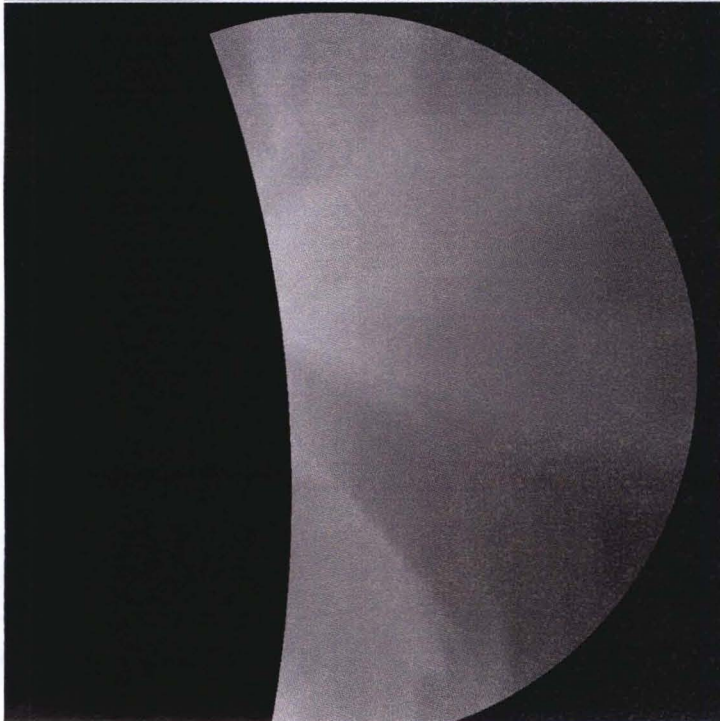
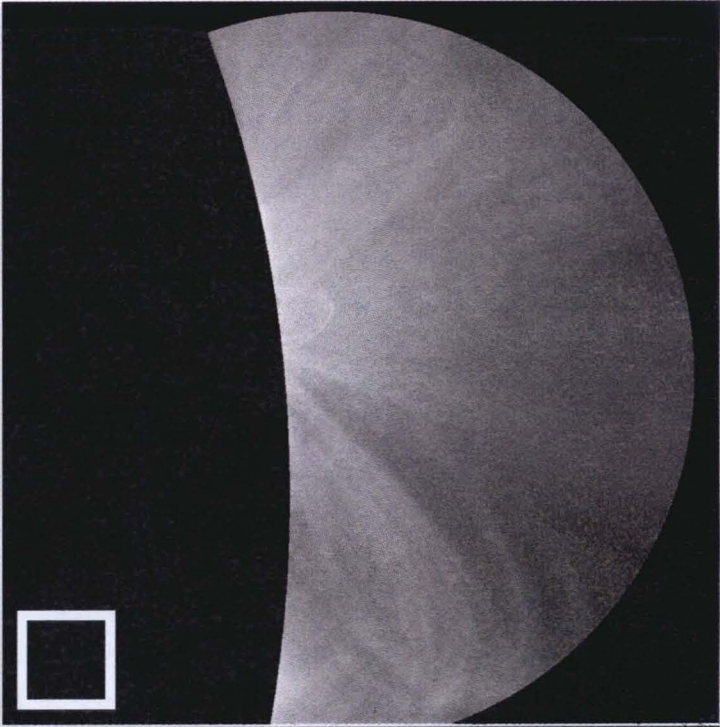
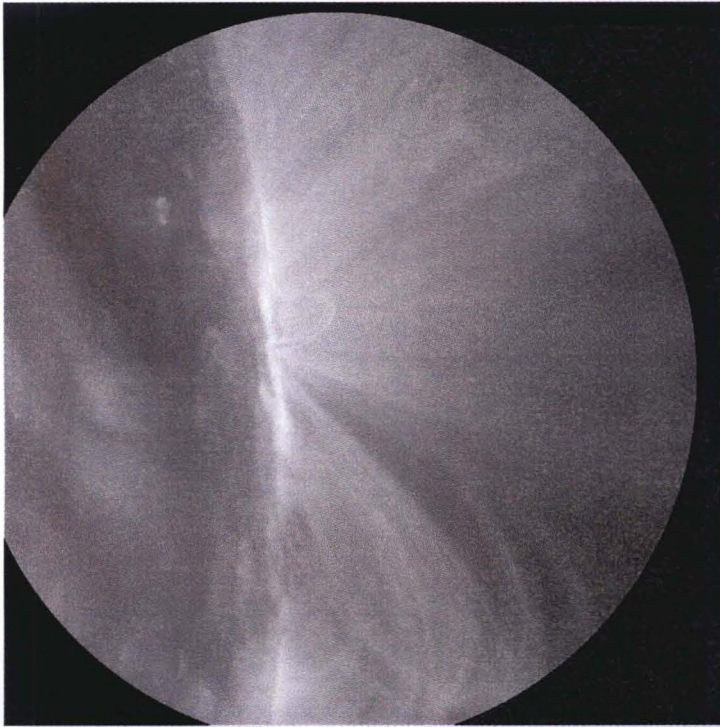
EIT Fe XII

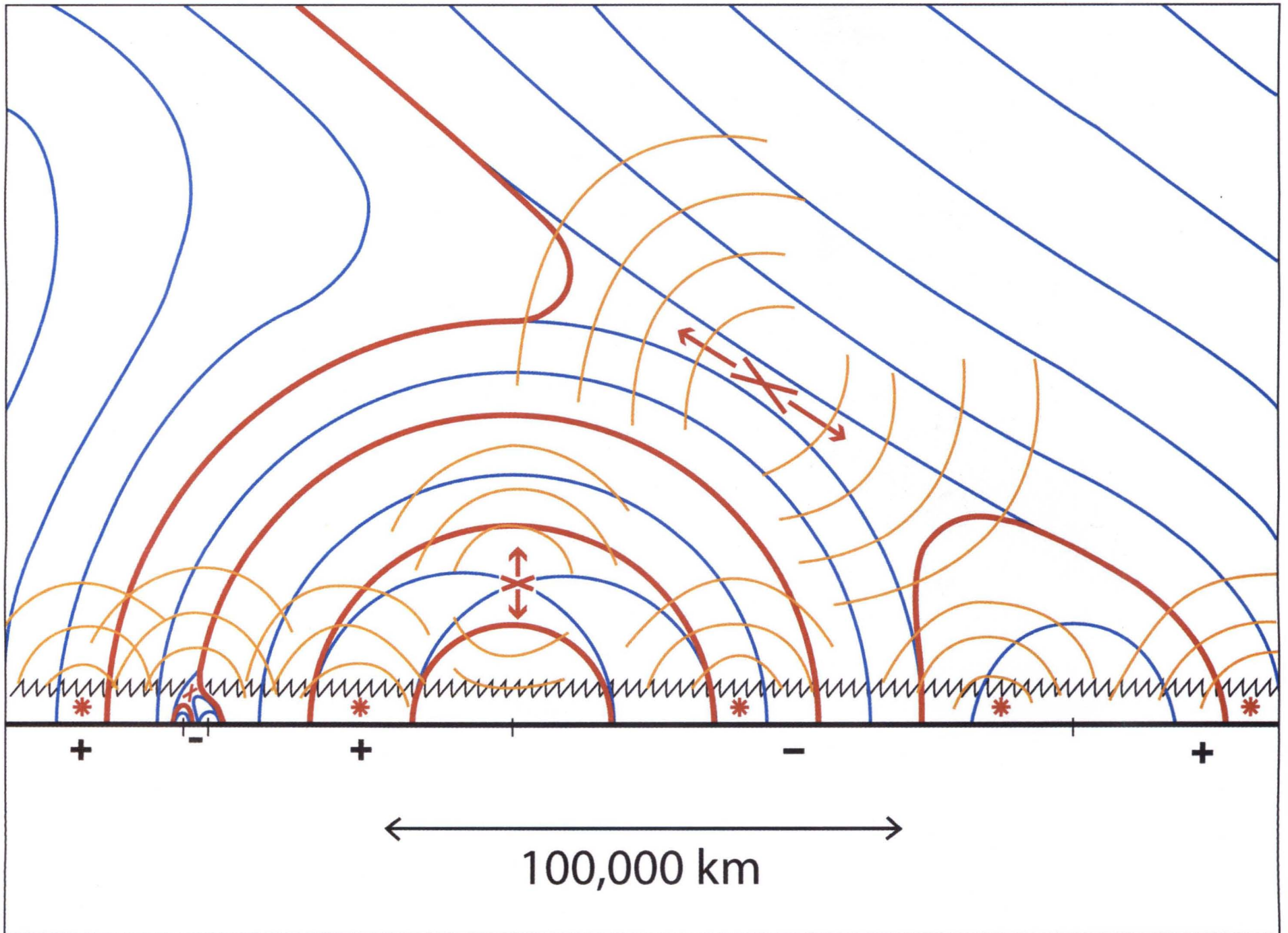
24 July 2004



30 July 2004







Overall Point

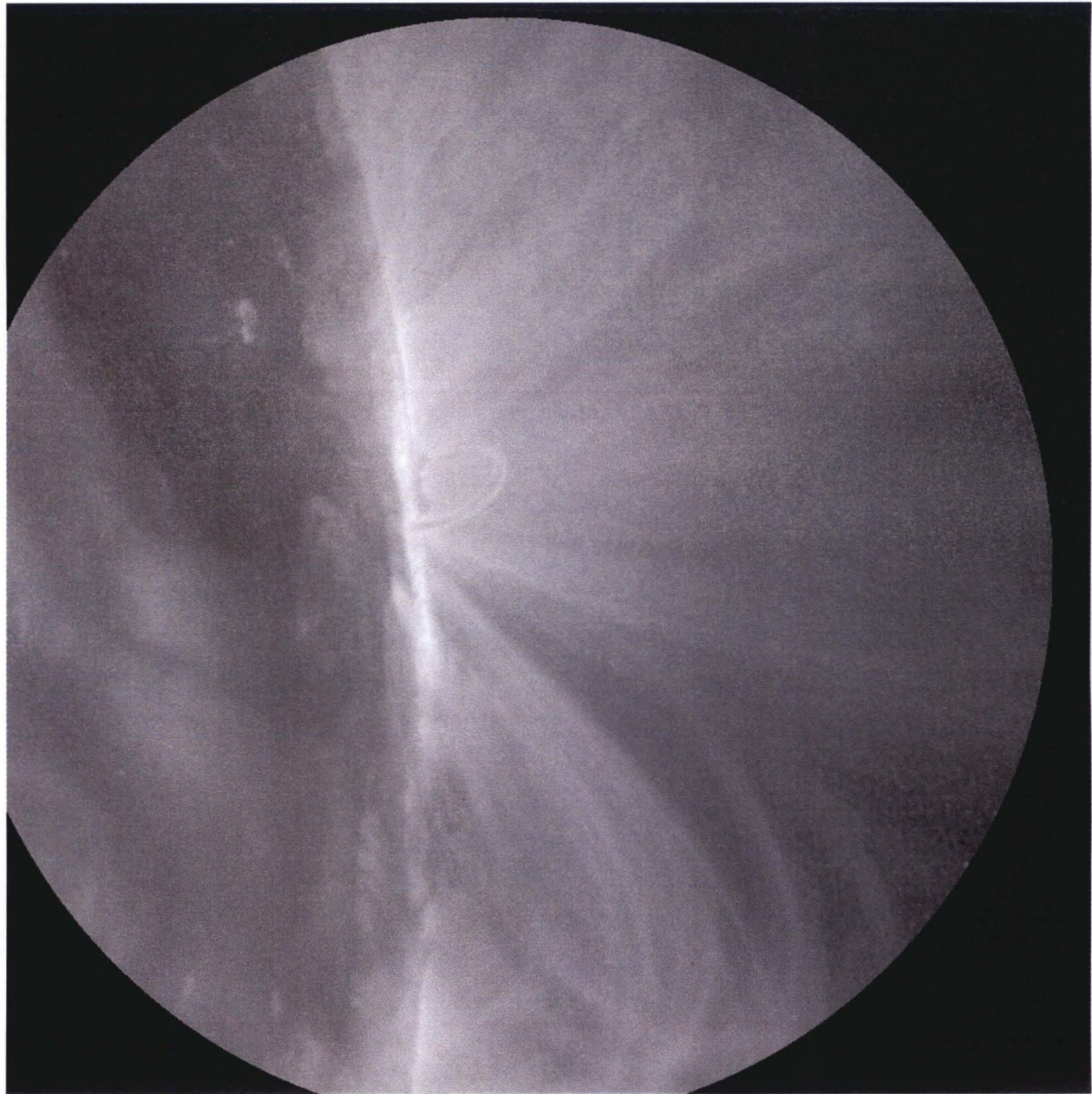
Hi-C will deliver 0.2 arcsec resolution (0.1 arcsec/pixel) of the EUV corona.

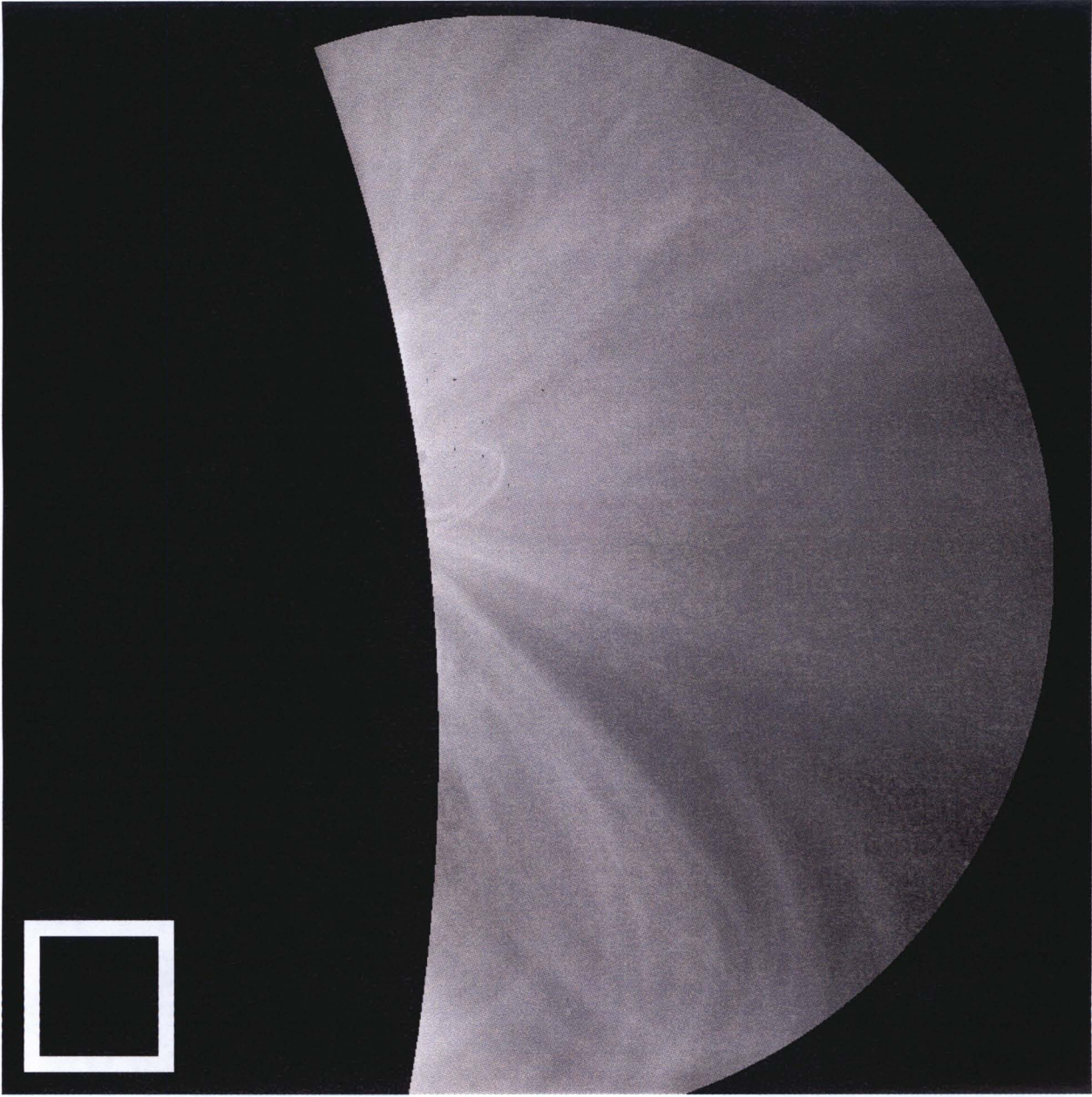
This **will reveal** whether there are two different modes of strong coronal heating in active regions or only one mode:

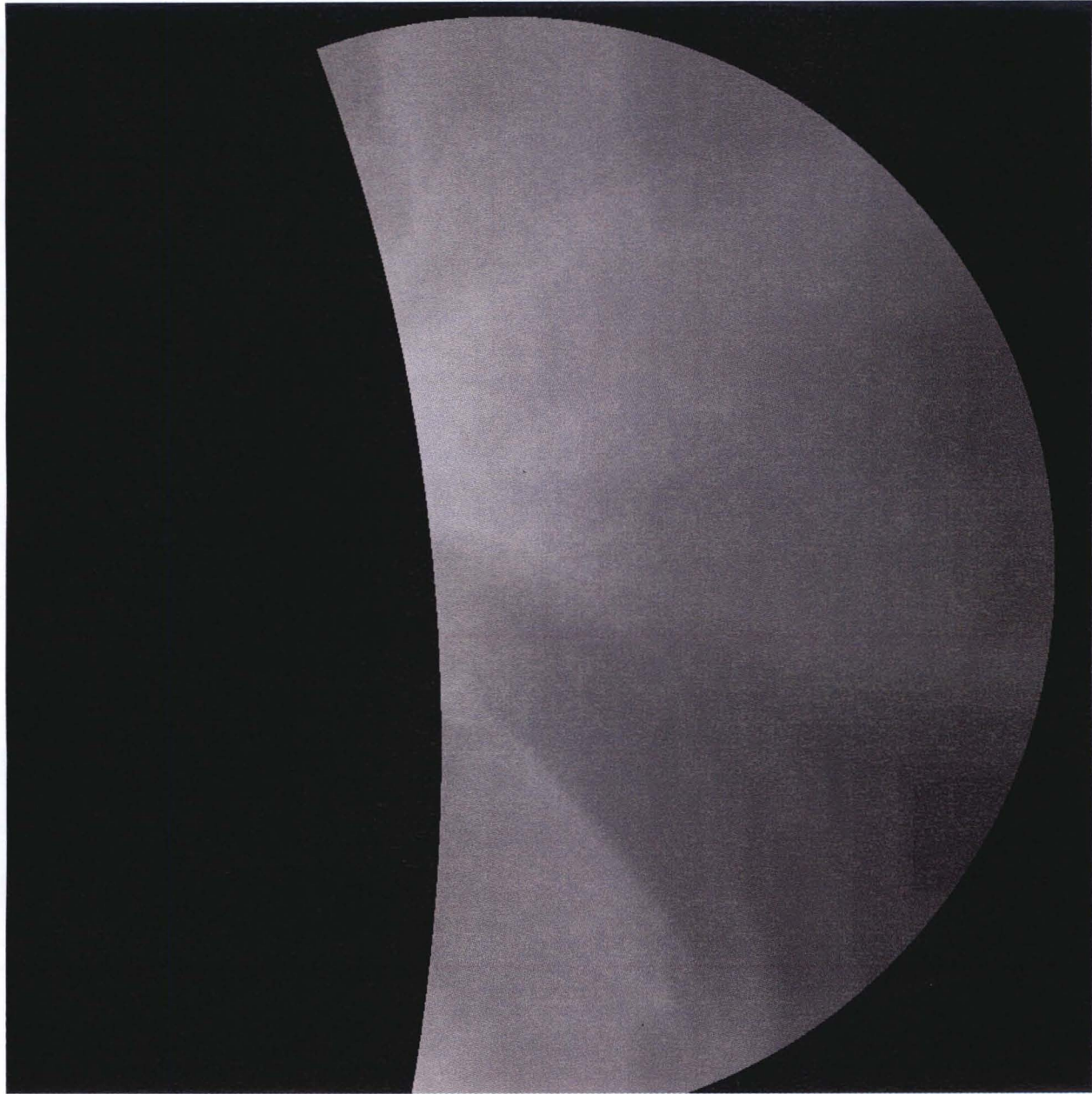
Loop heating and diffuse heating

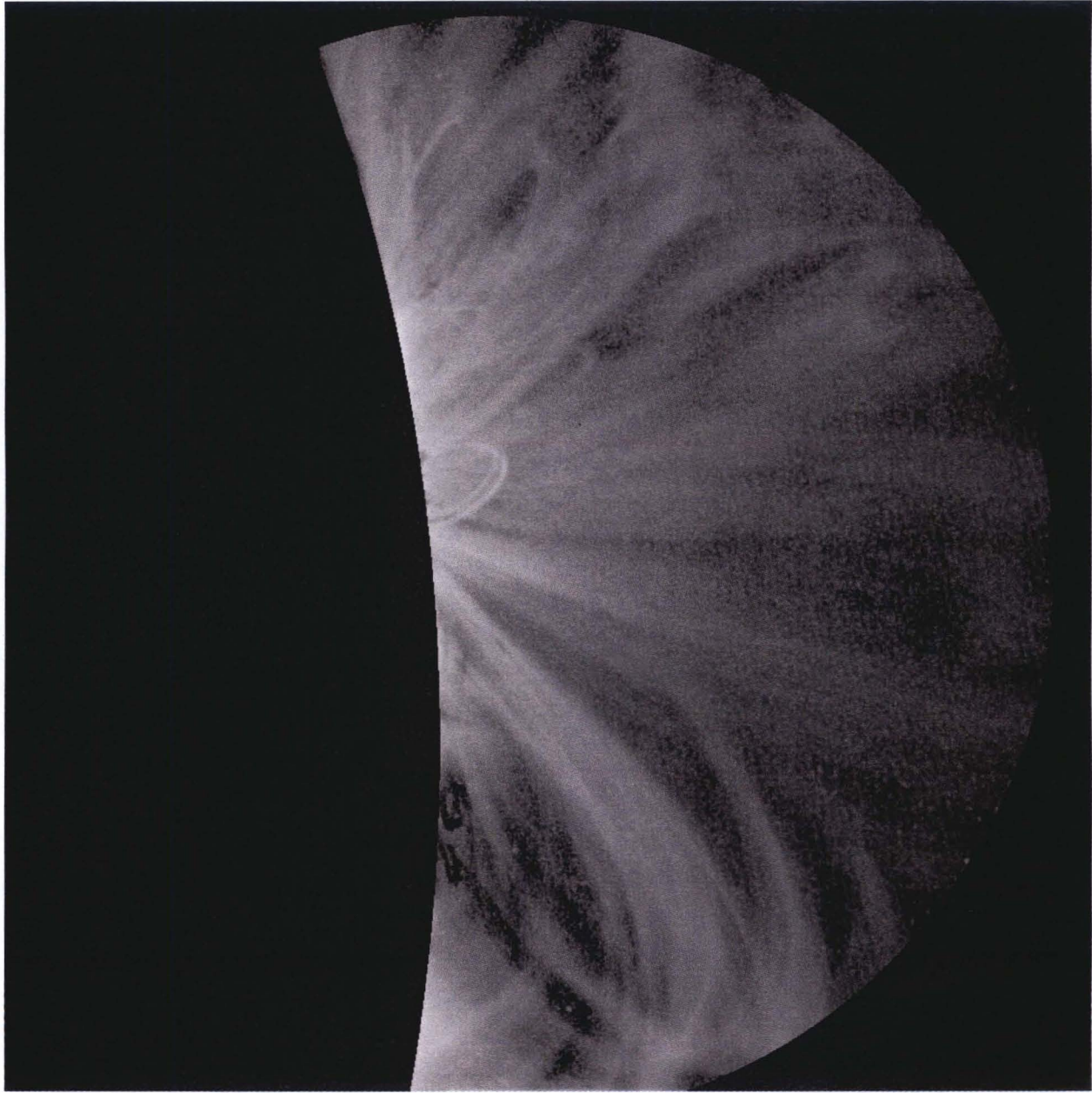
Or

Only loop heating.









SDMetrics Entry - Presentations

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