Analysis of GPI Data from the 2004 Run

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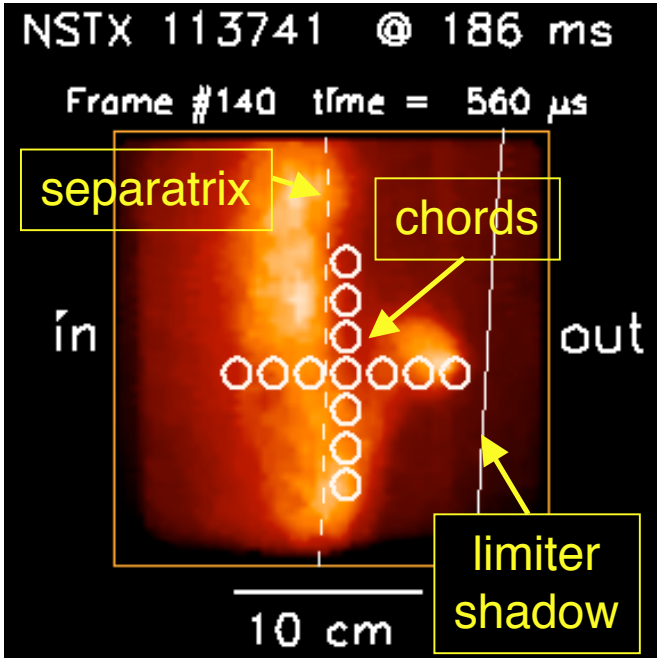
NSTX Results Review
7/27/06



~ 400 shots of 300 frame imaging data with 13 ch. fast chord data

see http://www.pppl.gov/~szweben/NSTX04/NSTX_04.html

Analysis Results This Year

- L vs. H-mode analysis (APS DPP ‘05, Zweben, PoP ‘06)
- Bicoherence analysis of chord data (White, PoP ‘06)
- Velocity field analysis of image data (Munsat, to RSI ‘06)
- Blob structure analysis of image data (Alonso, EPS ‘06)
- Blob motion analysis of image data (Grulke, EPS ‘06)
- Blob model analysis of image data (Myra, to PoP ‘06)
- DEGAS 2 modeling of image data (Stotler, JNM ‘06)

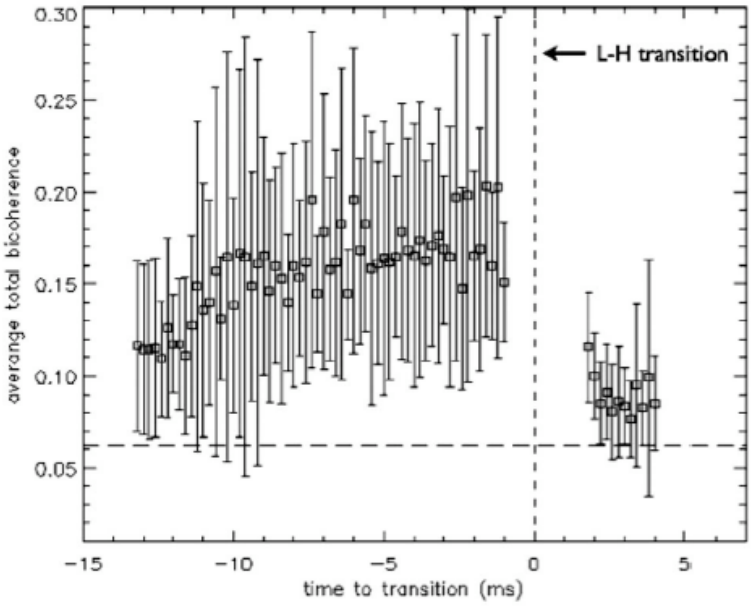
≤ 30 shots analyzed in detail so far !

Bicoherence Analysis of L-H Transition

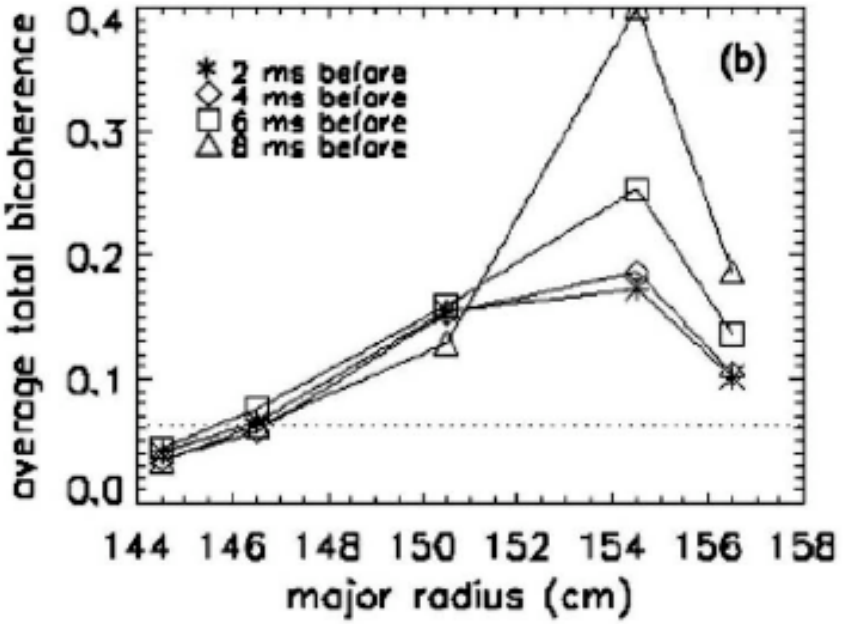
- Looked for an increase in bicohrence before L-H transition, as seen in probe data from DIII-D (Moyer, PRL '01)

- Did ***not*** see this in NSTX, within time and space resolution available from chord array for L-H transition shots

bicoherence vs. time



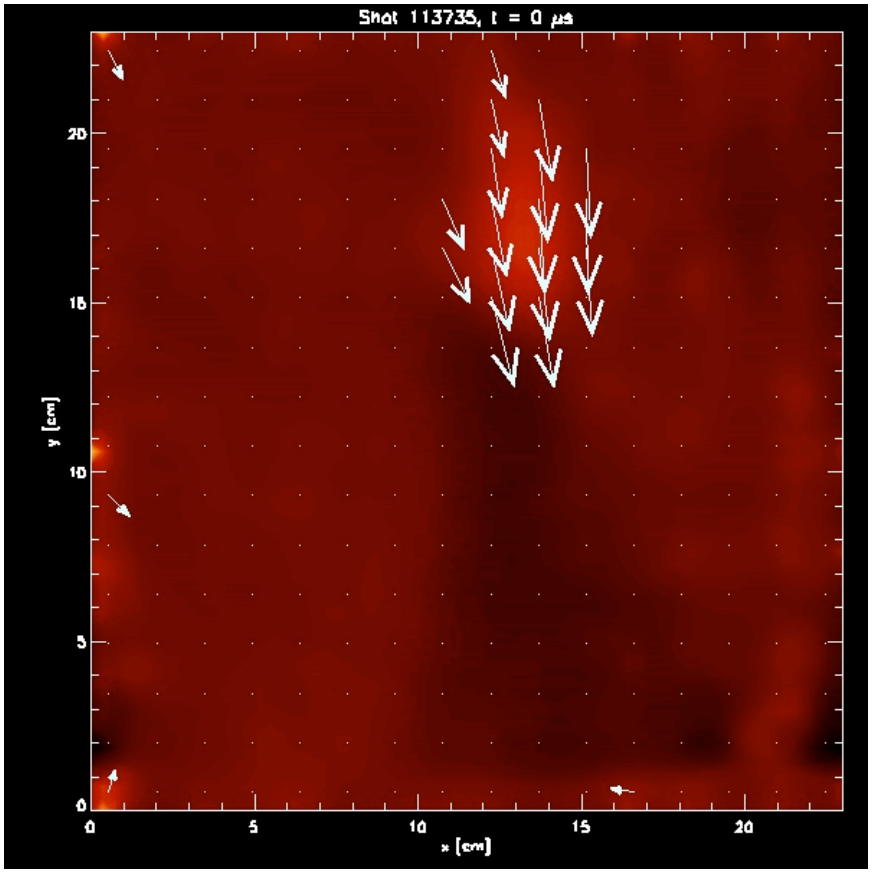
bicoherence vs. radius



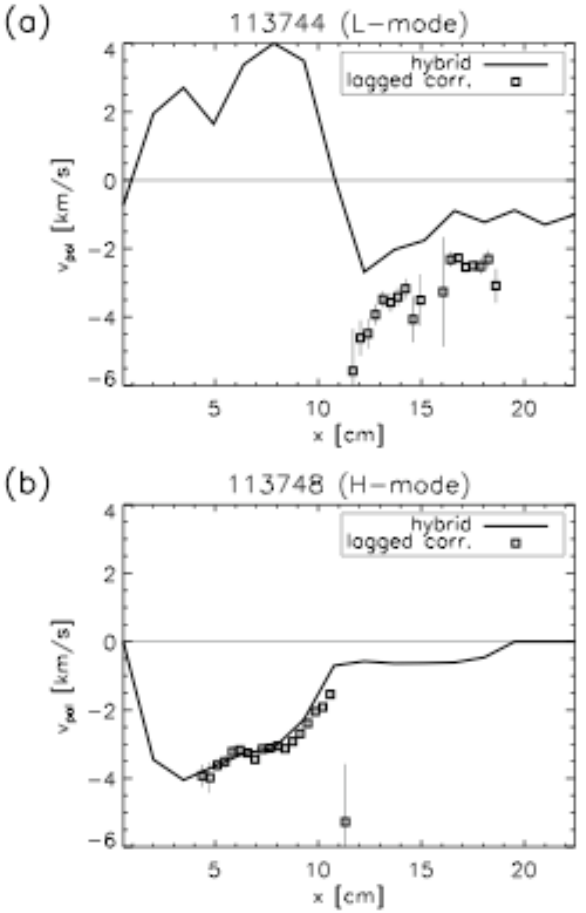
Velocity Field Analysis of Image Data

- Hybrid code (optical flow + 2-D ‘tiling’) works for ≤ 6 km/sec

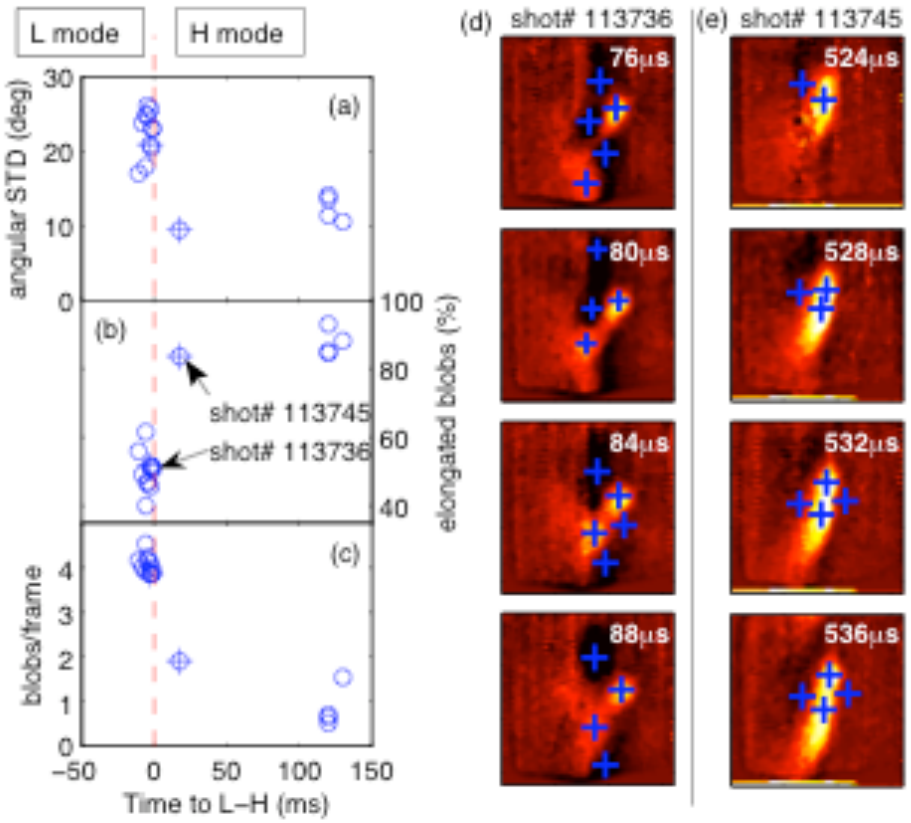
2-D velocity fields



vs. cross-correlation



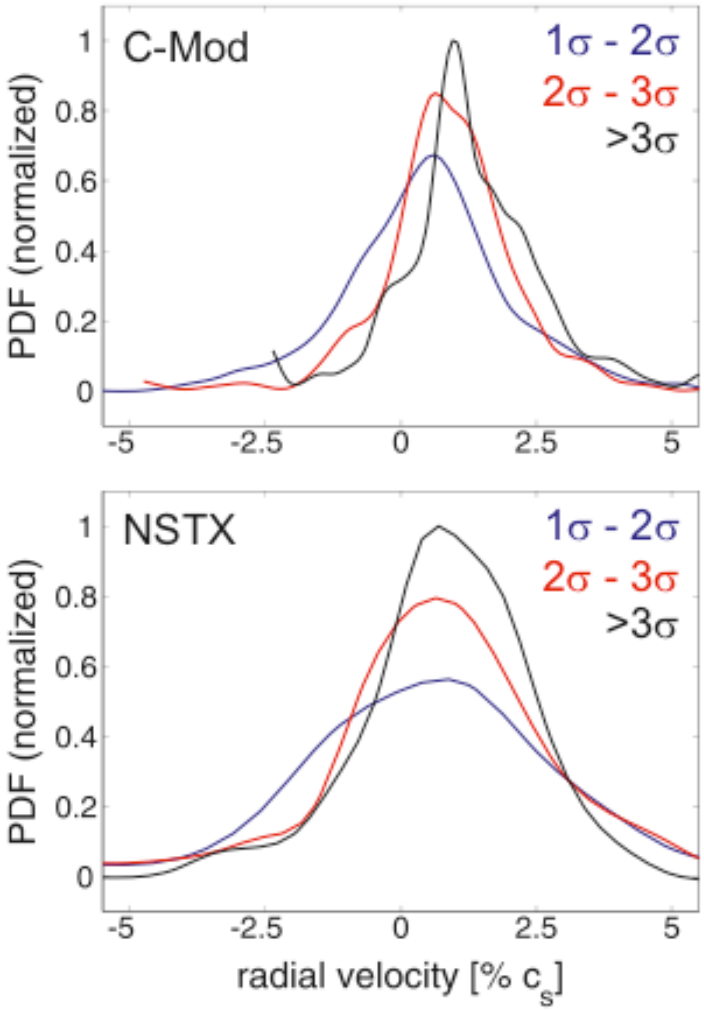
Blob Structure Analysis of Image Data



- 2-D wavelet analysis sorts blobs into sizes, e.g. k=(1.2±0.5) cm^{-1}
- Blob shape is more elongated in H-mode compared to L-mode
- Number of blobs is reduced in H-mode compared to L-mode

Figure 4. $k = (1.2 \pm 0.5)$ cm^{-1} blobs statistics for different NSTX shots in L and H mode regimes (a)-(c). Image series (e) and (d) are sample sequences for the shots marked in (b). Detected $k \sim 1.2$ cm^{-1} structures are marked with a blue cross.

Blob Motion Analysis of Image Data



- Blob V_{rad}/C_s ~ 1-2% in NSTX, similar to C-Mod
- Little change of V_{rad}/C_s with size or amplitude of blobs in NSTX
- Comparison with 2-D ESEL turbulence code in progress

Further Analysis of 2004 GPI Data

- Physics of 2-D velocity fields (Munsat)
  - zonal flows, radial flows, $\nabla \bullet V$, $\nabla x V$, etc.
- Origin of blobs (Stoltzful-Dueck, Krommes)
  - comparison with 2-D turbulence code
- Variation with plasma parameters/heating (Agostini)
- Further blob velocity analysis (Windisch)