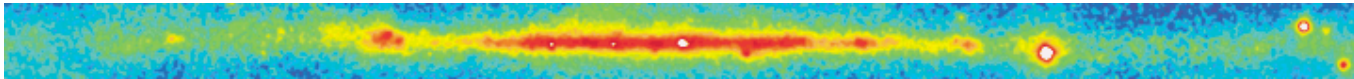
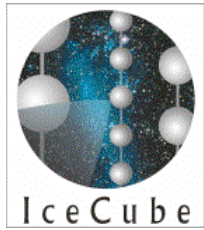




The Cygnus Region: An Extended TeV Source



John Kelley
September 2, 2005



Milagro Results



- ICRC: Milagro presents 5.5σ detection of extended TeV γ source
- Total flux is 2x Crab! (brightest in sky)
- Extended nature means HESS, other IACT have difficulty imaging

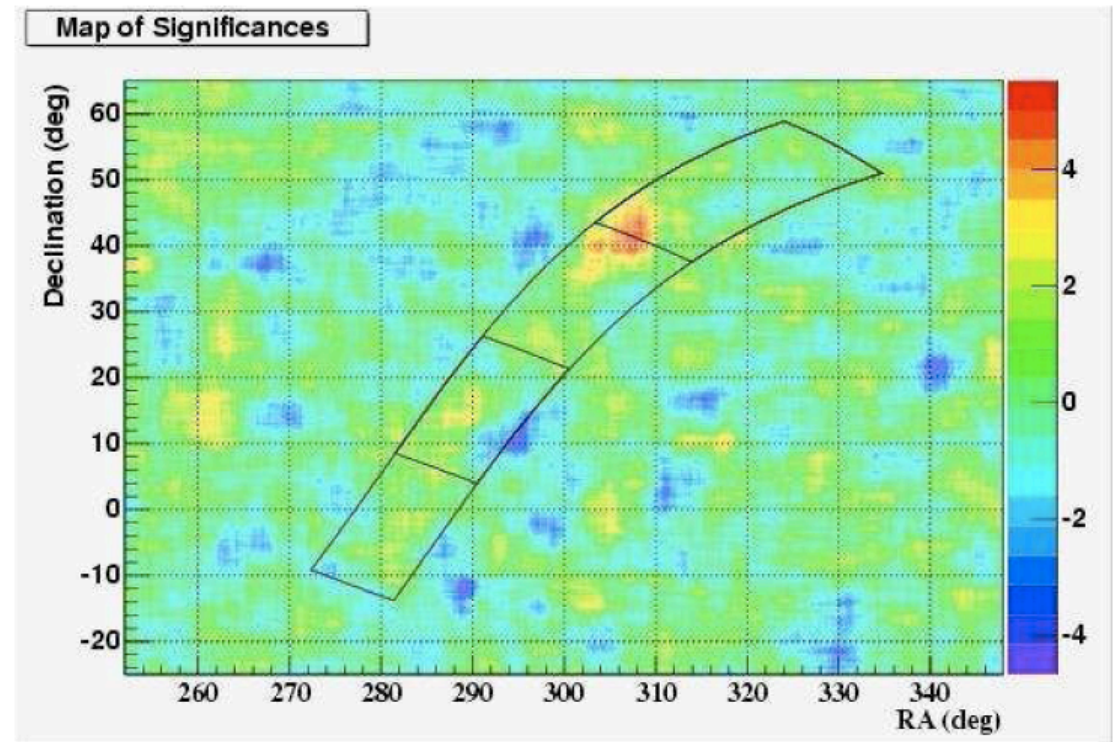
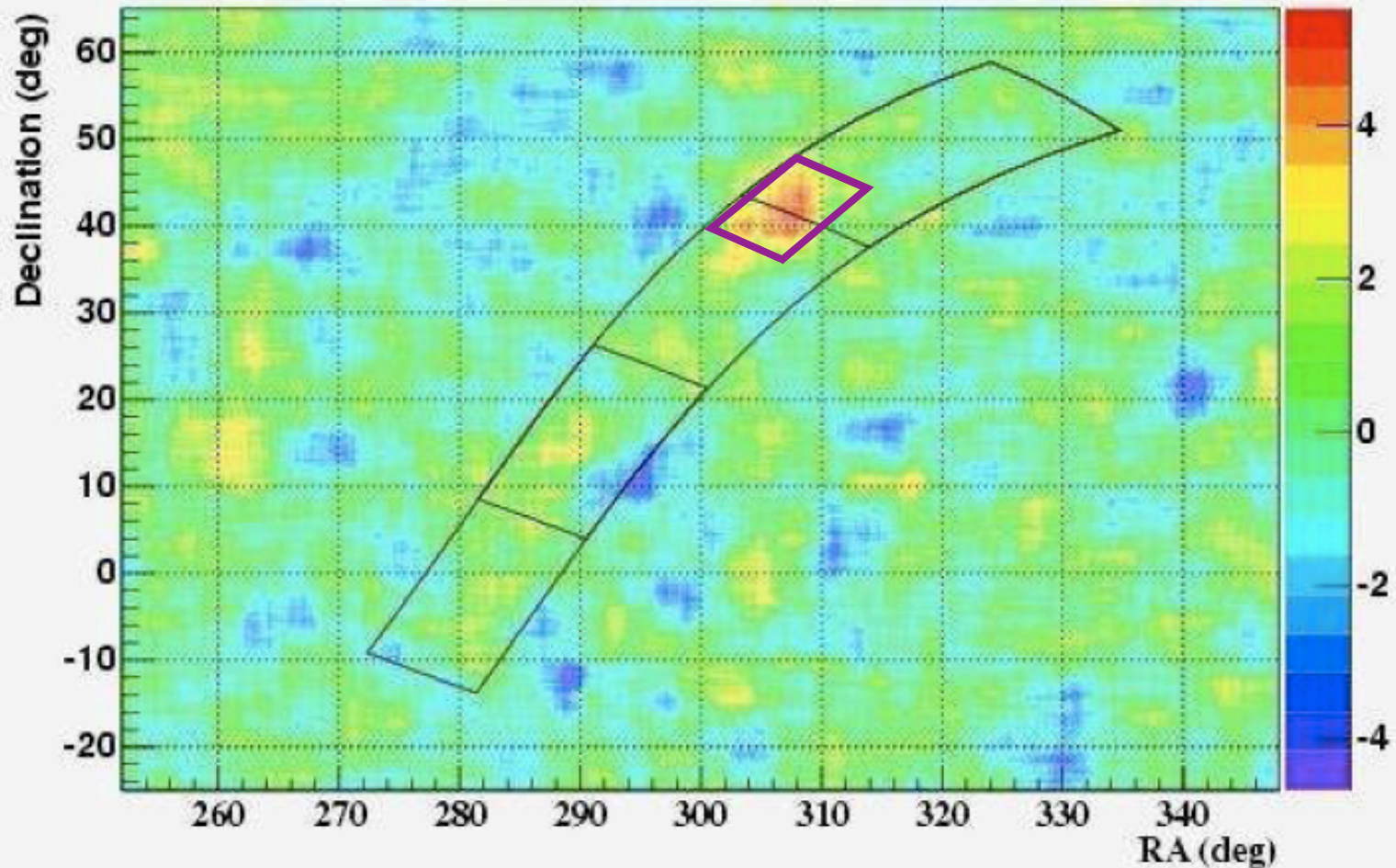
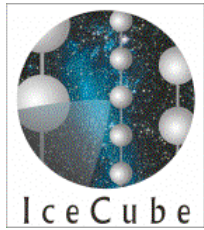


Figure from astro-ph/0503244

Map of Significances



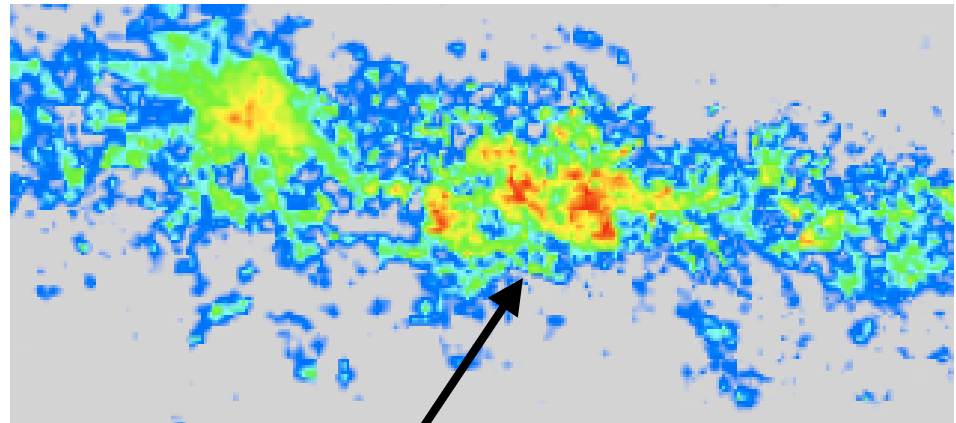
- In galactic coordinates, region extent is approx. $b \in (-1^\circ, 4.5^\circ)$, $l \in (74^\circ, 85^\circ)$
- Corresponds to Cygnus region of galactic plane

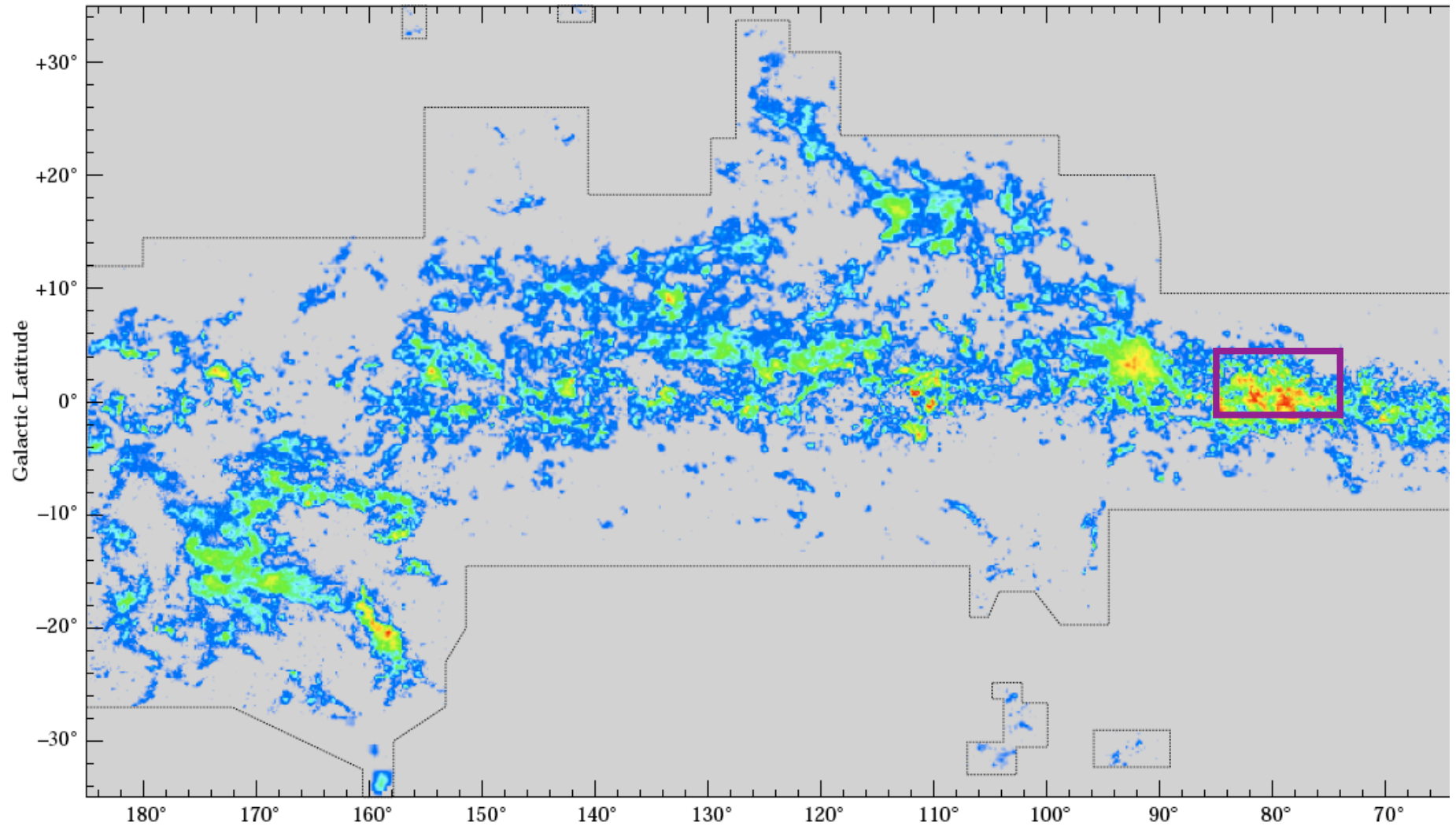


CO Maps

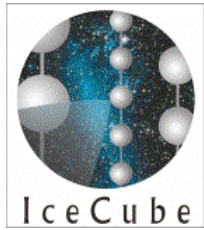


- Molecular CO surveys (radio) indicate dense cloud in same location
- Suggestive of hadronic origin



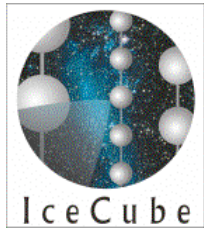


- Purple box shows Milagro region from slide 3
- CO data from Dame, Hartmann, and Thaddeus, [astro-ph/0009217](https://arxiv.org/abs/astro-ph/0009217)



Neutrino Implications

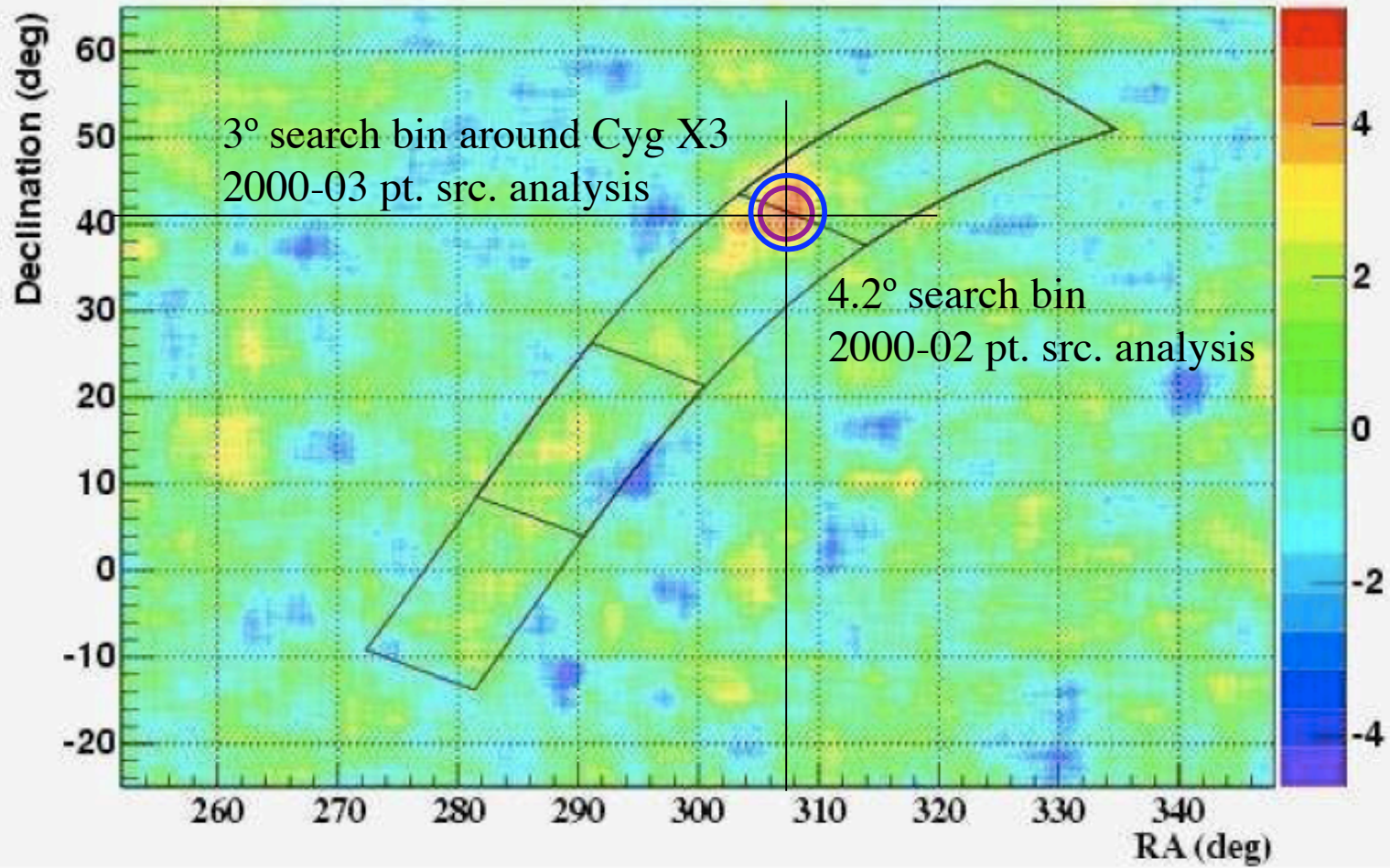
- Extended source ($\sim 5^\circ$ by 10°) means point source searches are less effective
- Can possibly utilize some of galactic plane machinery to examine this region (instead of entire plane)
- Don't look at longitude distribution!



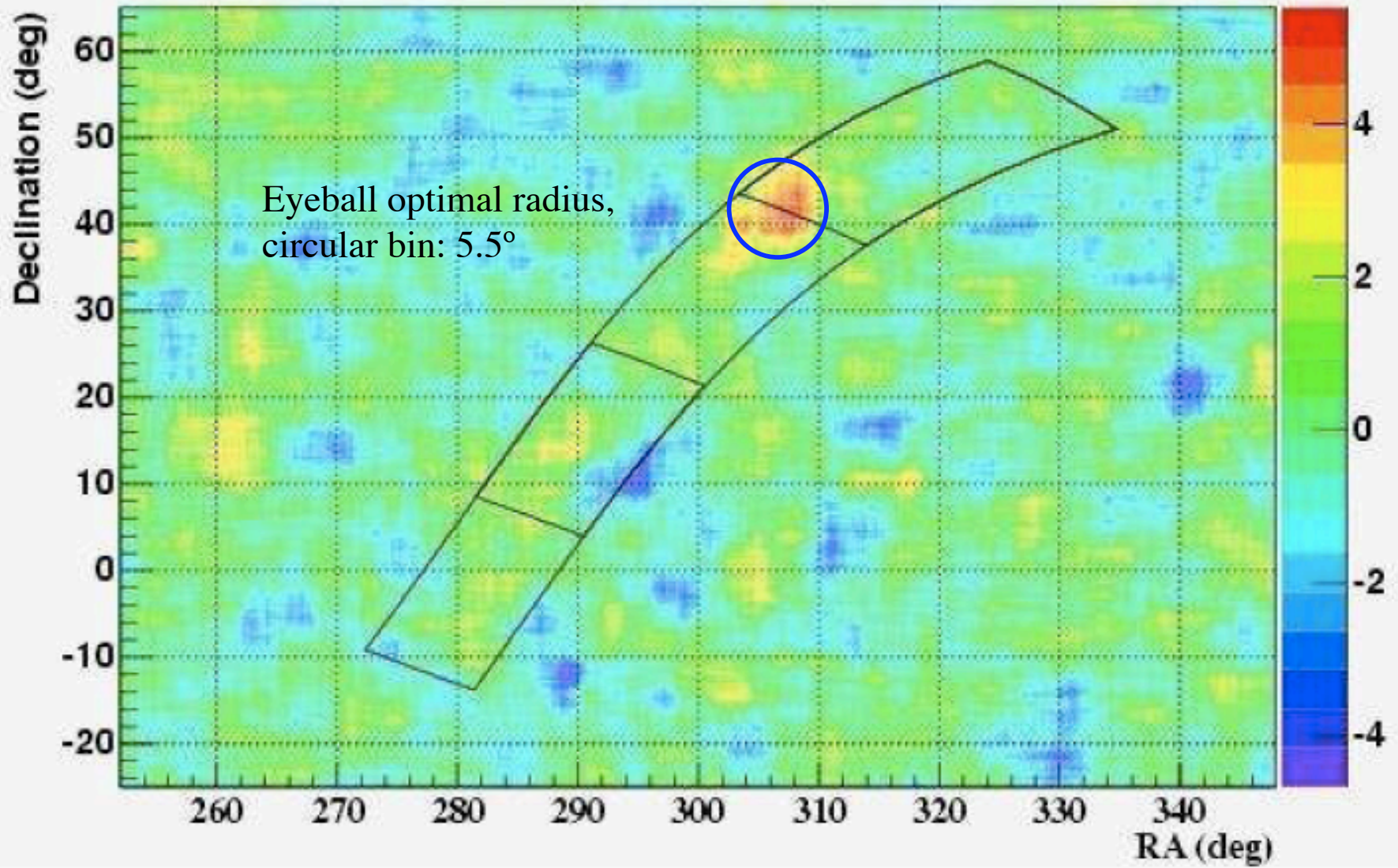
Ideas on How to Proceed

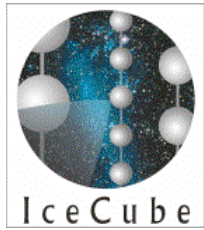
- Define signal region precisely by using Milagro results and CO maps
- Determine how best to generate signal MC (current line source technique not OK)
- Re-optimize on-source region
- Request “re-unblinding”

Map of Significances



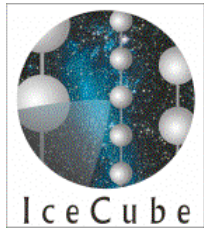
Map of Significances





What We've Seen

- For a 4σ marginal discovery, we would need 35 events on a background of 16.7 (2000-03 data sample)
- Zeuthen point source search would have seen a moderate excess of 10-11 events on 4.96 from Cyg X-3 (**reality: 6**)
- 2000-02 (You-Ren) sample: given what we need for extended source discovery, we would have seen 6-7 events on 1.29 (**reality: 1**)



Conclusions

- Existing point source searches not optimal, but most likely sufficient (for existing data)
- Should consider defining new on-source region for future point-source searches, though