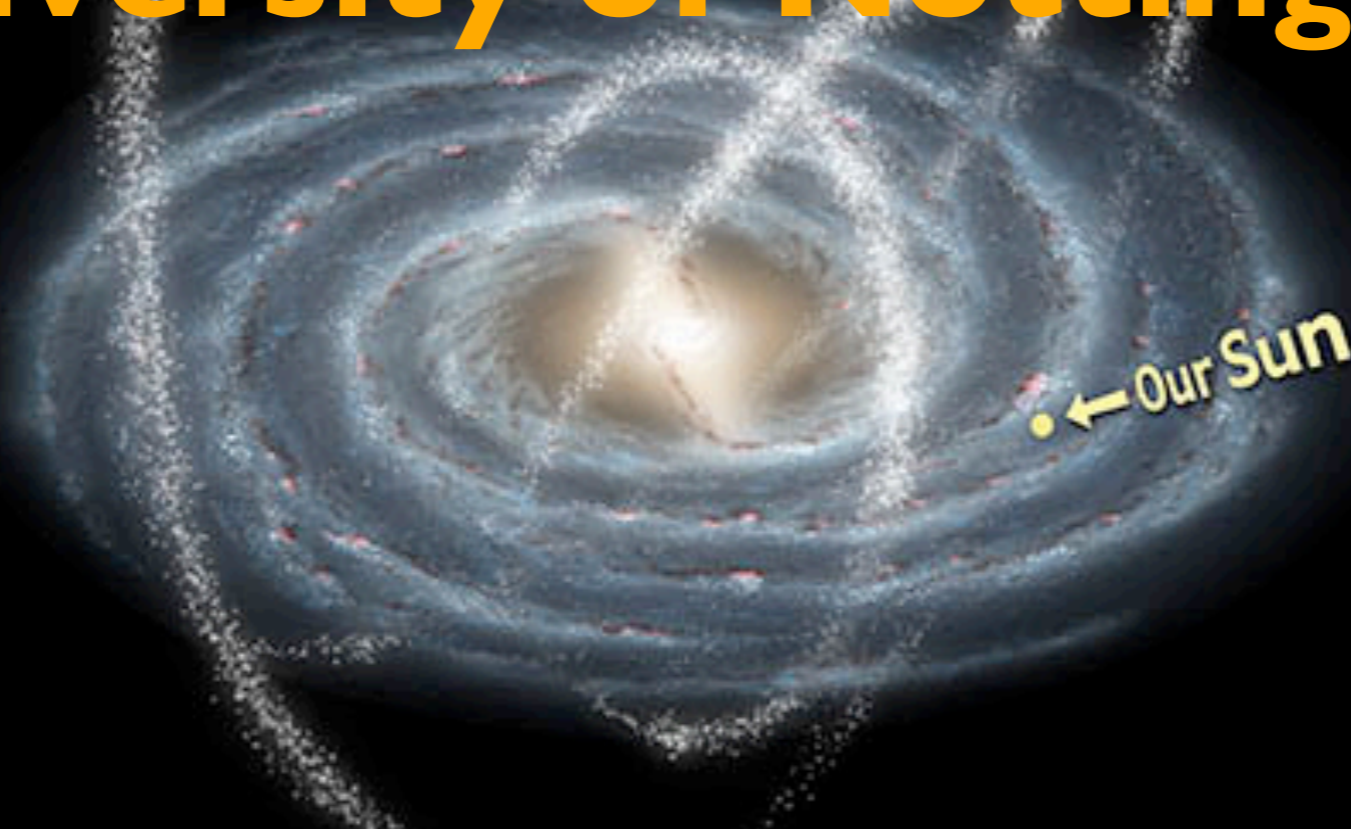


Constraining the Milky Way halo with thin streams

Hanni Lux

University of Nottingham



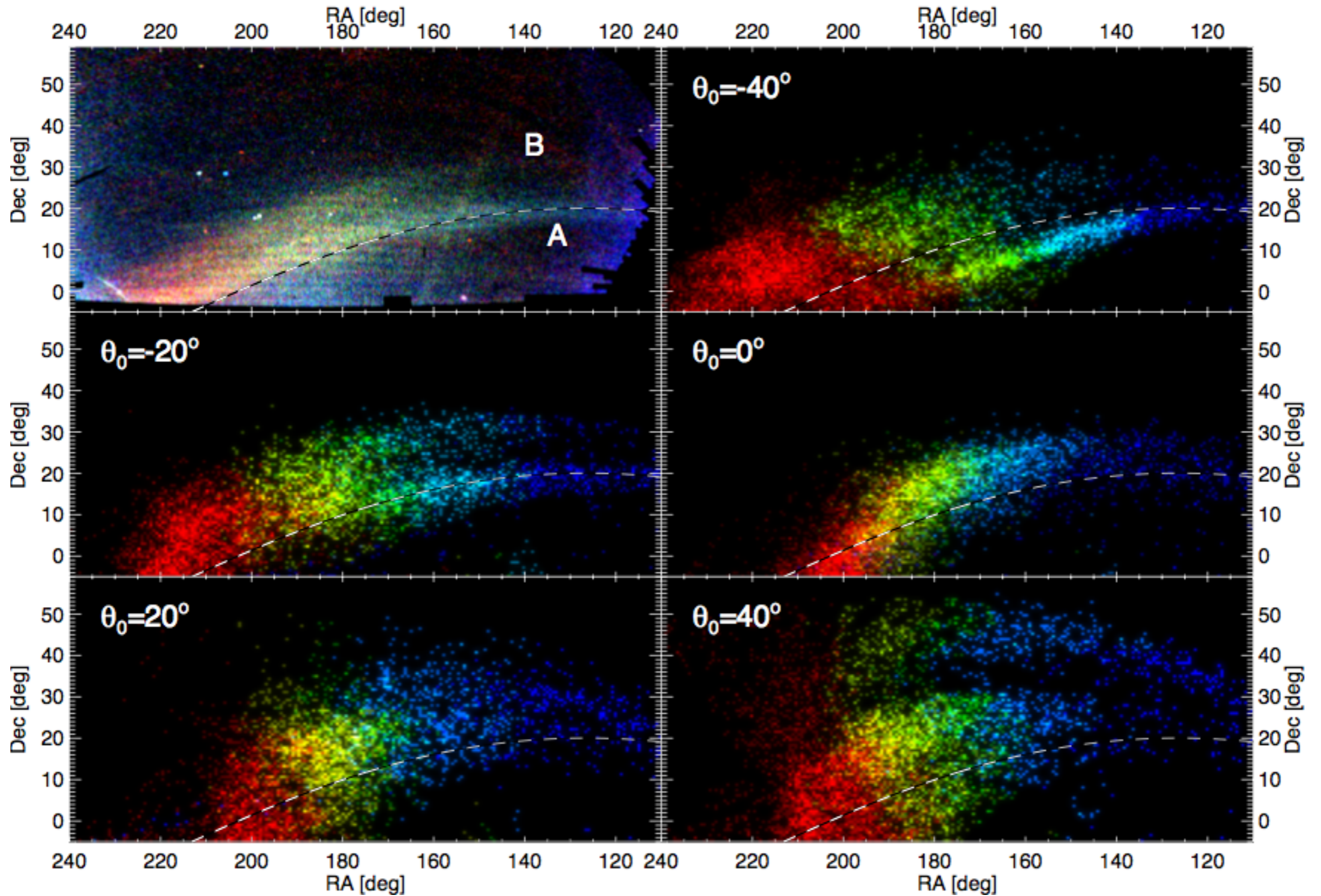
in collaboration with Justin Read,
George Lake and Kathryn Johnston



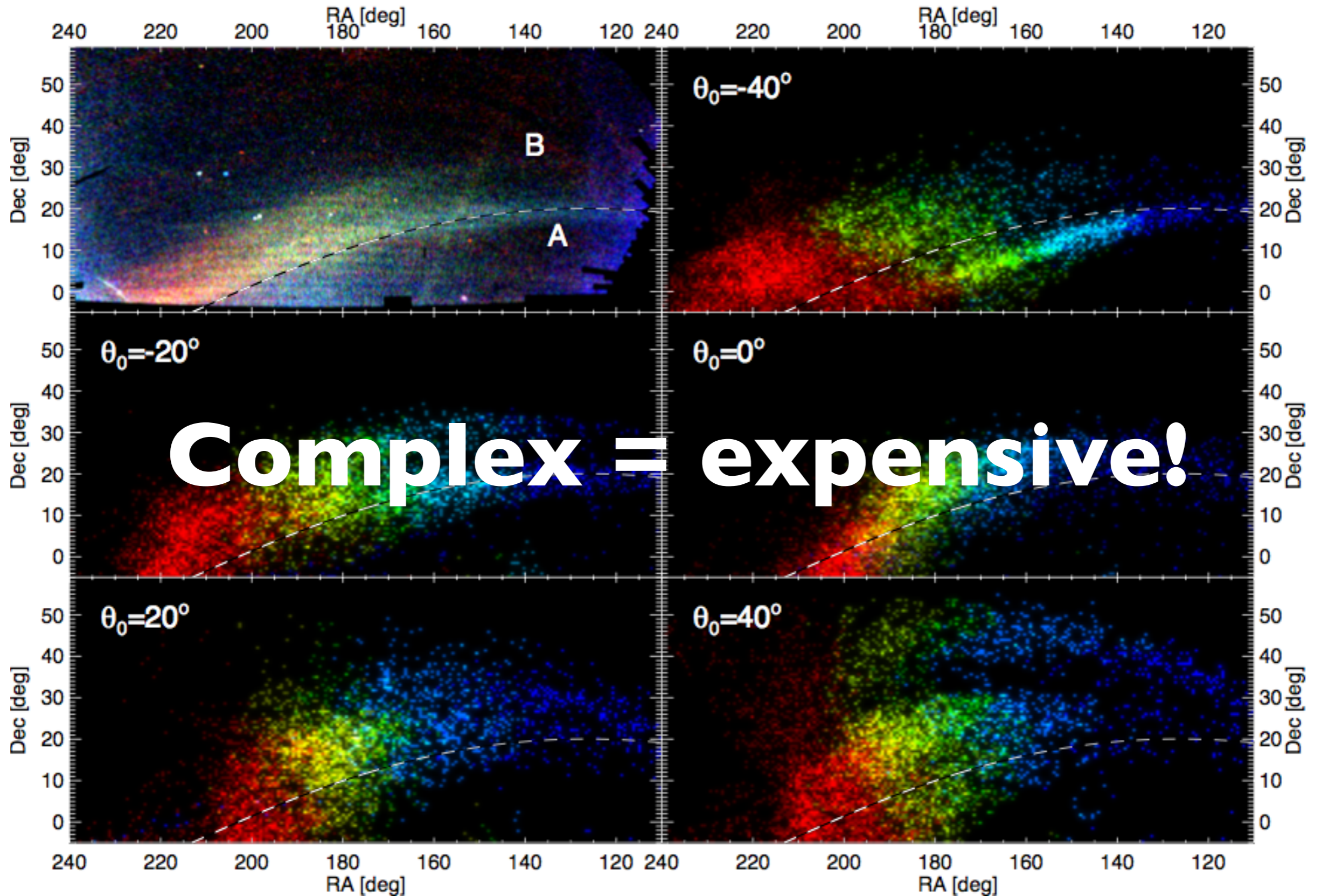
Sagittarius | Previous Work

- **Ibata 2001 - spherical halo**
- **Helmi 2004 - prolate halo, based on velocity data**
- **Johnston et al. 2005 - oblate halo, spatial distribution of M-stars**
- **Fellhauer et al. 2006 - spherical halo assume bifurcation = two different wraps**
- **Law et al. 2009/Law & Majewski 2010 - (mildly) triaxial, fitting position + radial velocity data**

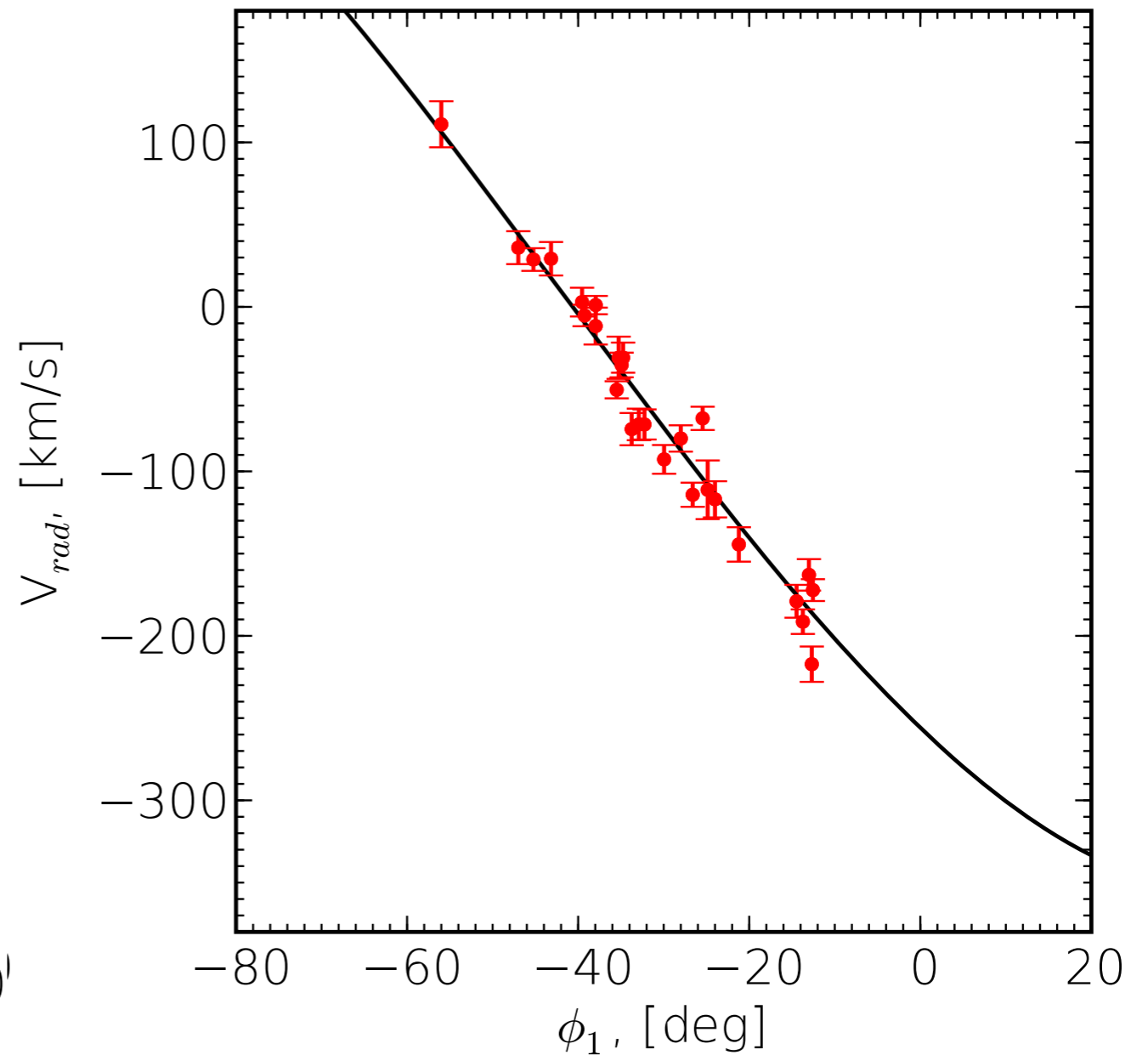
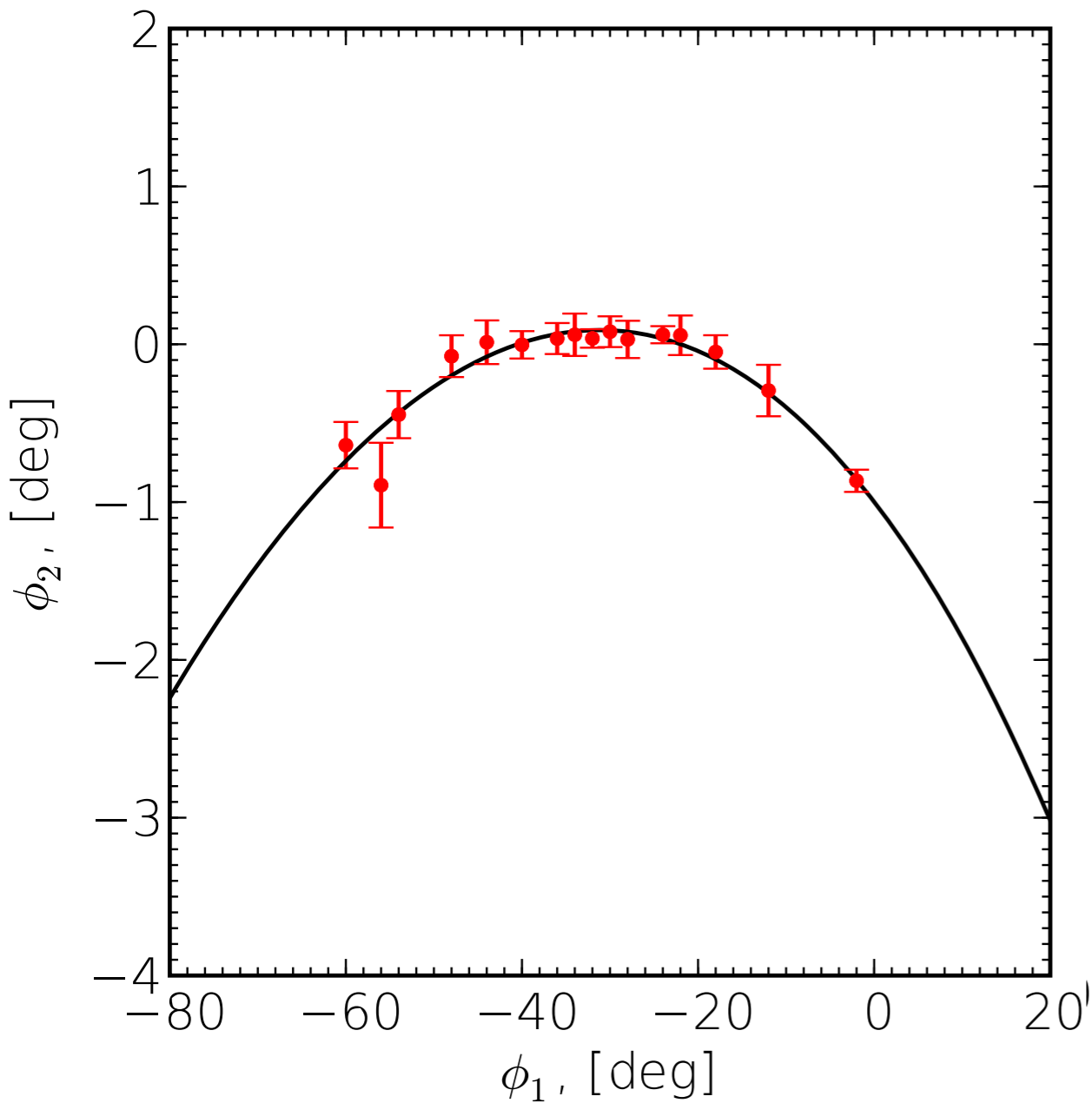
Sagittarius | Bifurcation



Sagittarius | Bifurcation



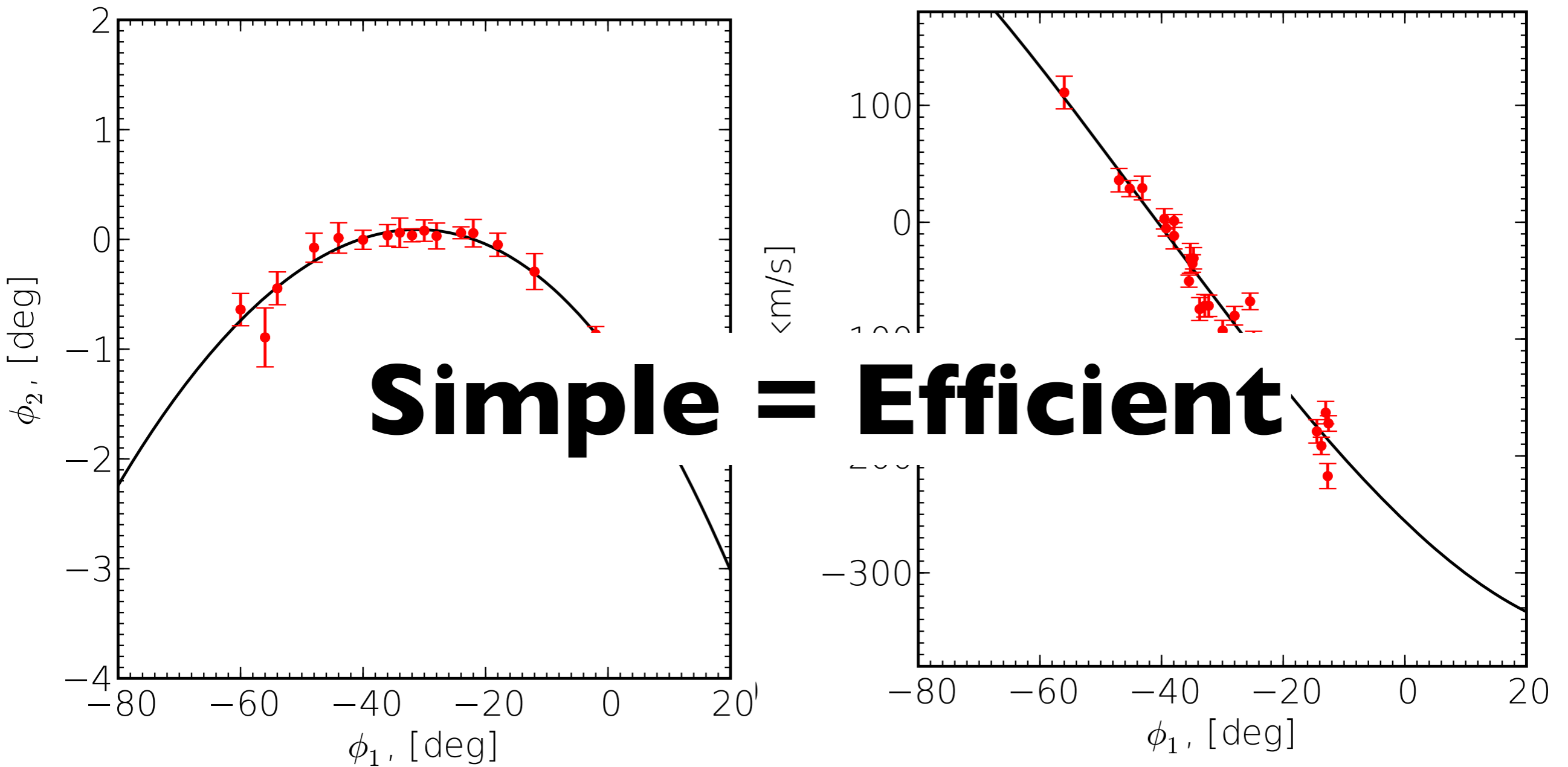
Alternatives | Previous Work



GDI; Koposov et al. 2010

also Newberg et al. 2010, Willett et al. 2009

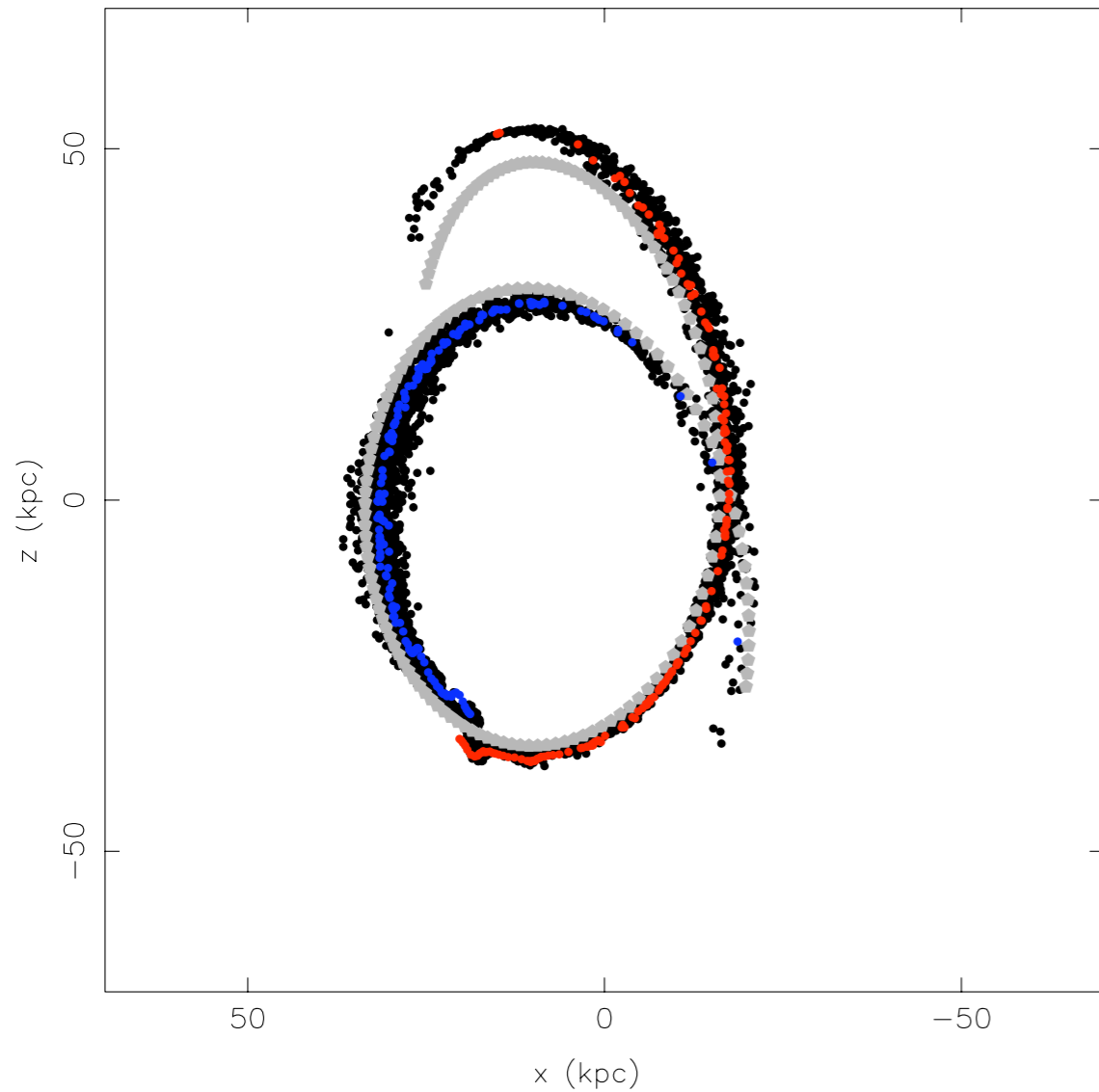
Alternatives | Previous Work



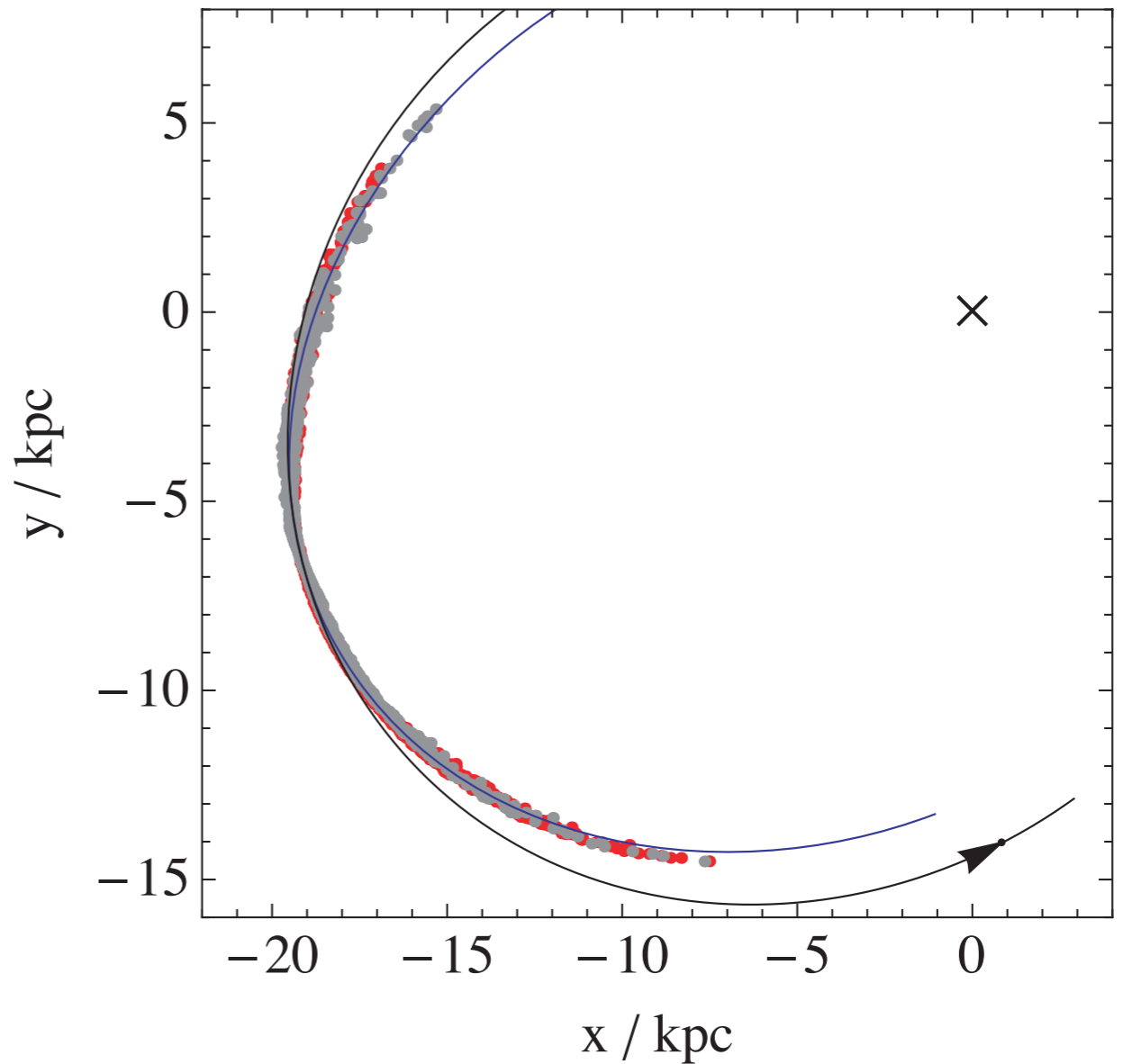
GDI; Kopolov et al. 2010

also Newberg et al. 2010, Willett et al. 2009

Alternatives | Previous Work

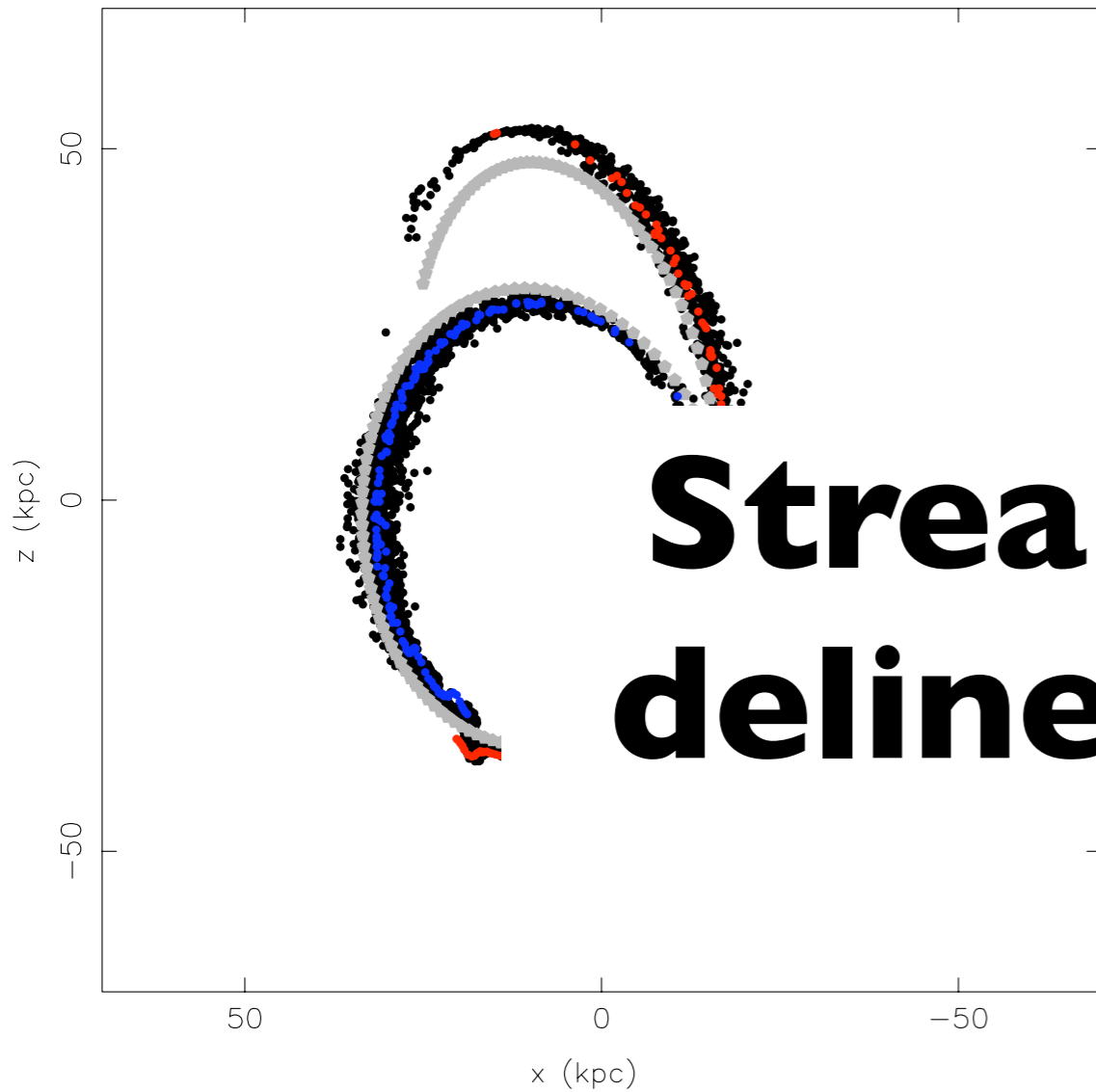


Varghese et al. 2011

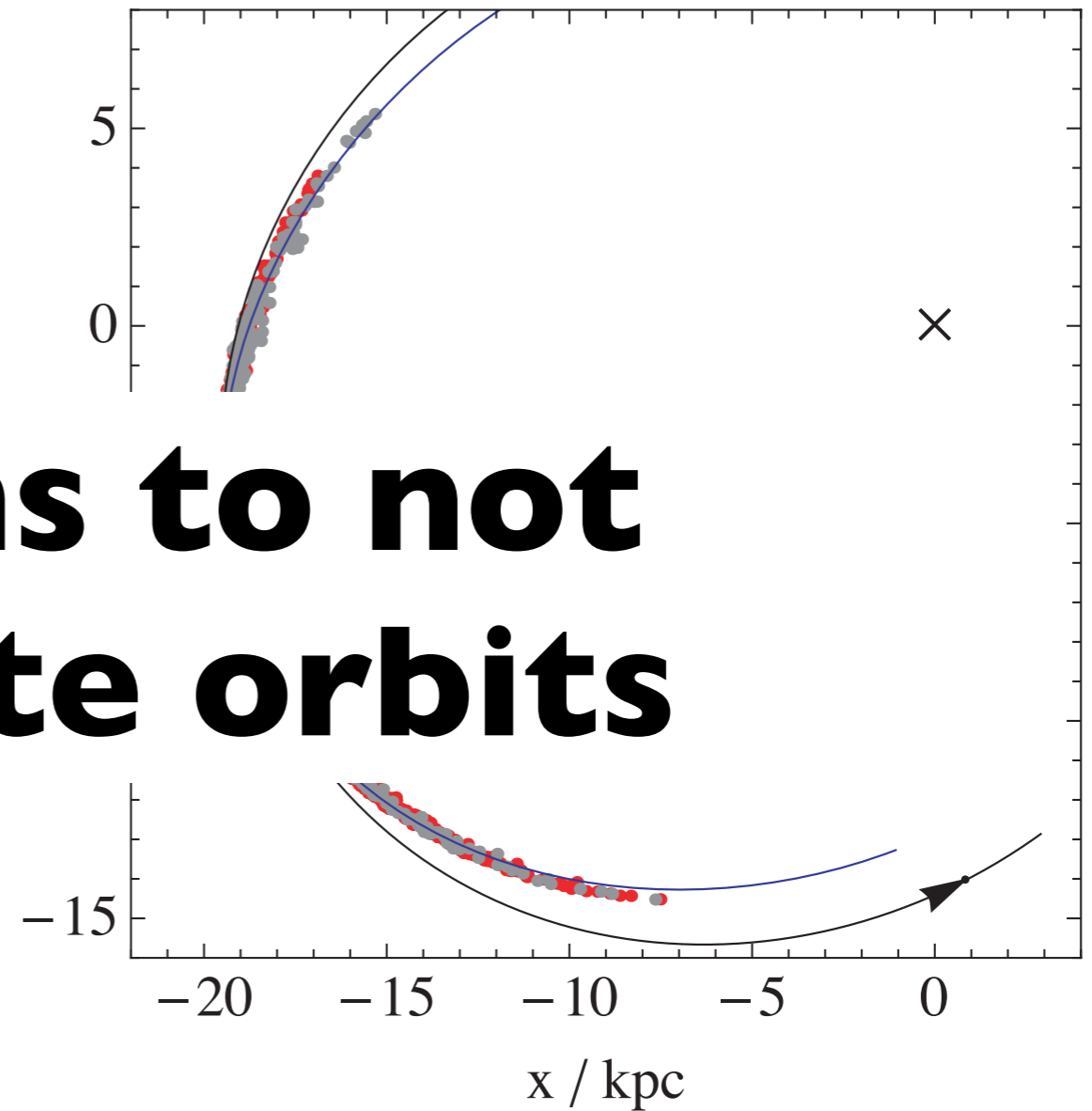


Eyre & Binney 2011

Alternatives | Previous Work



Streams to not delineate orbits



Varghese et al. 2011

Eyre & Binney 2011

Alternatives | **This Work**

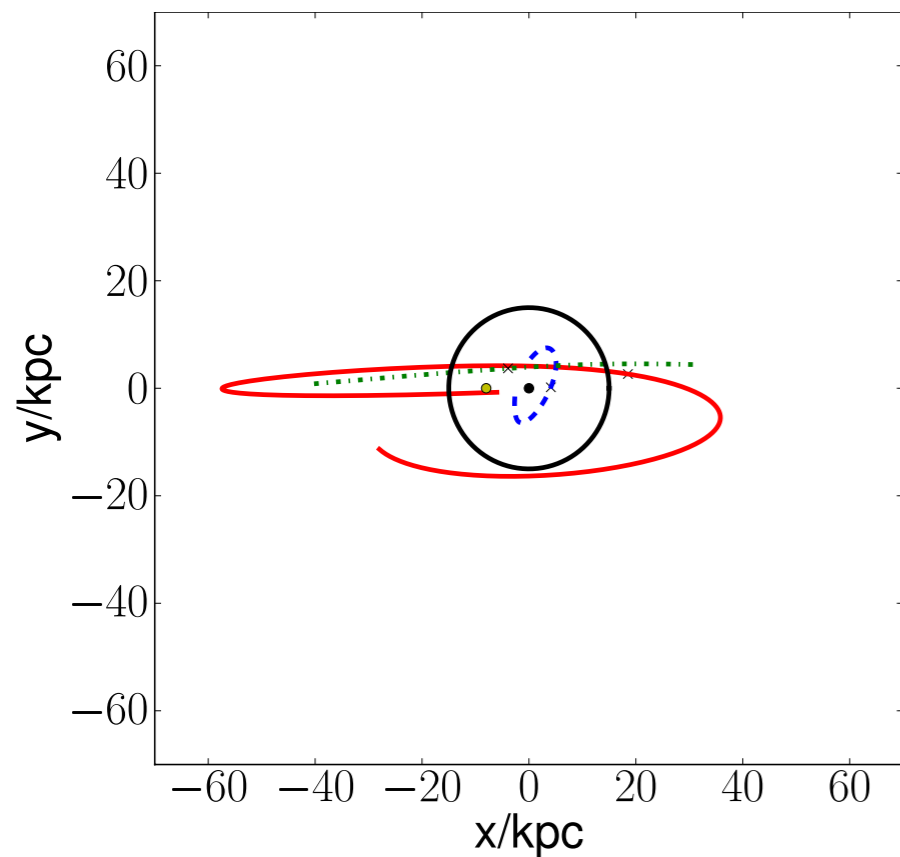
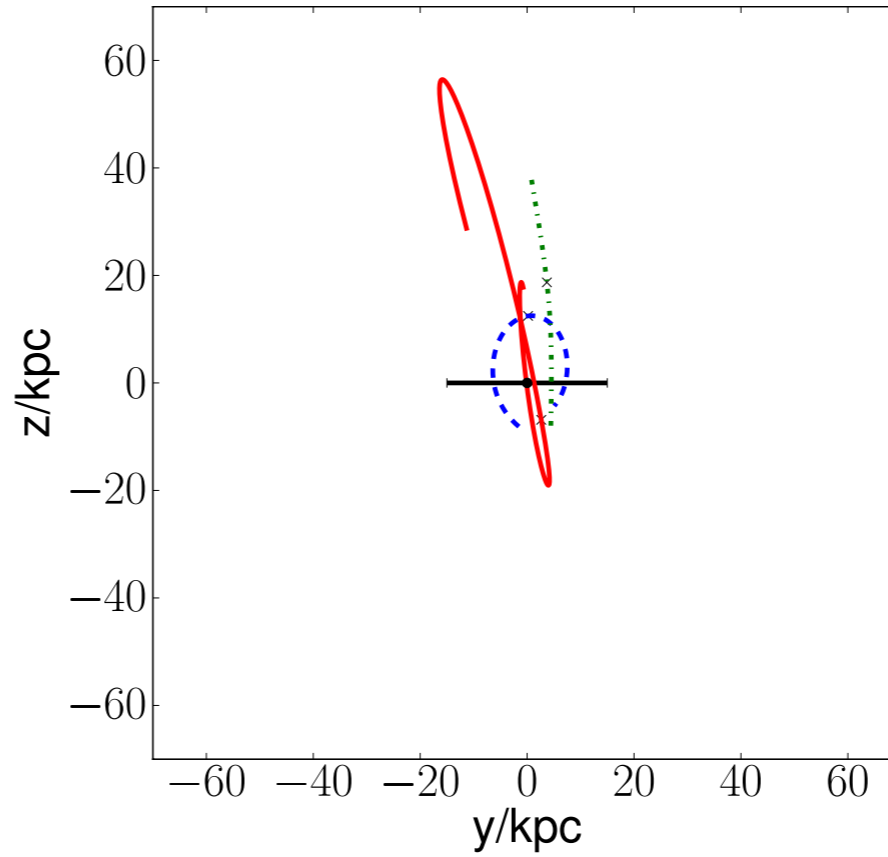
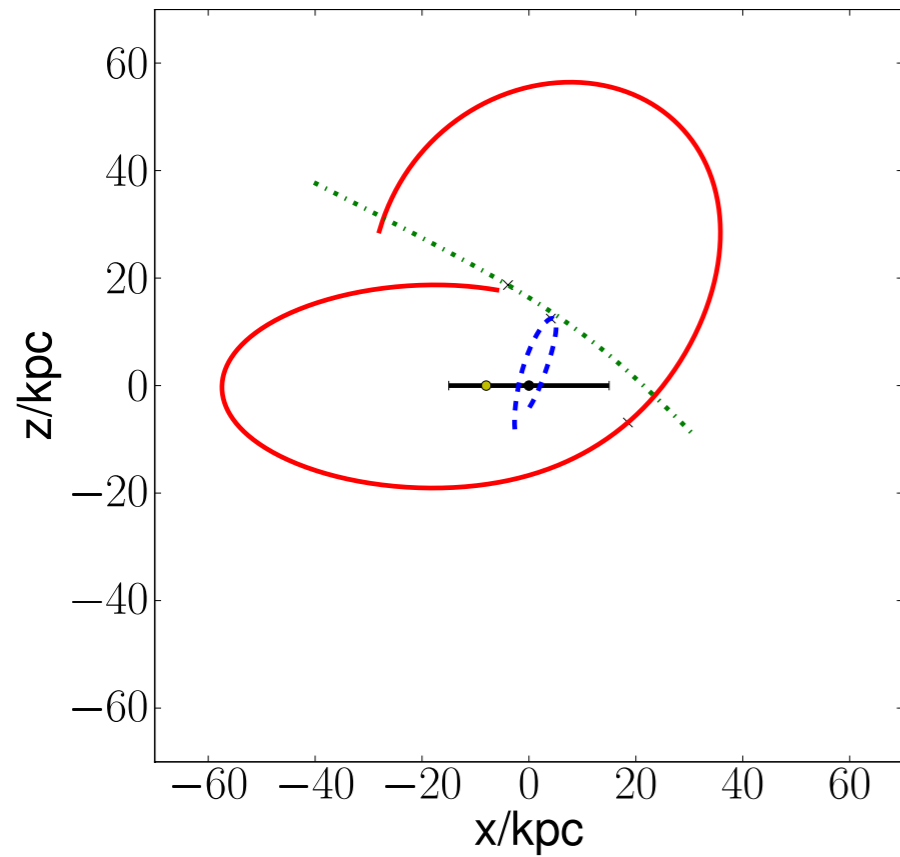
- **`thin stream approximation' = stream-orbit-offset significantly less than errors:**
 - **(half) the stream width**
 - **radial velocity dispersion**
 - **distance + proper motion measurement errors**

Lux et al. 2012, in prep

Thin Streams | Criteria

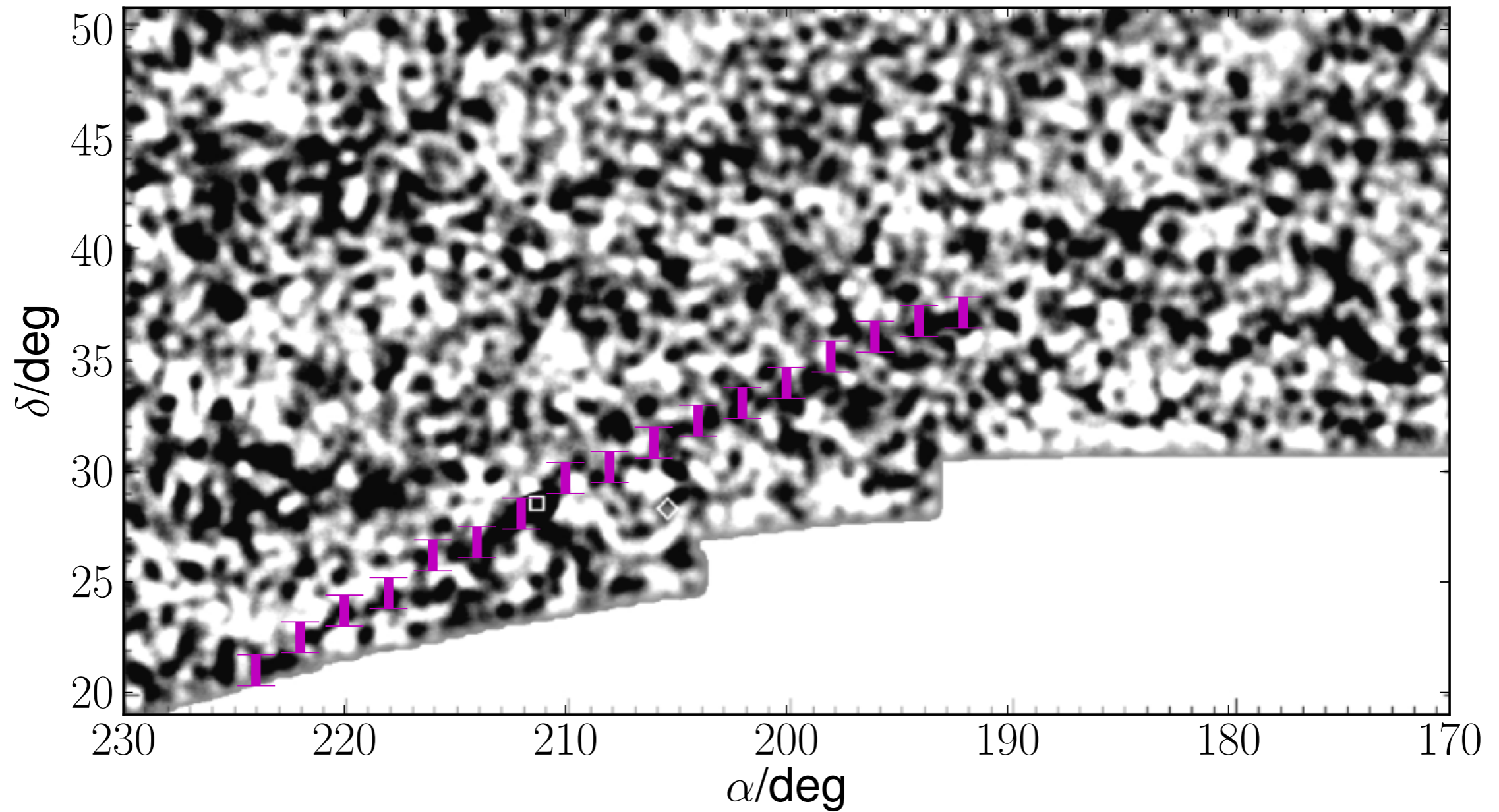
- **Globular cluster stream** $M \leq 10^5 M_{\odot}$
- **Low eccentricity; no cloudy morphology**
- **advantageous orbital alignment**
- **High inclination with respect to the disc** $\gtrsim 45^{\circ}$
- **Distant from the disc** $d \gtrsim 10 \text{ kpc}$
- **more?**

Thin Streams | Orientation



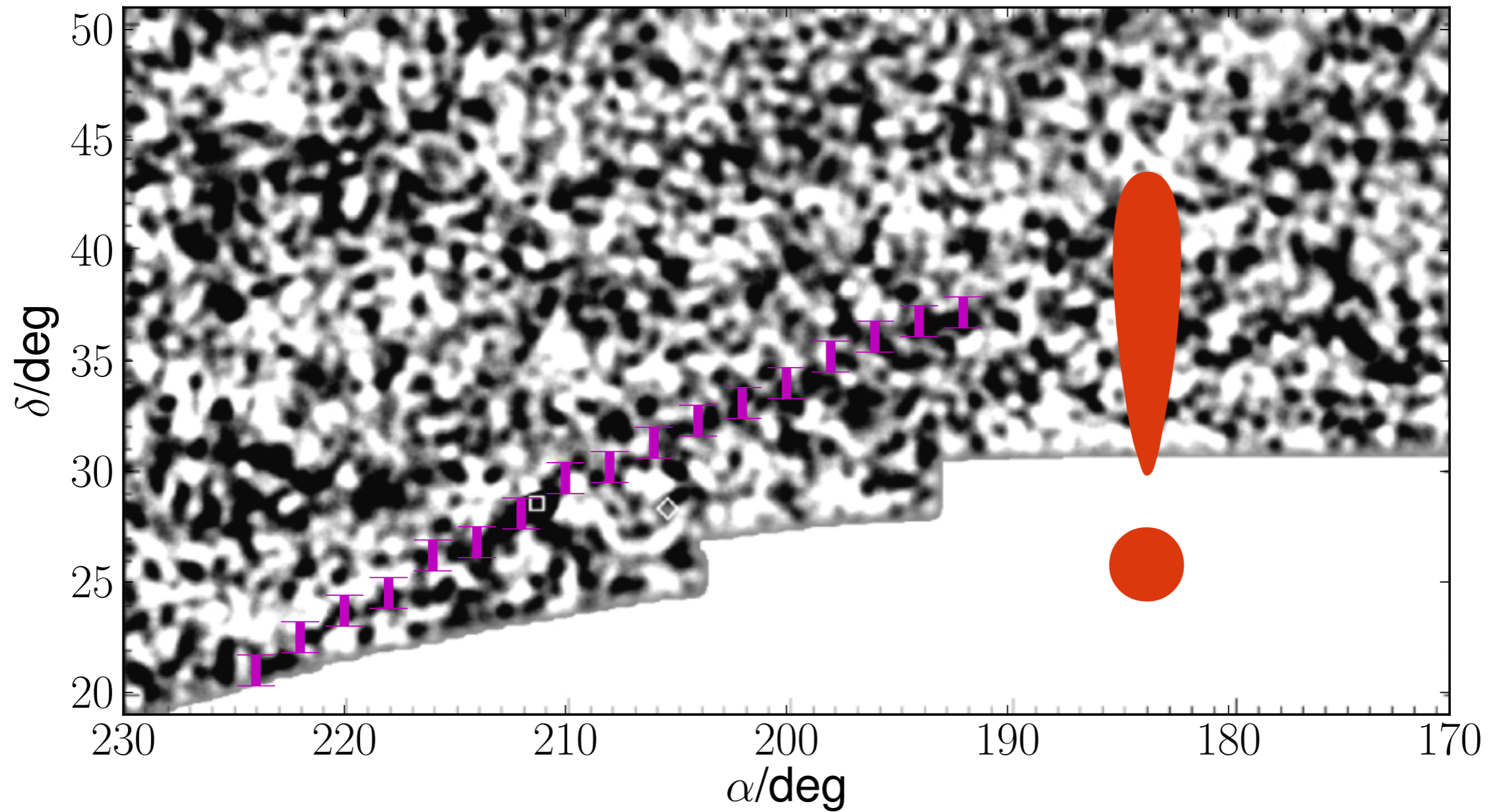
Sagittarius
Pal 5
NGC 5466

Thin Streams | NGC 5466



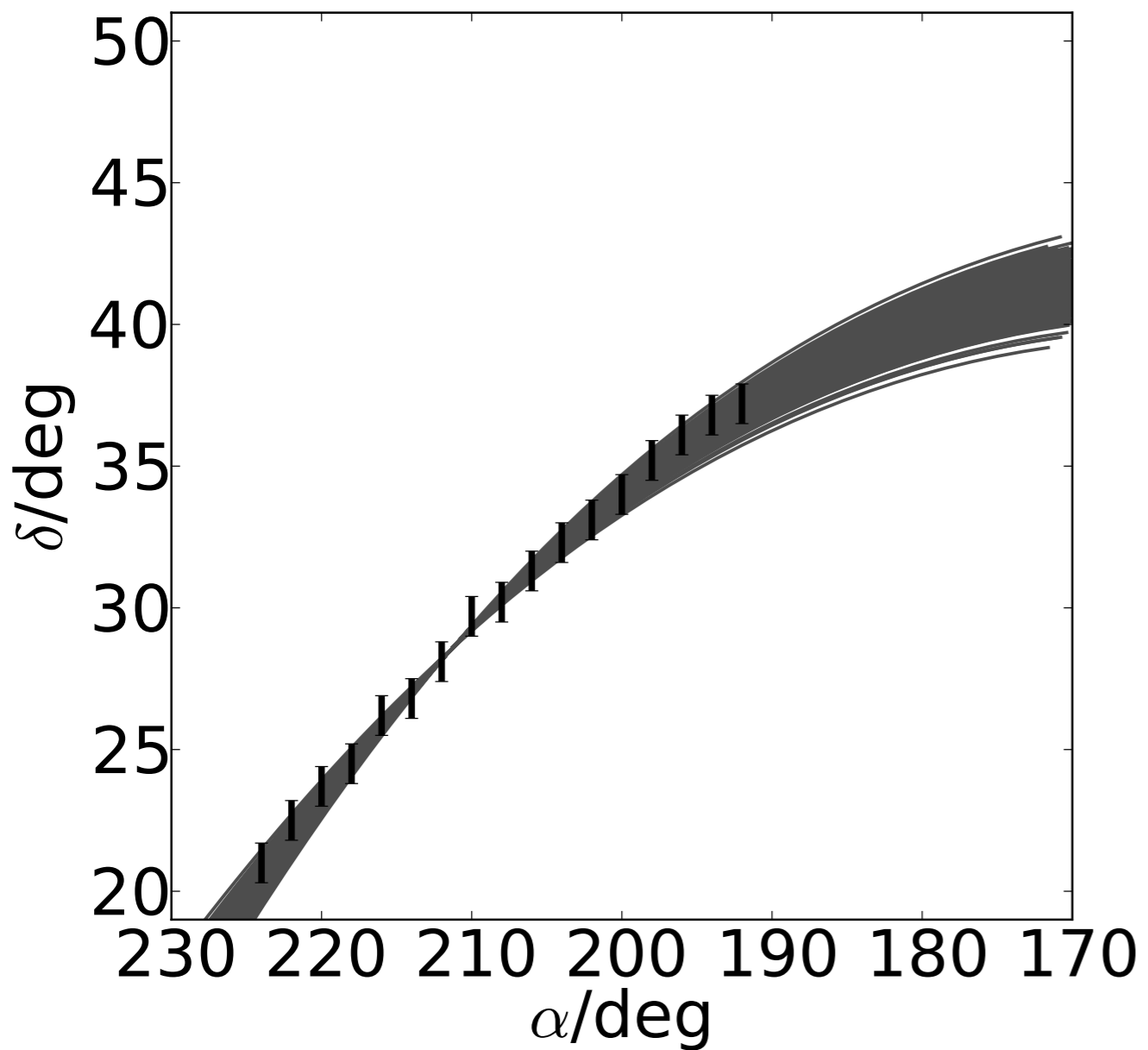
Grillmair & Johnson 06

Thin Streams | NGC 5466



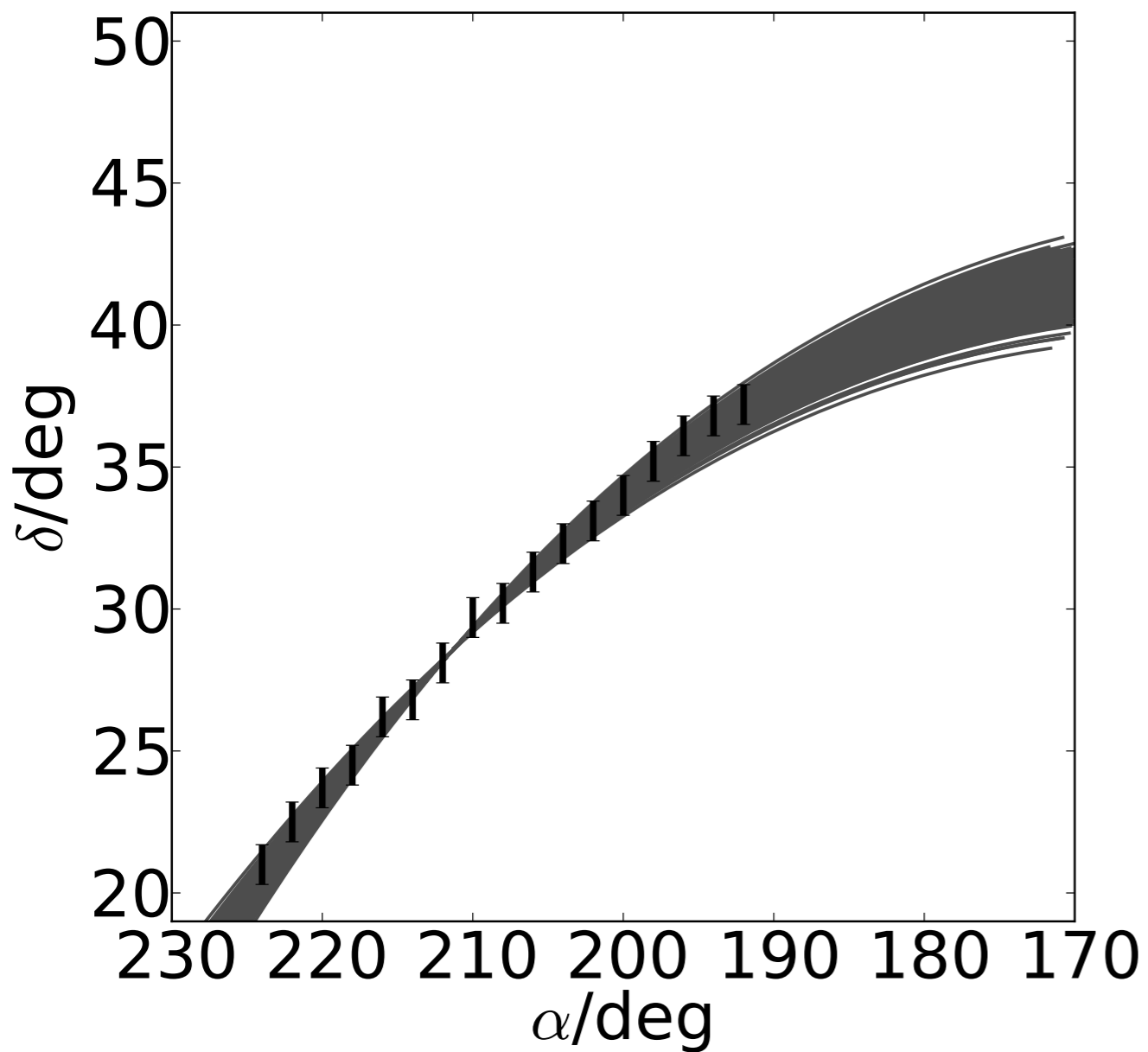
Grillmair & Johnson 06

Thin Streams | NGC 5466

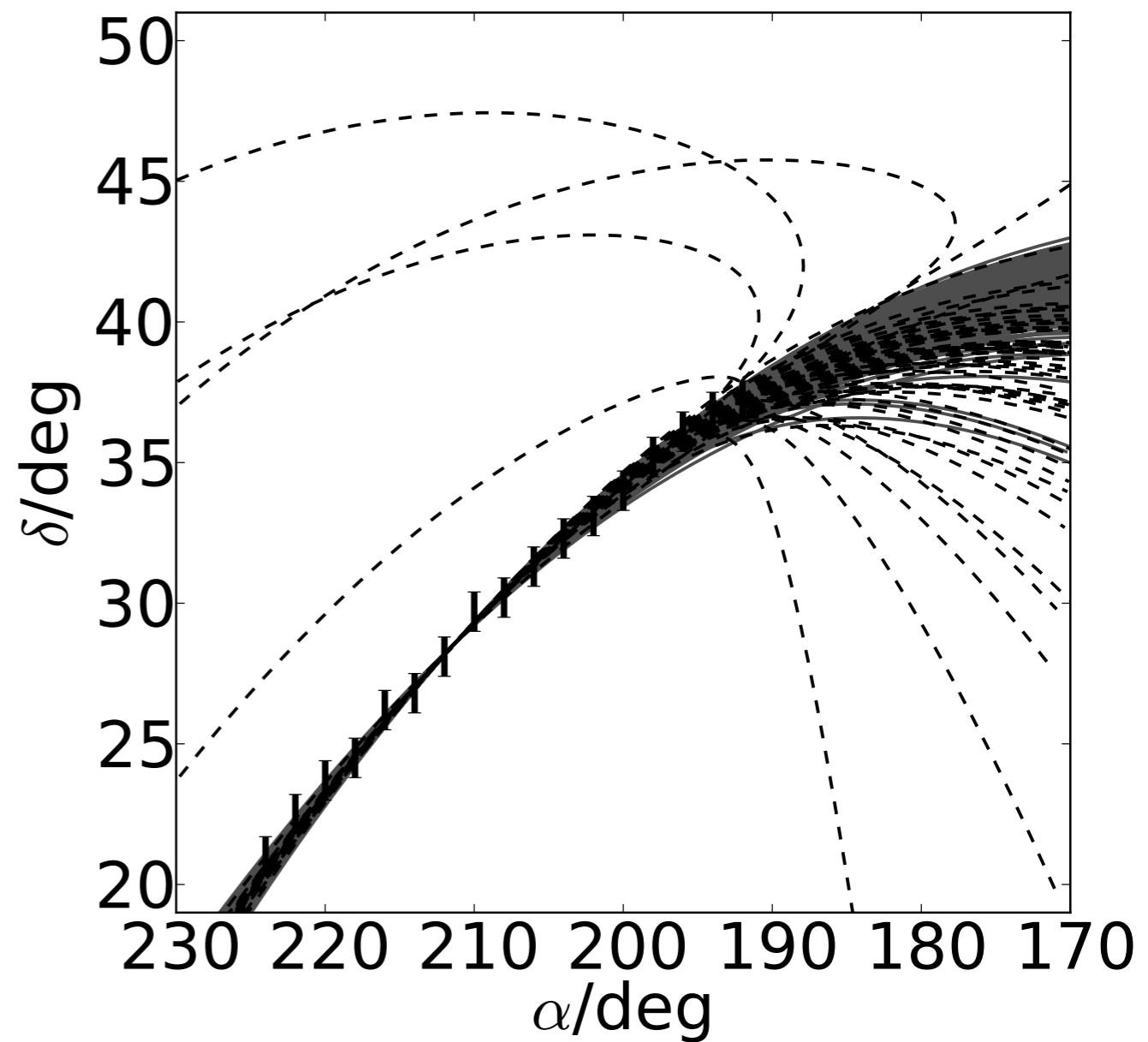


**Spherical/Prolate
Halo**

Thin Streams | NGC 5466

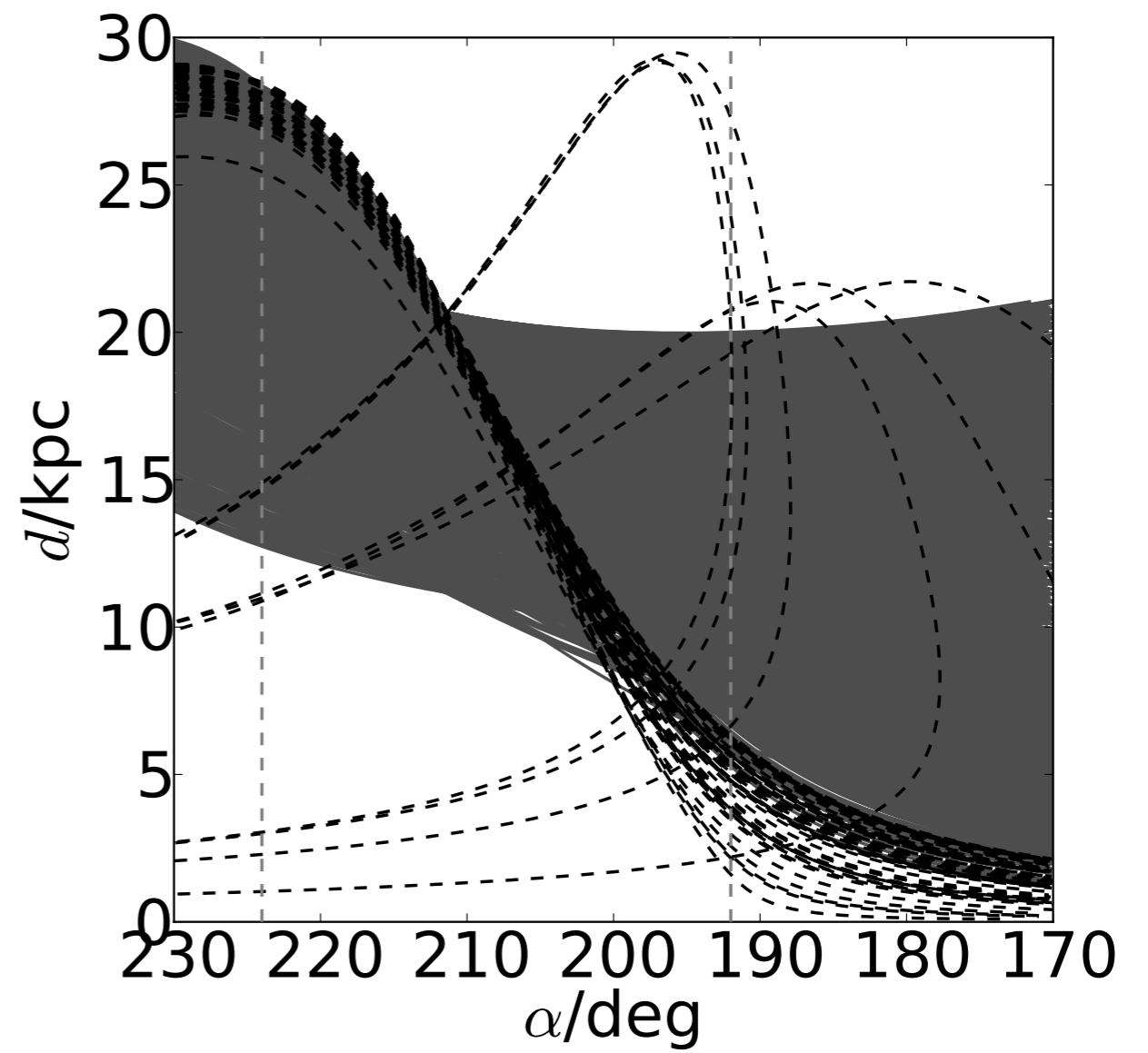
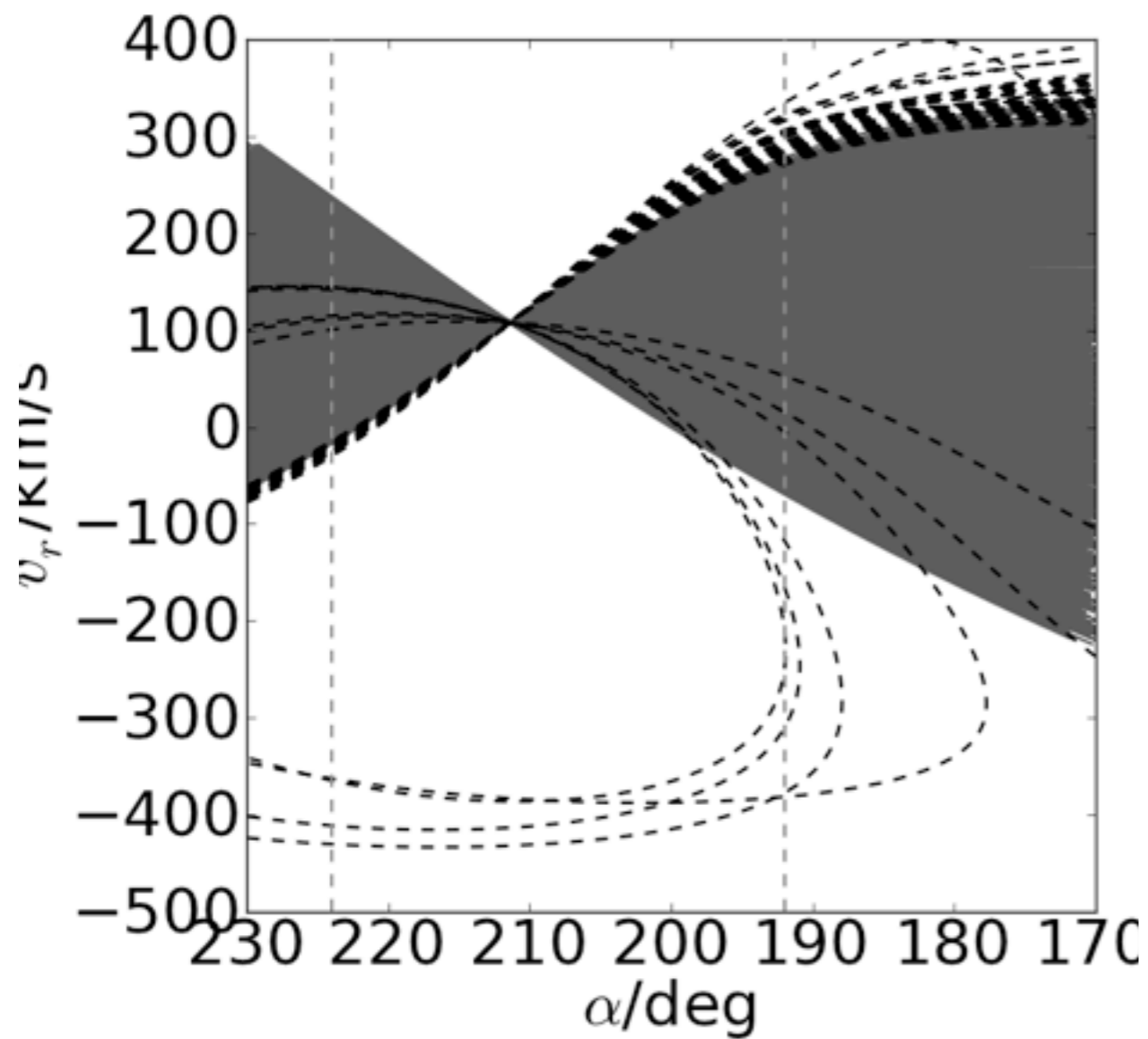


**Spherical/Prolate
Halo**



**Oblate/Triaxial
Halo**

Thin Streams | NGC 5466



Lux et al. 2012, submitted to MNRAS

Thin Streams | Summary

- **So far Sagittarius provides the best constraints on the MW halo shape**
- **Thin streams promise a simpler approach**
- **However, the current data is not constraining**
- **Serendipity: NGC 5466 promises a new way to constrain the MW halo shape**

Subhaloes going Notts

**How well
can we
recover
subhaloes?**

a workshop on finding subhaloes in cosmological simulations
in

Dovedale, Nottingham (UK)

14/05/2012 – 18/05/2012

more information and registration at
<http://popia.ft.uam.es/SubhaloesGoingNotts>



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