Measurement

- We are now entering the wide field era
- Single gains no longer adequate
- Gains are direction dependant

Components of DDEs

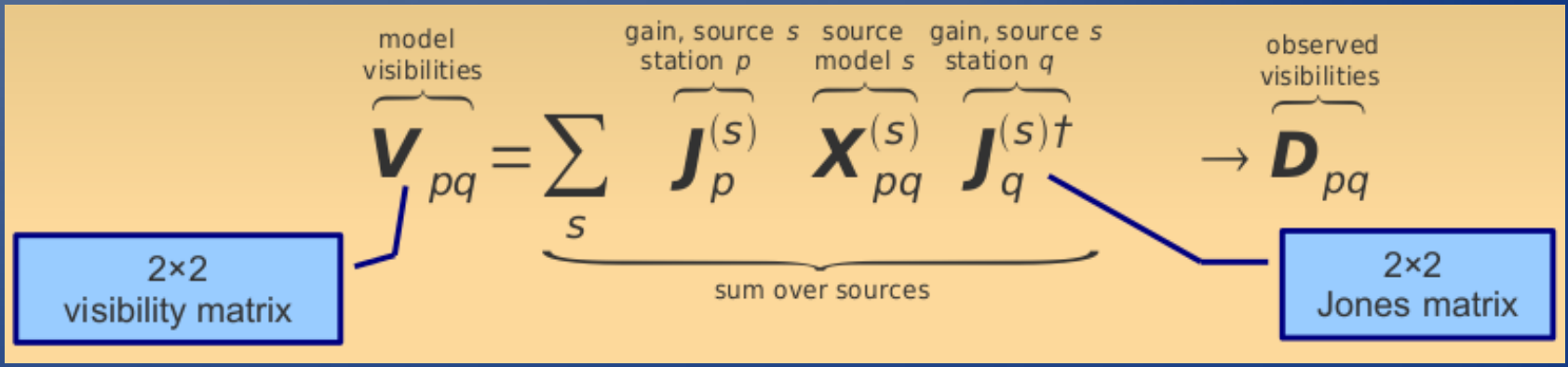
- Beams
- Pointing errors
- Atmosphere

Open Loop vs Closed Loop

- Open Loop
  - Measurement seperated from target observations
  - Holography, pan & scan
- Closed Loop
  - Beam determined by the target field

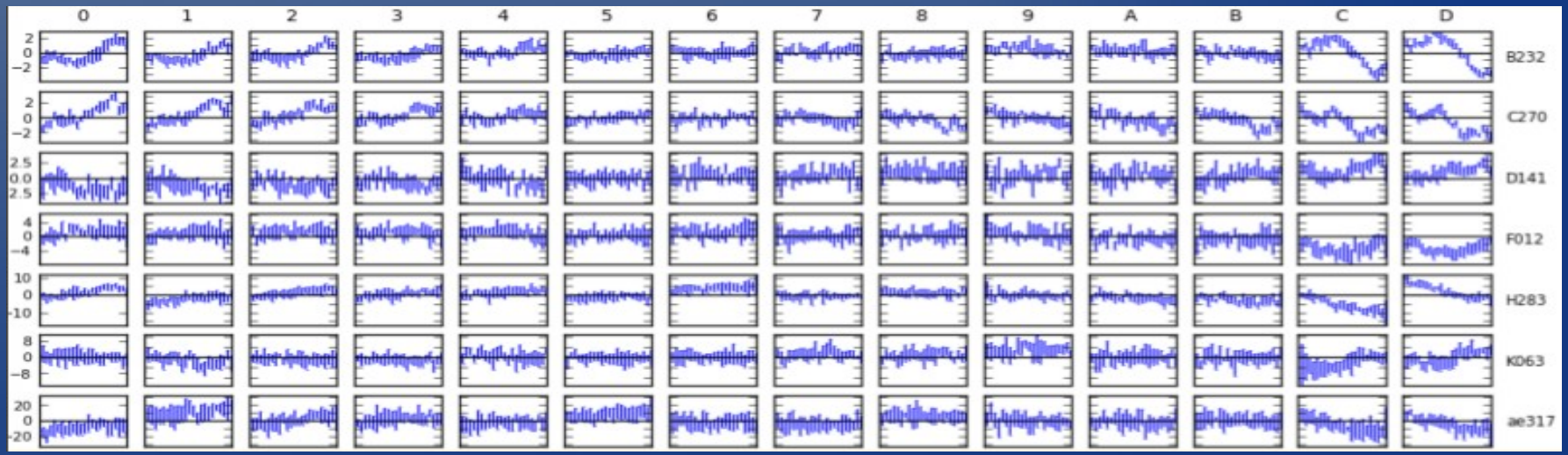
Smirnov's DDEs

- Extensive analysis of WSRT DDEs with MeqTrees

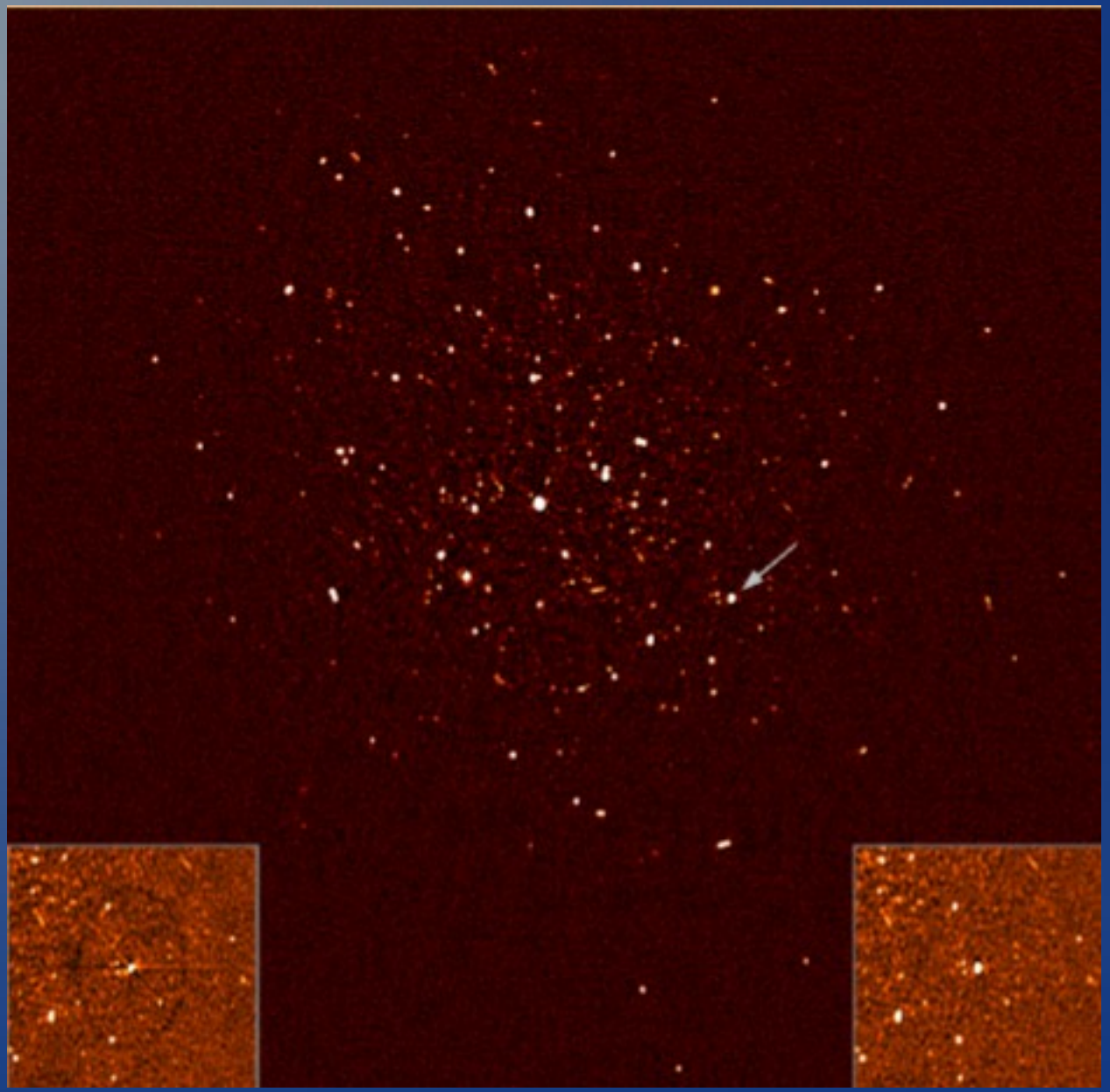


Differential Gains

$$V_{pq} = \overbrace{G_p}^{\text{overall gain}} \Bigg(\underbrace{\sum_s \overbrace{dE_p^{(s)}}^{\text{differential gain}} \overbrace{E_p^{(s)}}^{\text{nominal beam}} \overbrace{X_{pq}^{(s)}}^{\text{source model}} E_q^{(s)\dagger} dE_q^{(s)\dagger}}_{\text{sum over sources}} \Bigg) G_q^{\dagger}$$



V. High Dynamic Range



dE

- The Good
  - Fly swatter approach
  - Great maps
- The Bad
  - Rolls up beam, atmosphere, source structure
  - Comutational cost
  - Degrees of freedom

Seperating beam and sky

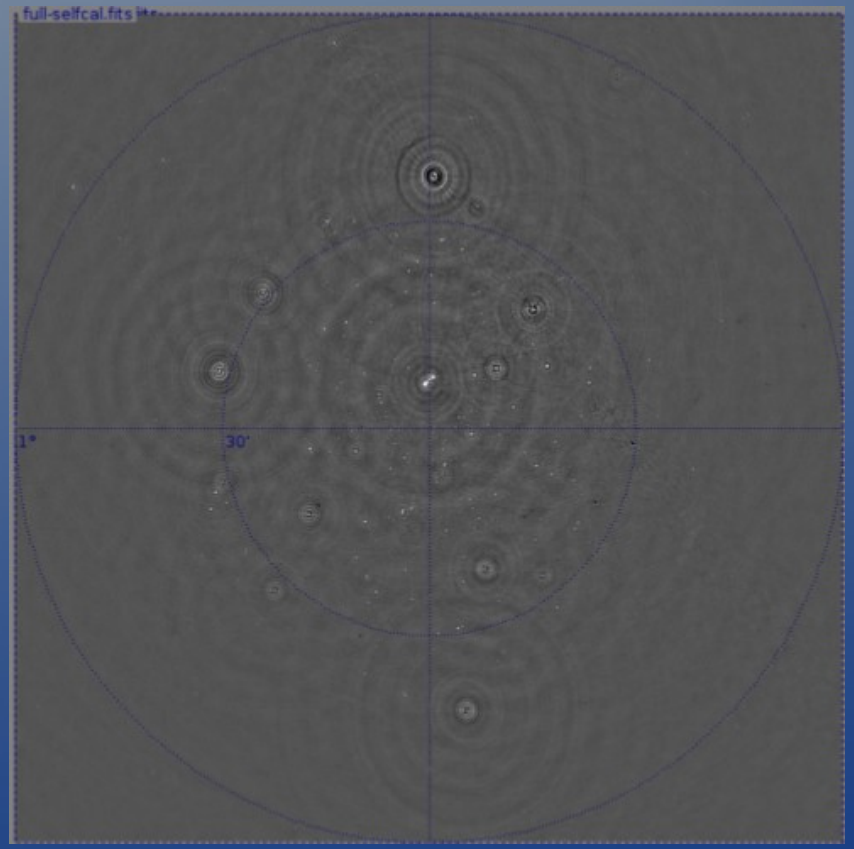
- The beams can only be determined realatively with a good sky model
- Brisken suggested scanning around the sky to trace the flux over the beam by linked tracks of sources

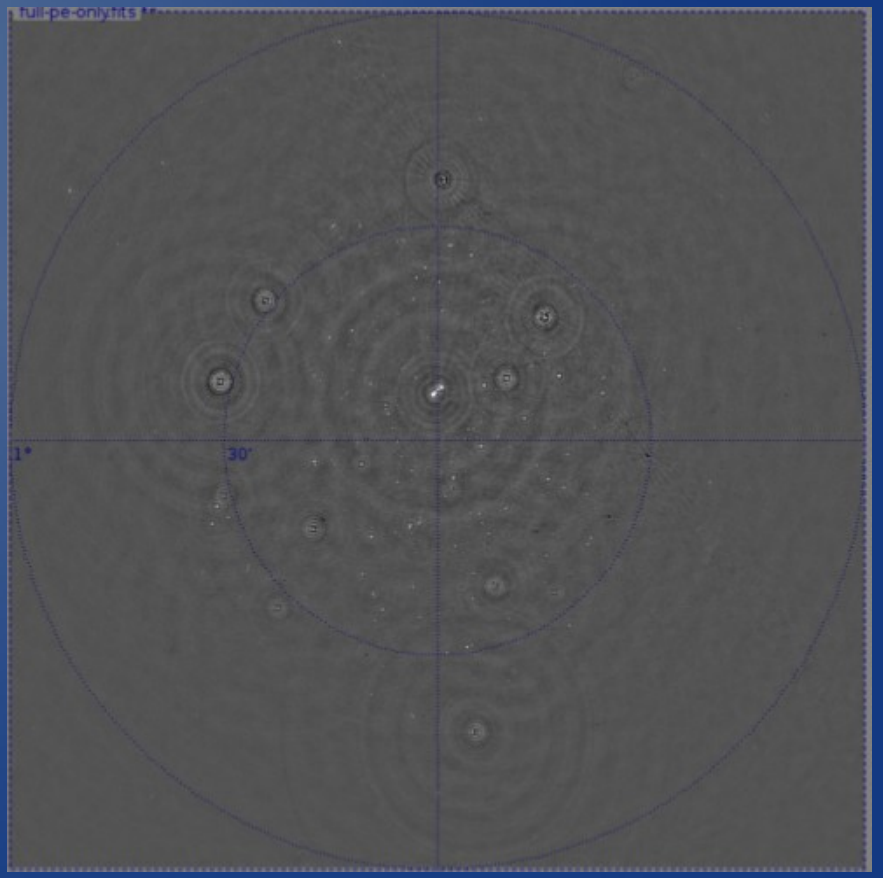
Pointing Self-Cal

- Given a beam model solve for pointing errors
- Low number of solvable terms
  - 2 reals per antenna vs. 1 complex per source
- Our beam models are quite poor, does not consider the atmosphere

Pointing Self-Cal

- Resutls were poor



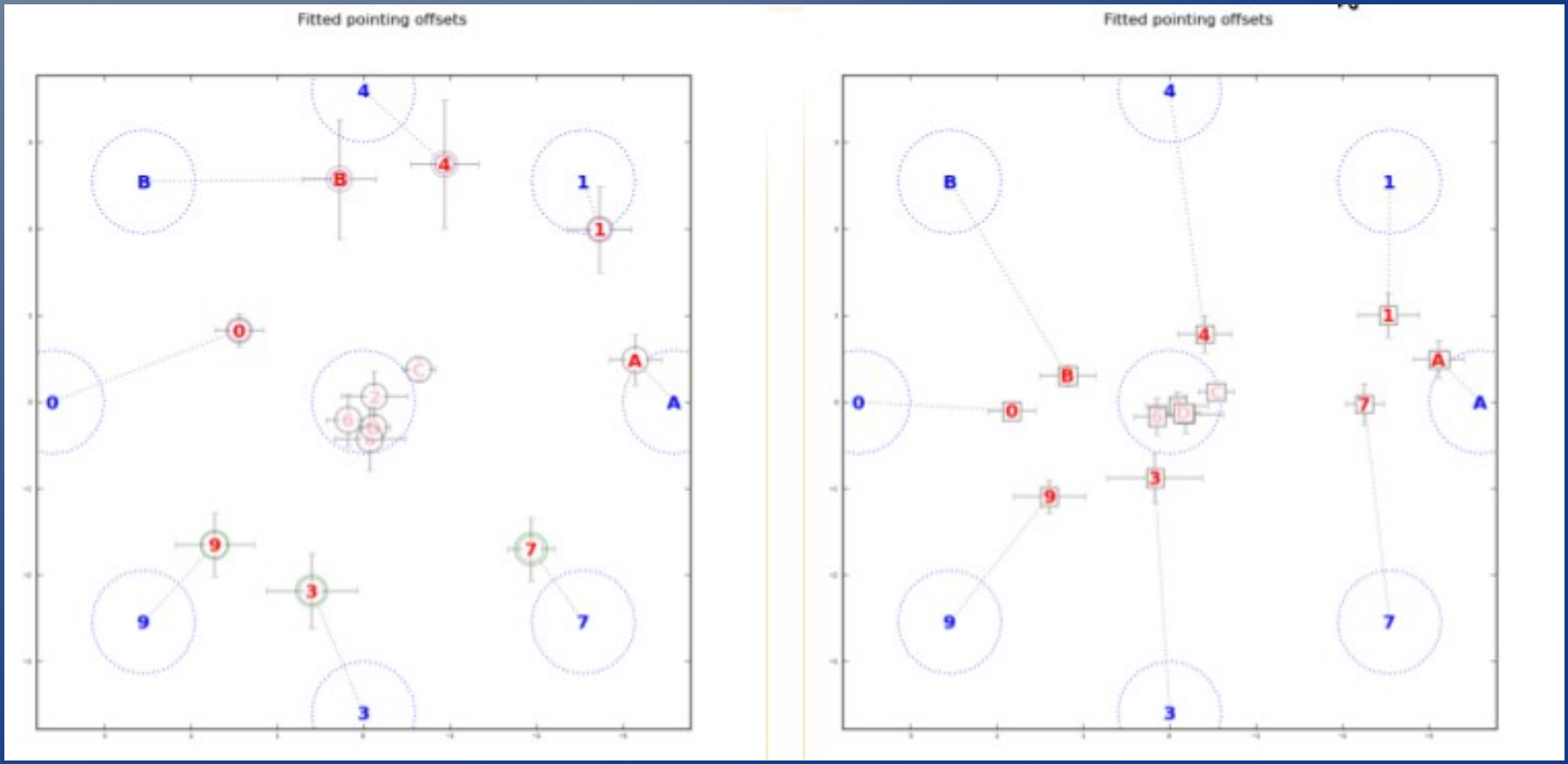


Pointing Self-Cal

- Not sufficient to model the effects
- Scale parameter aborbs some of this
- Need better beam models and combine with atmospheric models

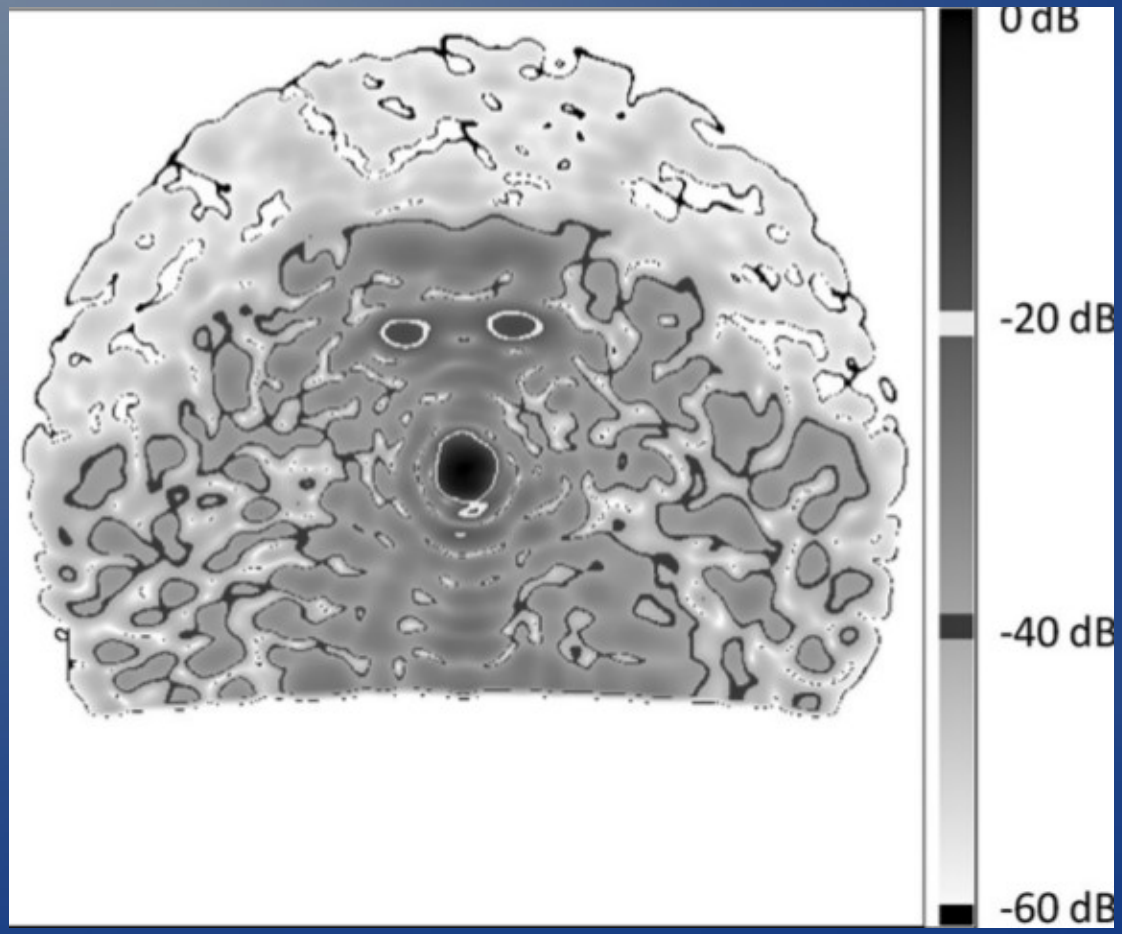
Pointing Self-Cal success story

- WSRT pointing analysis
- The WSRT wobble

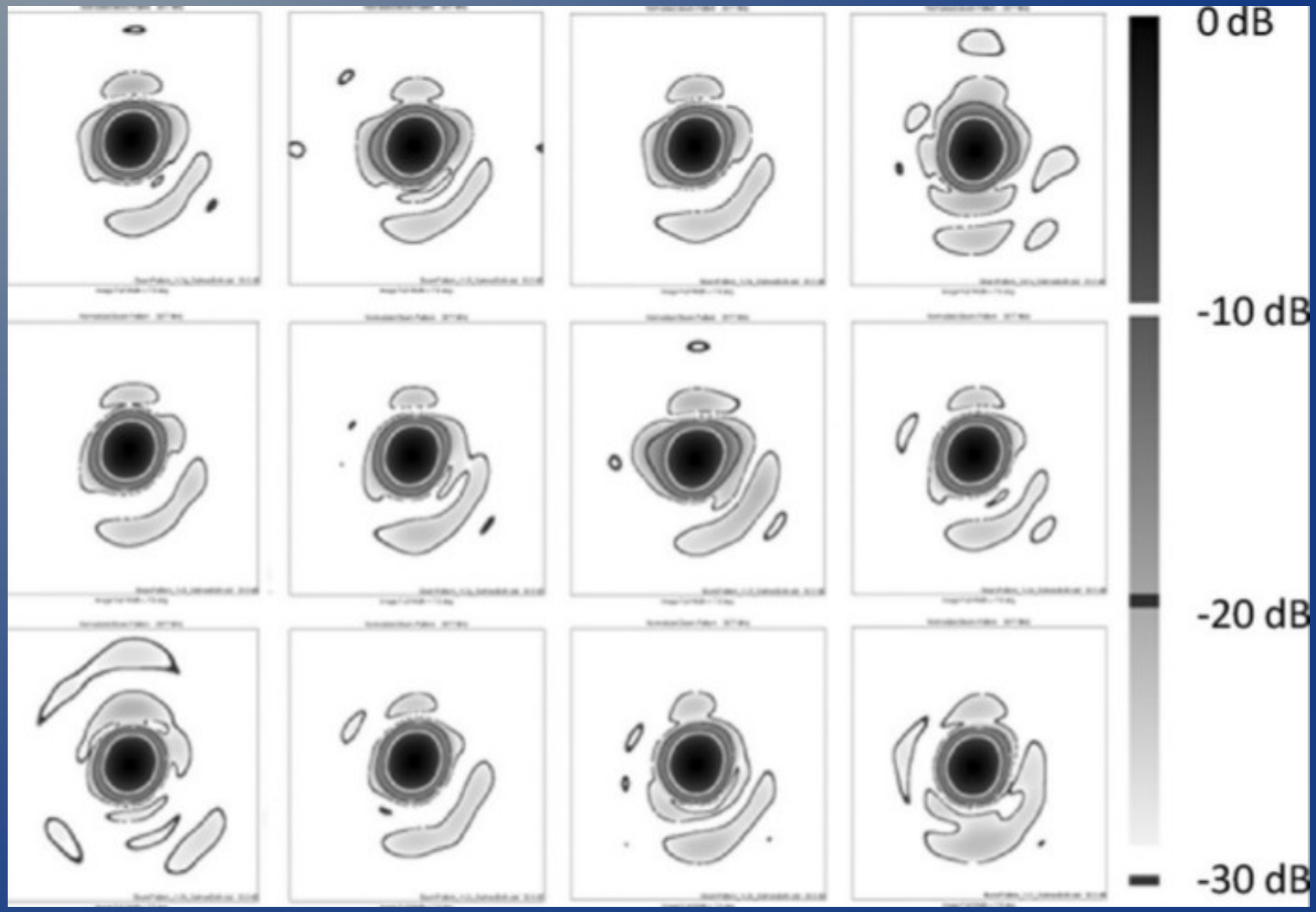


ATA Beams

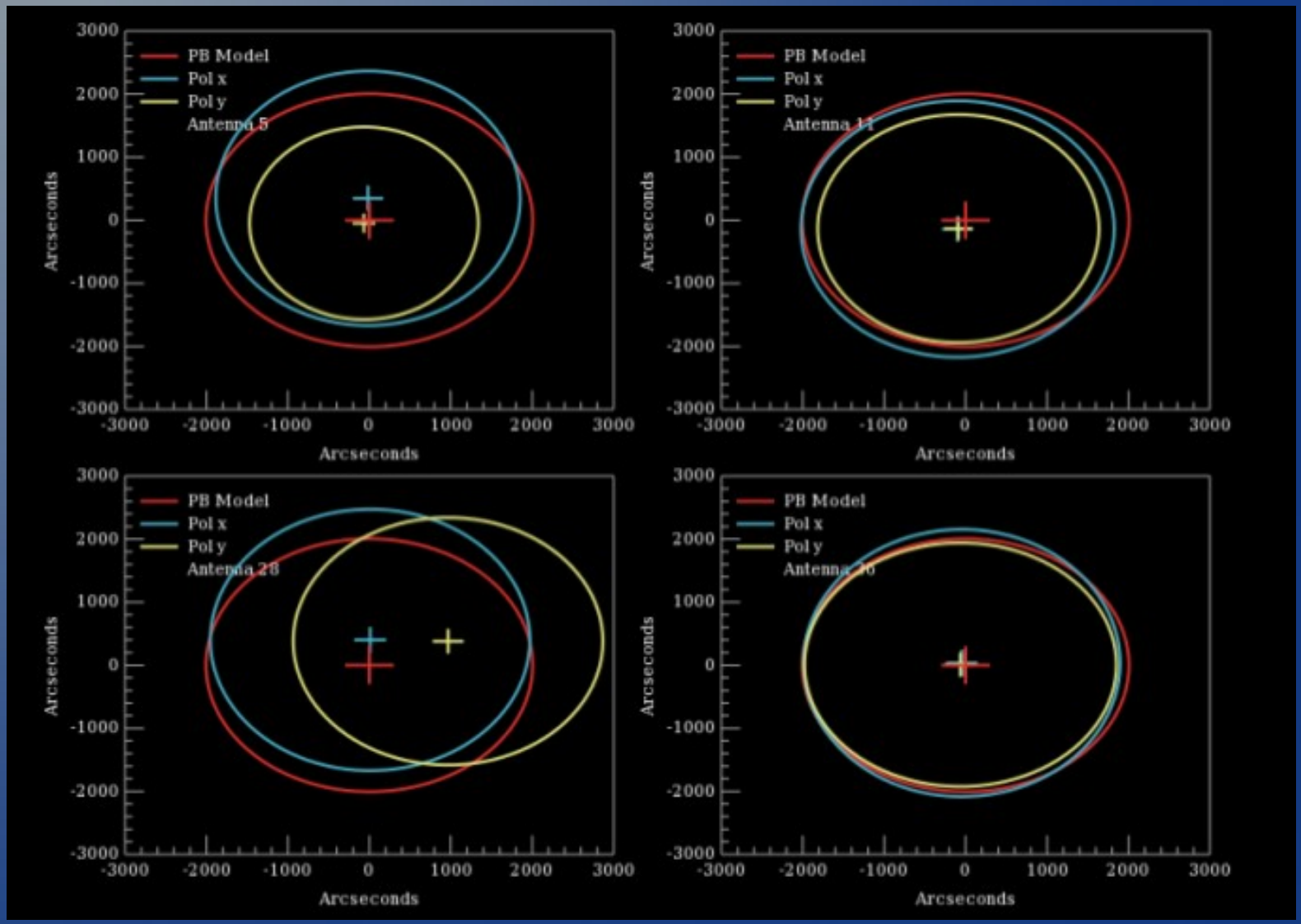
- Open loop measurements



ATA Beams



ATA Squint


PB Model
Pol x
Pol y
Antenna 5
Antenna 11
Antenna 28
Arcseconds
3000
2000
1000
0
-1000
-2000
-3000

Summary

- Beam measurement is not easy
- Can constrain our calibration models
- Limits degrees of freedom in our solutions