

Benthos DAT Evaluation

(making the directional acoustic transducer
work for long-range AUV operations)

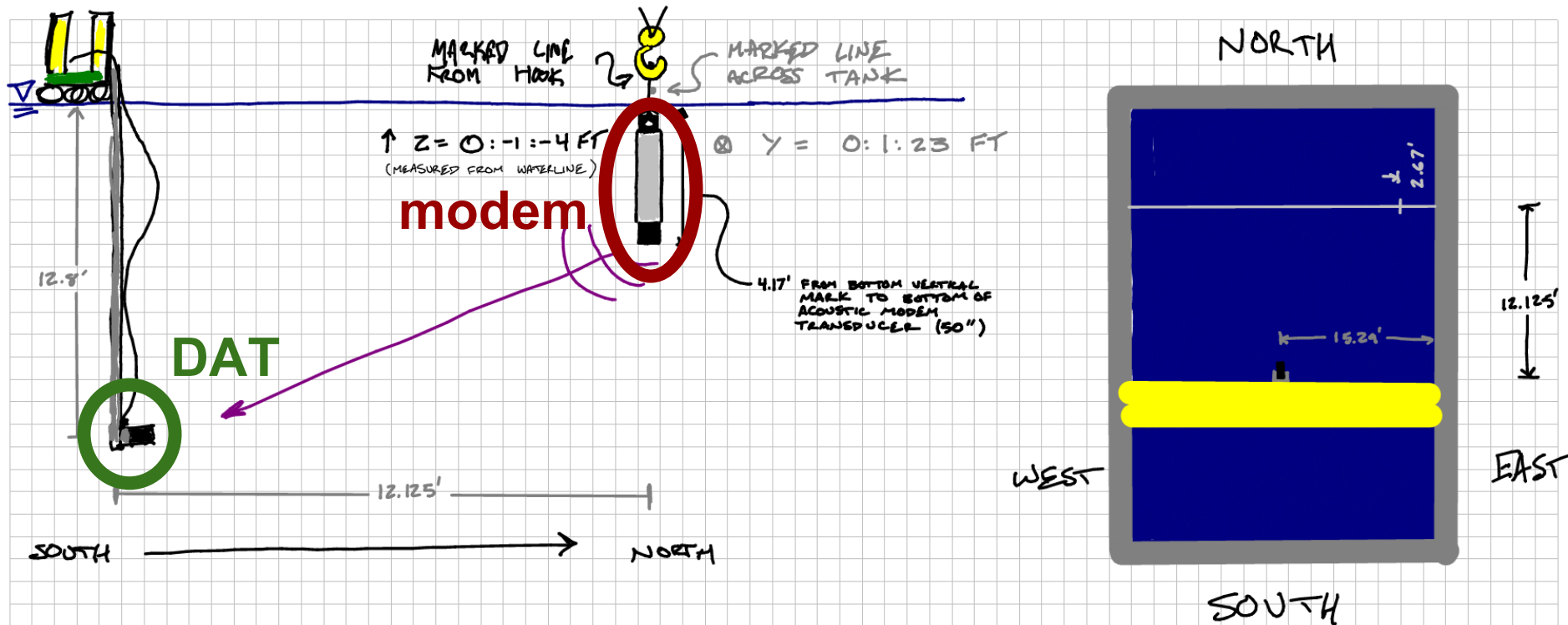
M Jordan Stanway
<mjstanway@mbari.org>
working with

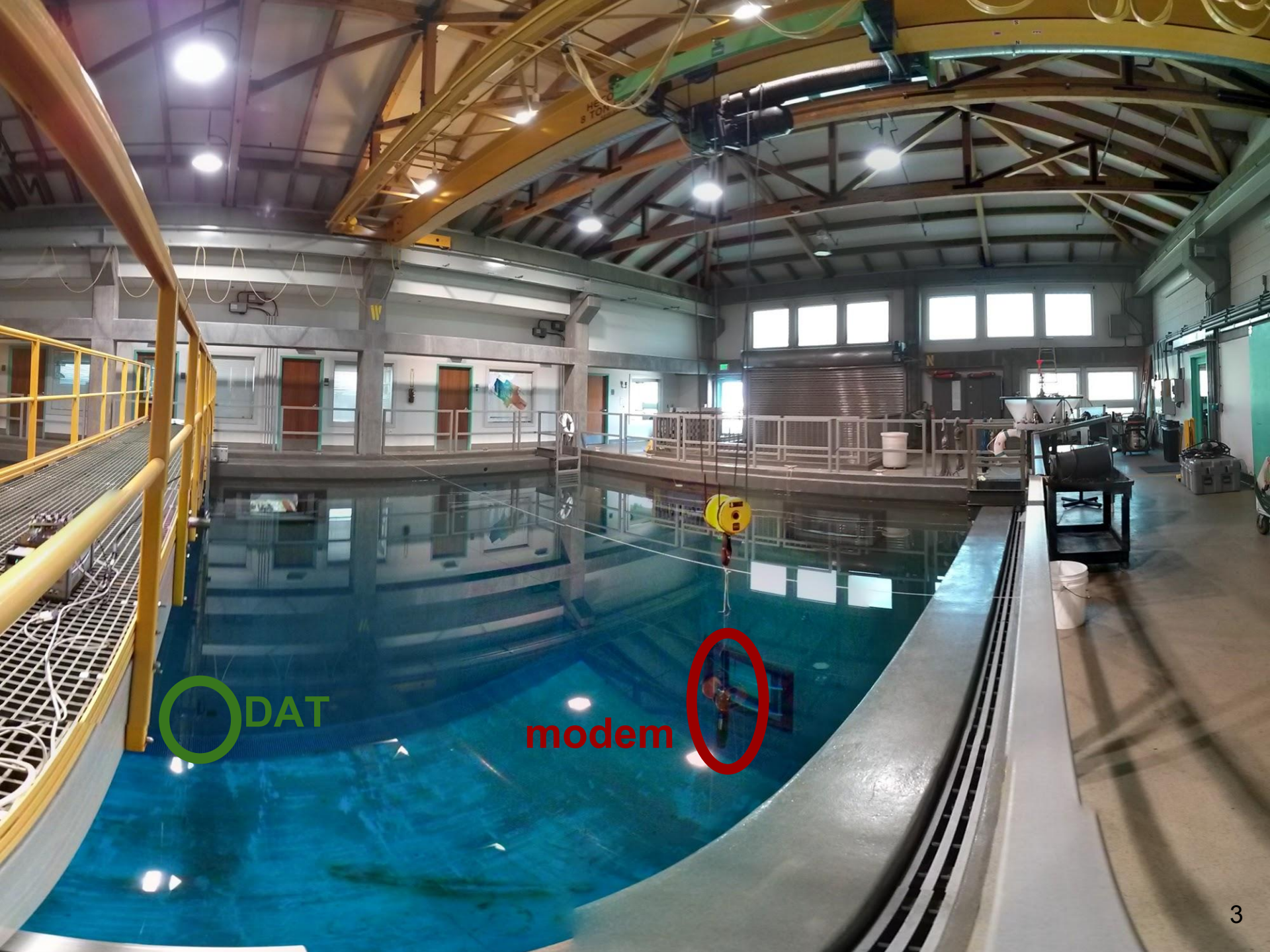
Andy Hamilton, Jim Bellingham, Brett Hobson, & Thomas Hoover

What is the DAT?

- alternate transducer head for Benthos acoustic modem
- 4 hydrophones, arranged in a tetrahedron
- estimates direction to signal source using relative phase of signals received at each hydrophone

DAT-only tests (Nov 2012)

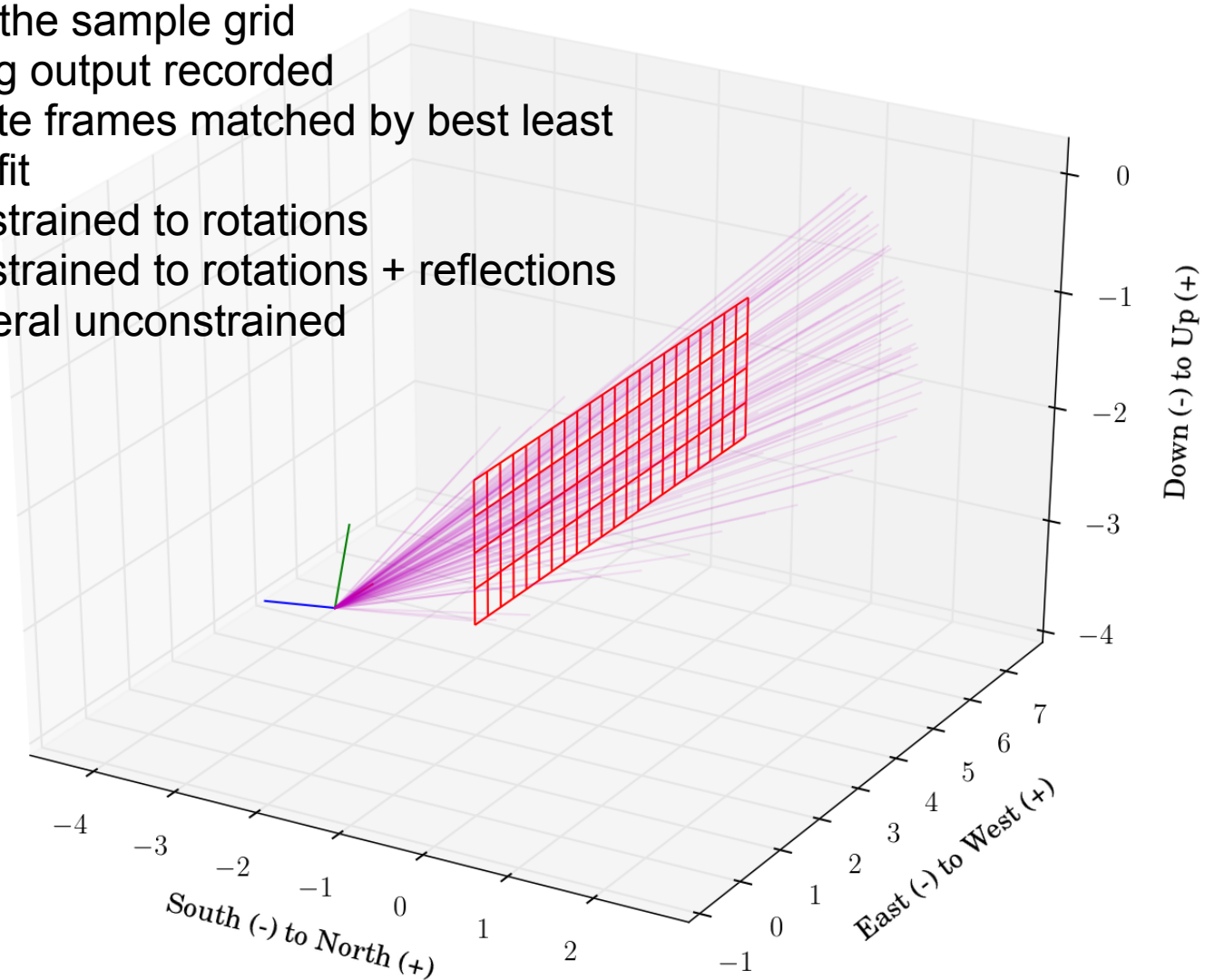




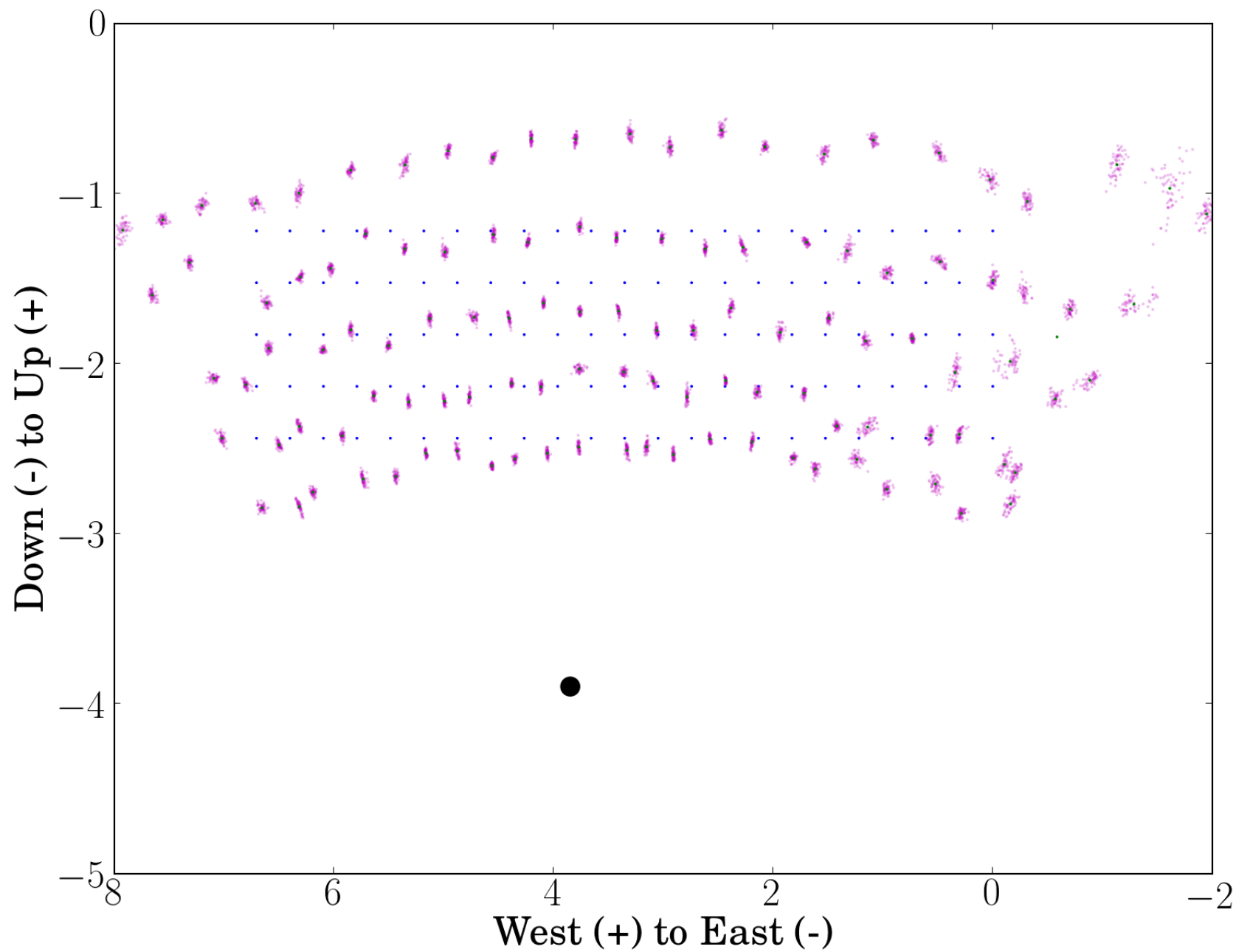
DAT

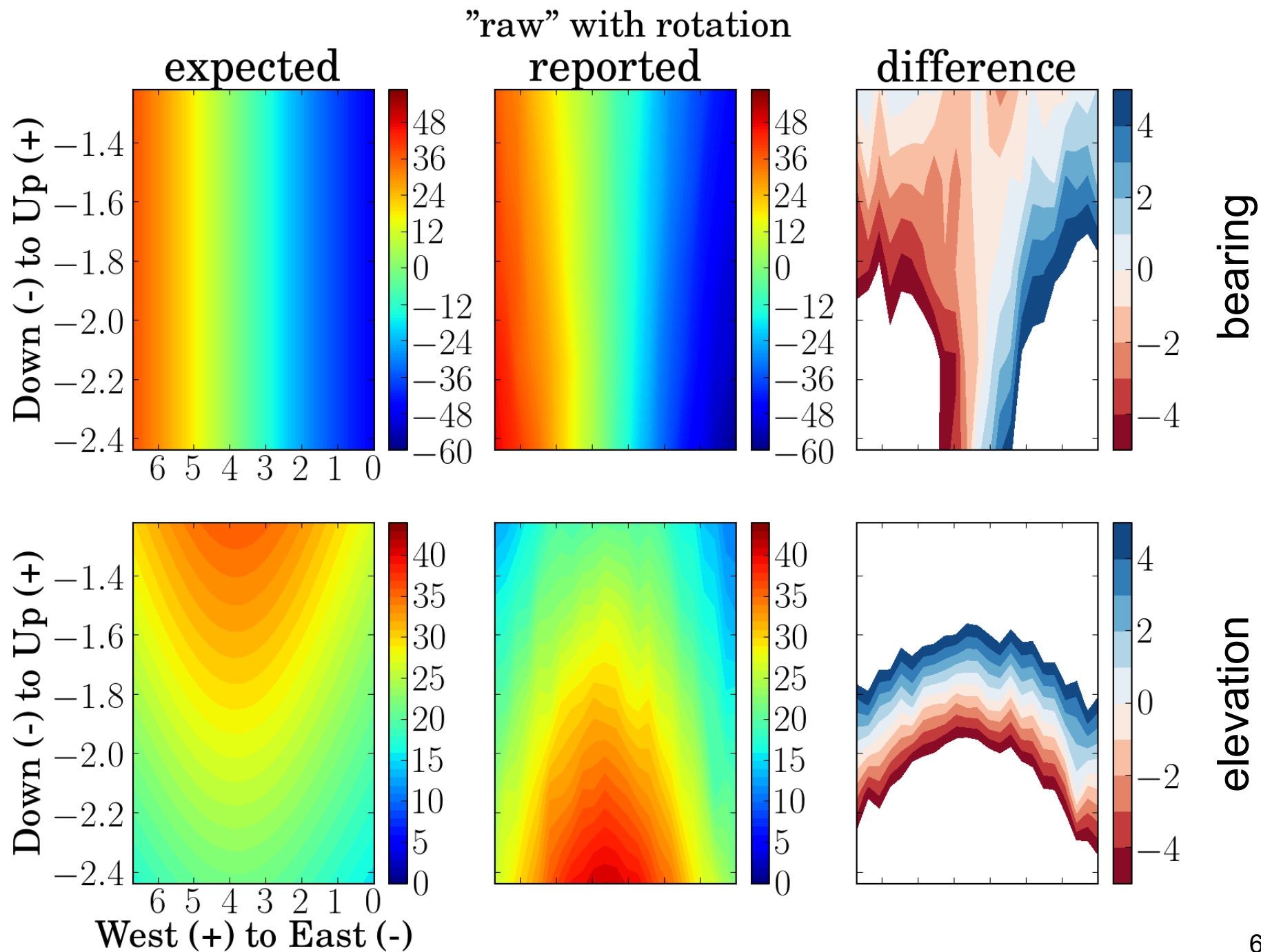
modem

- 115 nodes in sample grid (5 by 23)
- ~60 individual measurements at each node on the sample grid
- full debug output recorded
- coordinate frames matched by best least squares fit
 - constrained to rotations
 - constrained to rotations + reflections
 - general unconstrained



"raw" with rotation

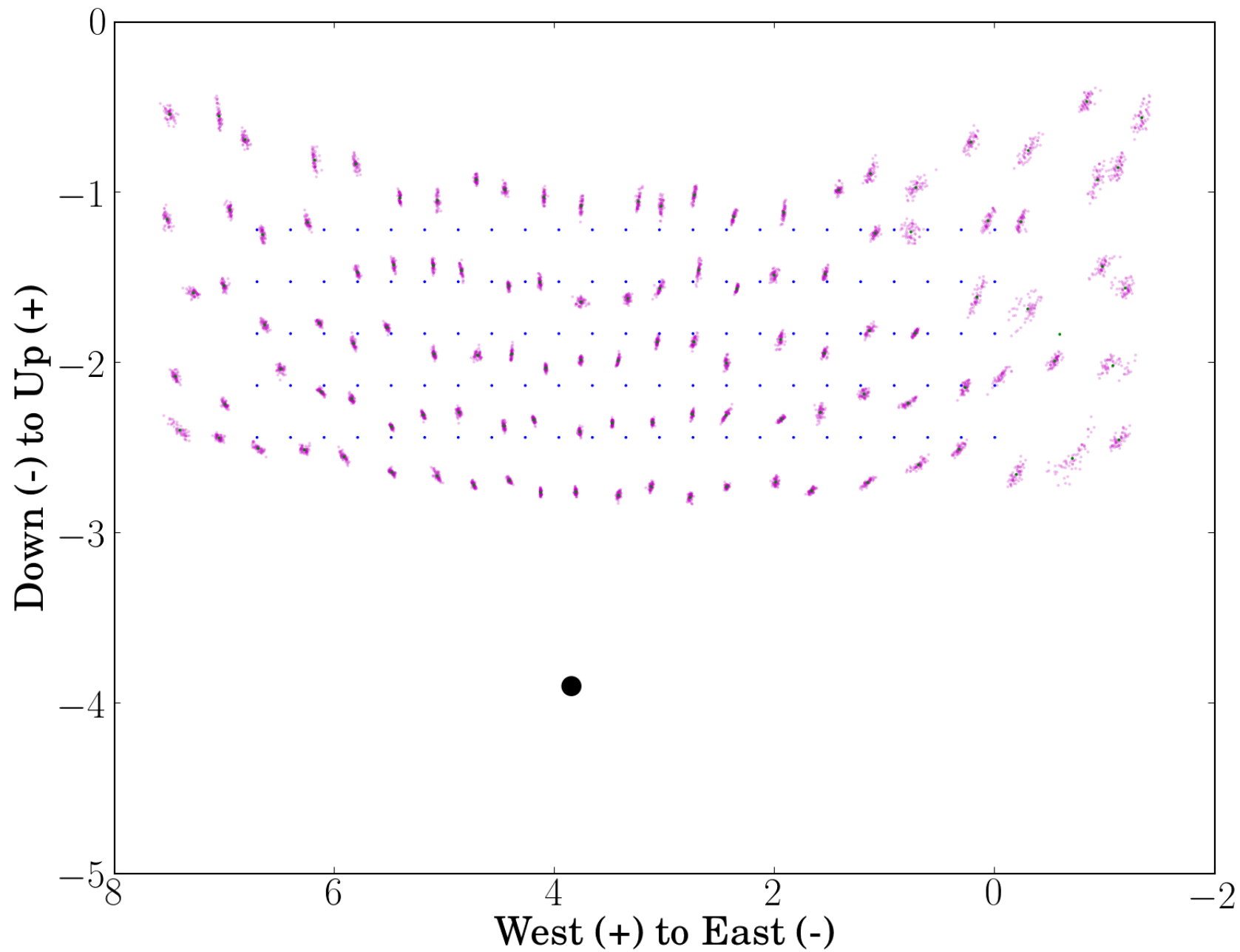


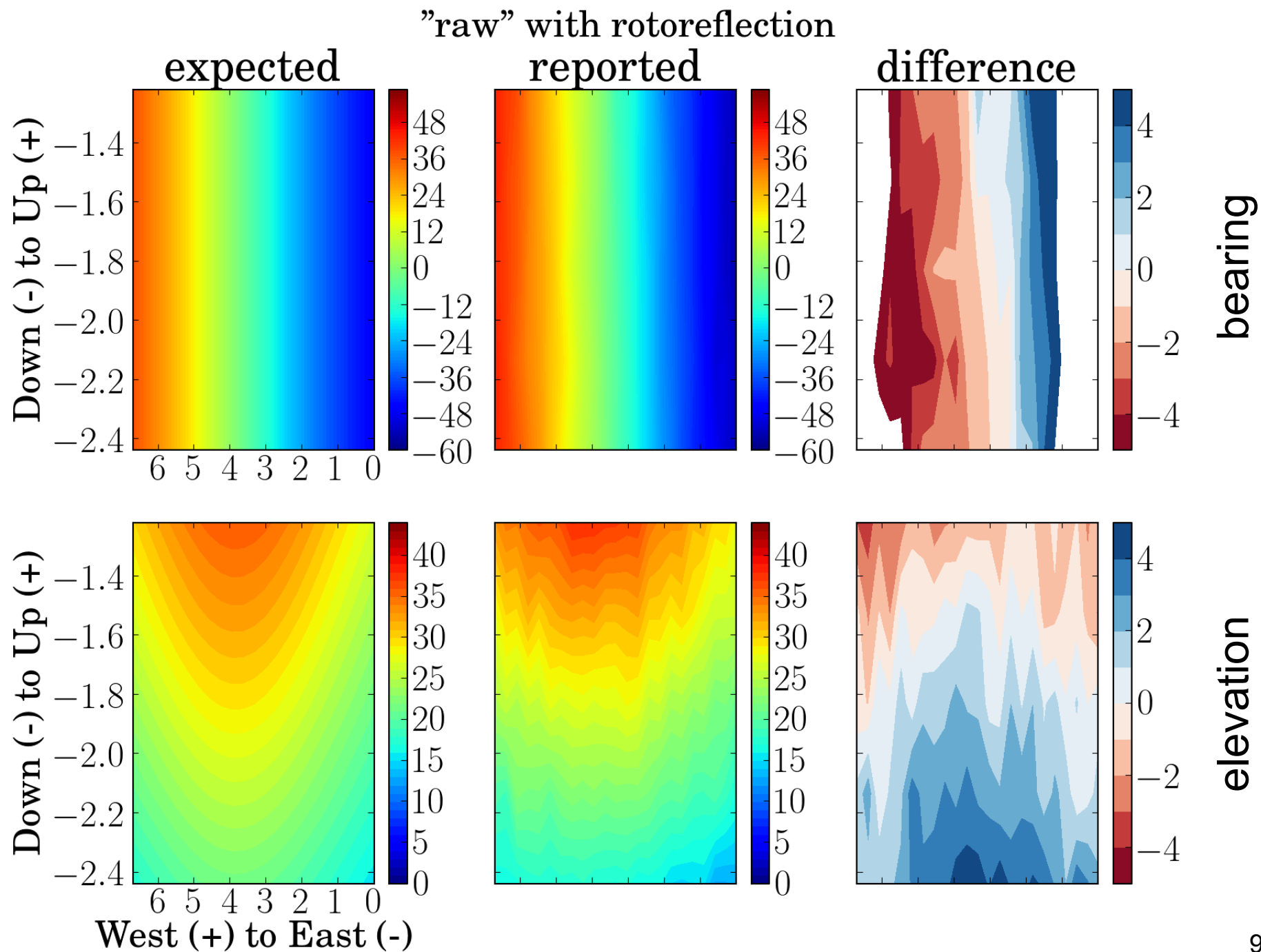


What happens if we allow a reflection?

(The DAT coordinate frame might be left-handed.)

"raw" with rotoreflection



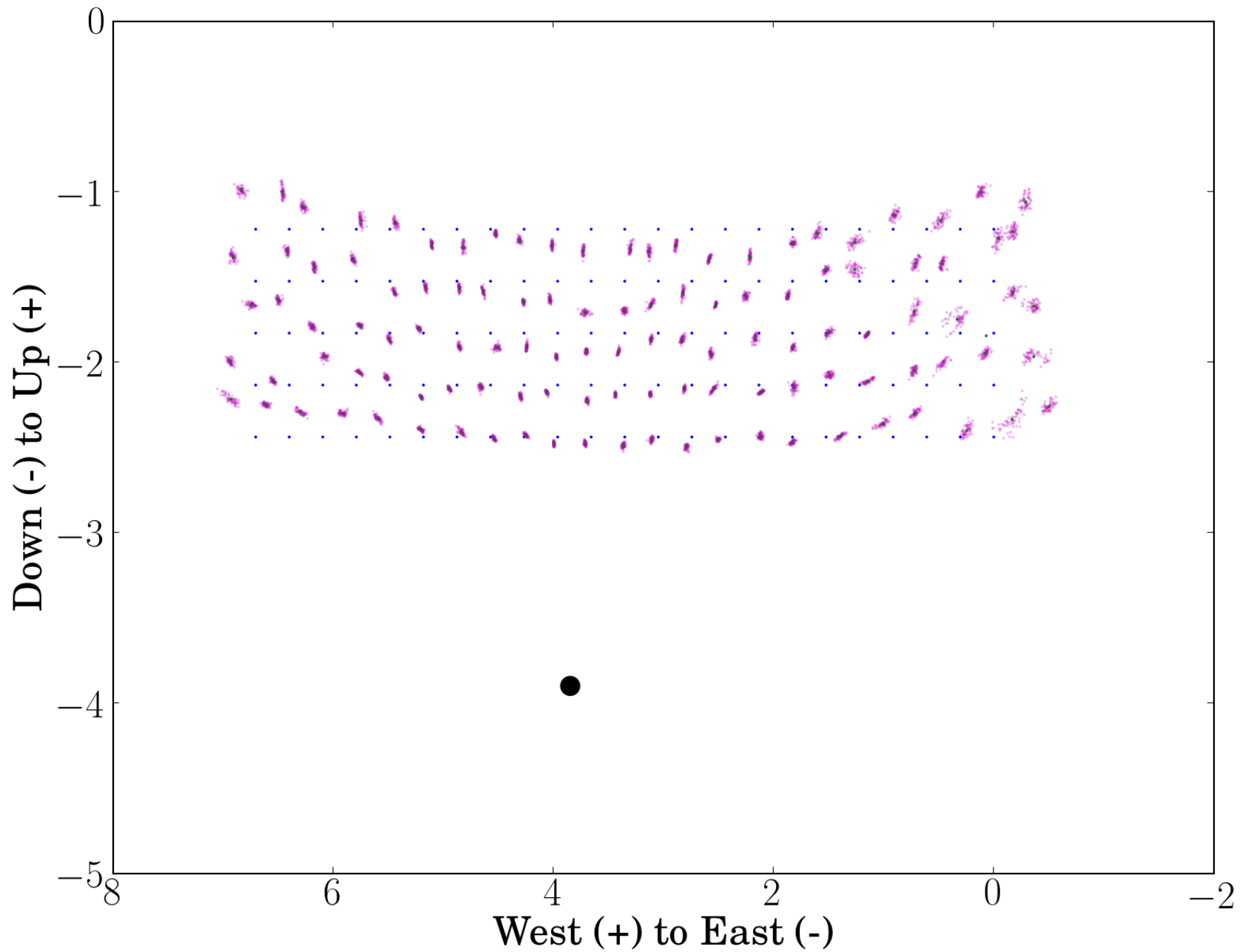


What happens if we allow a general transformation?

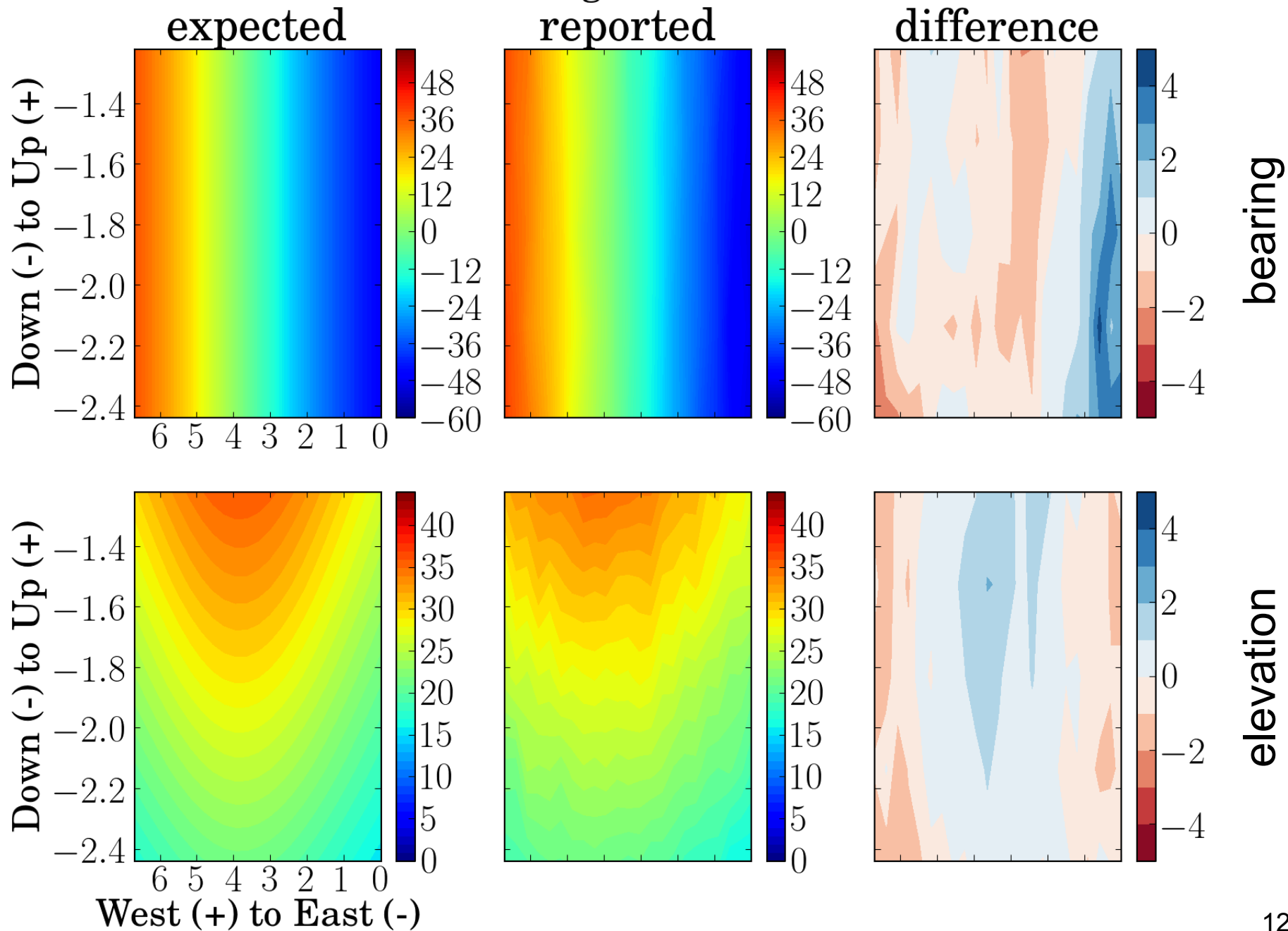
If we do this long-term, the DAT will need to be calibrated on the whole sphere, and direction measurements confirmed at multiple ranges.

(i.e., it would be time-consuming)

"raw" with general transform



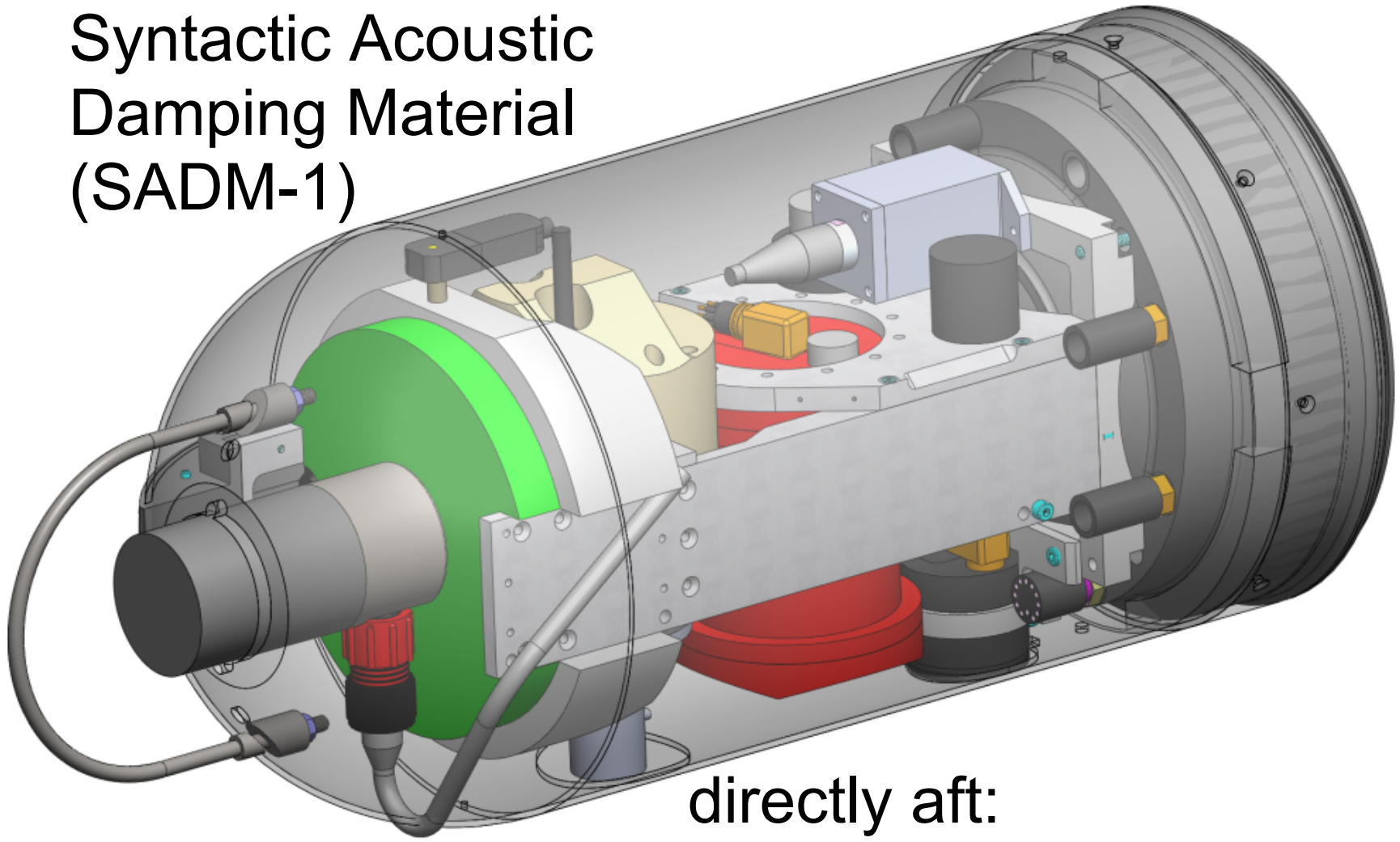
"raw" with general transform



Next steps:

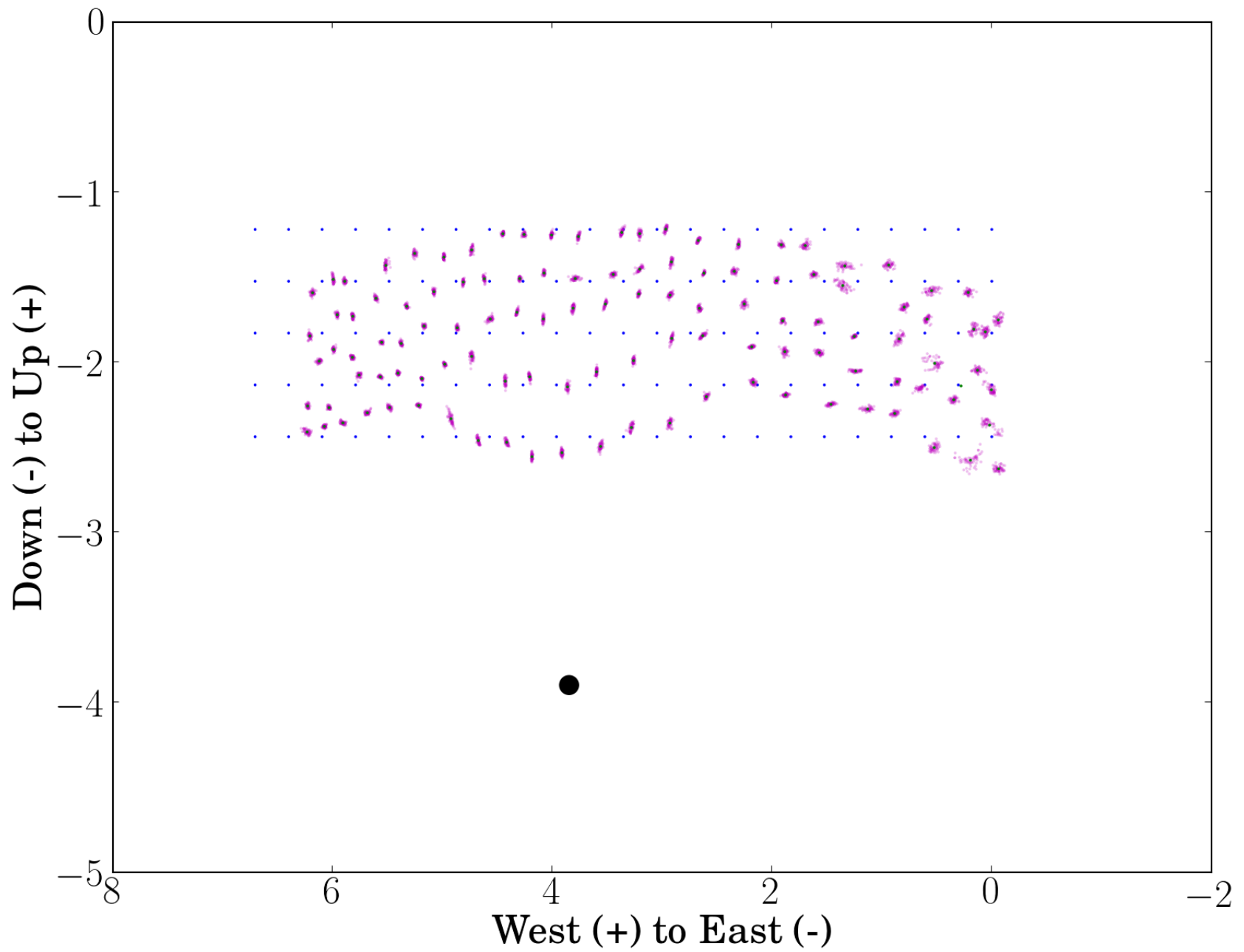
- confirm left-handed coordinate frame with manufacturer (Teledyne Benthos)
- repeat measurements near boresight of DAT
 - are the direction errors smaller?
 - will the DAT on its own perform well enough to support LRAUV docking? over what operating range?
- repeat measurements with sound absorbing backplate
- repeat measurements with backplate and installed in vehicle

in green:
Syntech Materials, Inc.
Syntactic Acoustic
Damping Material
(SADM-1)

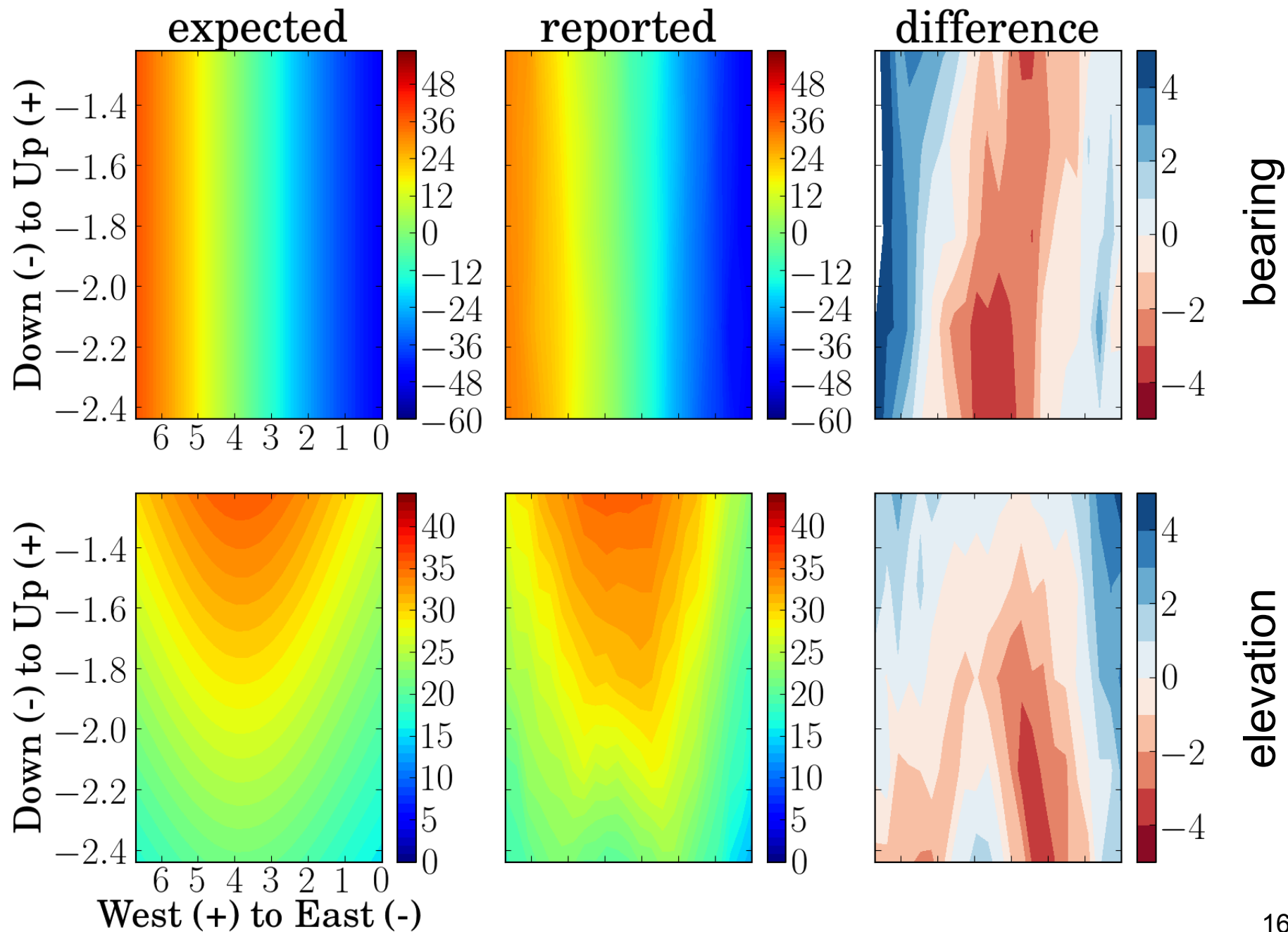


directly aft:
additional syntactic foam
required for buoyancy

"calibrated" with rotoreflection



"calibrated" with rotoreflection



"phase" with rotoreflection

