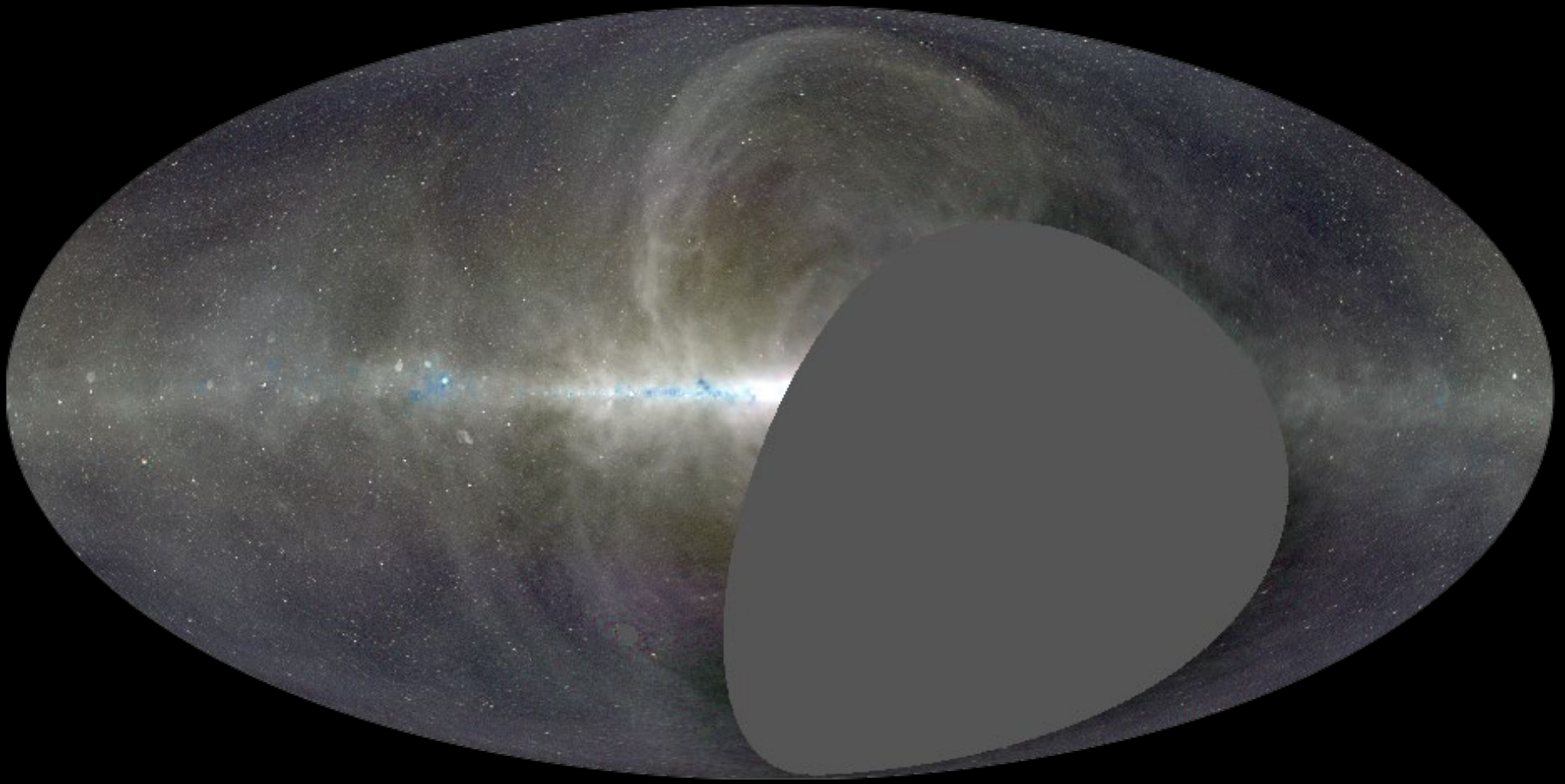
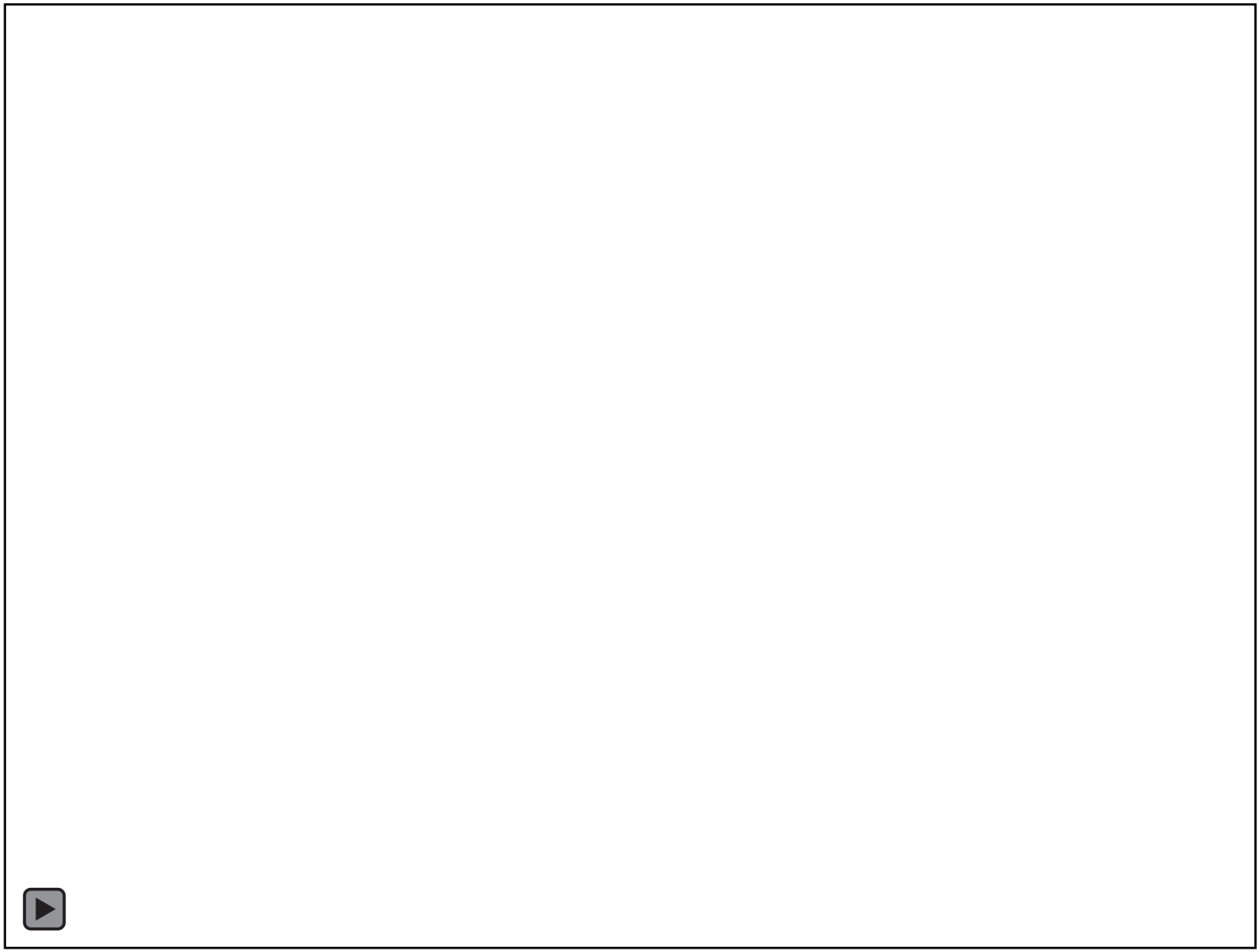
Data Product 2: m-mode images



Tihkonov regularized m-mode analysis (Eastwood et al. 2018, 2019)
(Based on Shaw et al. 2014, 2015)

Cosmic dawn, survey catalogs, Galactic structure, polarization, slow transients

Data Product 3: Astroparticle air showers



First RF-only detection of cosmic-rays (10 events in 40 hours)

Methodology can be applied to detection of tau neutrinos

Monroe et al. 2019

Stage 3: NSF MRI

NSF MRI funding: $2.2 million

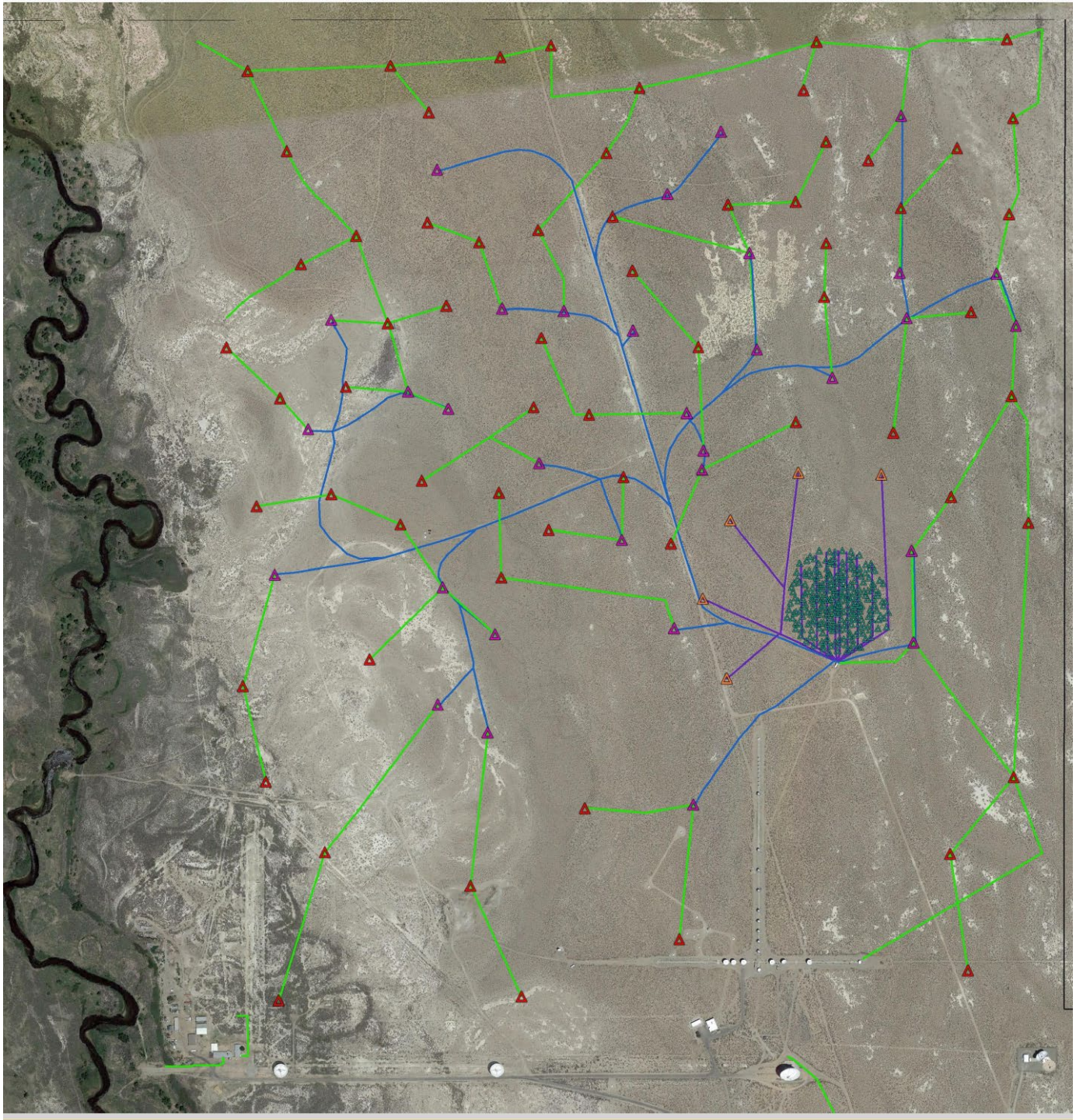
PI team: Gregg Hallinan, Judd Bowman, Dale Gary, Jonathon Kocz, Andrea Isella, Andres Romero-Wolf

2-year construction effort culminating in a science-ready instrument (88% fabrication)

i) Improved (polarized) imaging performance (better resolution and lower sidelobes)
ii) Reduced signal path contamination
iii) Improved calibration performance
iv) Capability for 1000 hour integrations
v) Simultaneous all-sky imaging, 12 x beam-forming and cosmic-ray search
vi) ~5 minute raw voltage buffer
vii) Integration of 40 m for improved calibration and antenna holography

Baseline:
~100 mJy (1-σ) in 10 seconds at zenith

Goal:
10 mJy (1-σ) in 20 minutes at zenith (sidereal subtraction Stokes I and V)
5 mJy (1-σ) in daily m-mode maps (Stokes I and V)



Mapping Antenna Beams

- Lack of knowledge of the antenna beam is a major limitation for most science and a driver of computational cost (requires peeling)

- Three approaches being implemented in parallel:

  i) Holography of antennas with 40m dish using pulsar gating

  ii) beam-mapping via a drone (led by Danny Jacobs of ASU)

  iii) A novel technique using cosmic-rays

Key Science Projects

Extrasolar space weather

Cosmic Dawn

Transients

Gravitational wave follow-up

Solar dynamic imaging spectroscopy

Galilean moon subsurface characterization

Cosmic rays