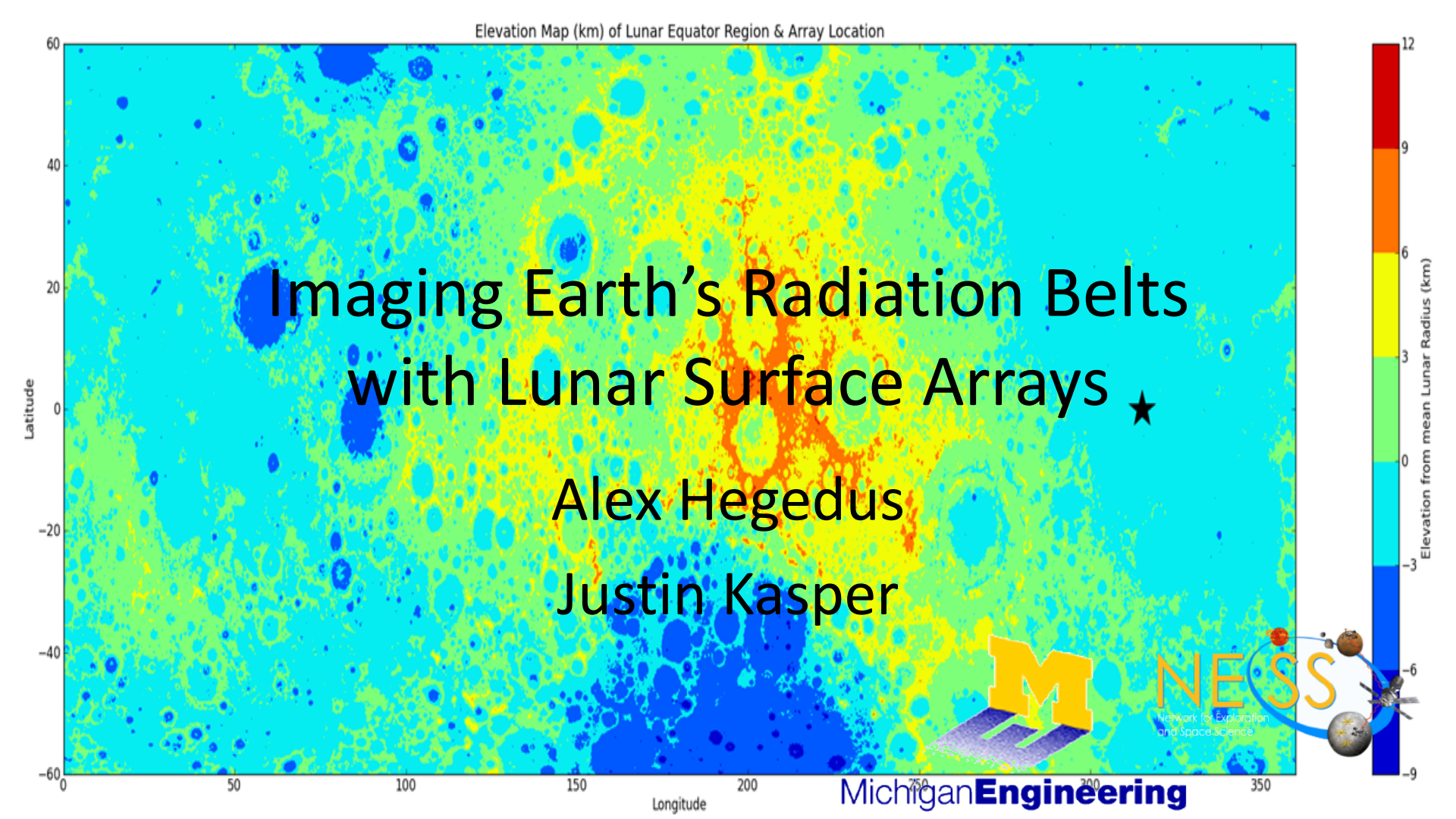


# Imaging Earth's Radiation Belts with Lunar Surface Arrays ★

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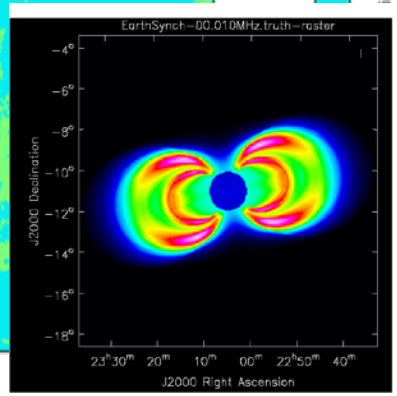
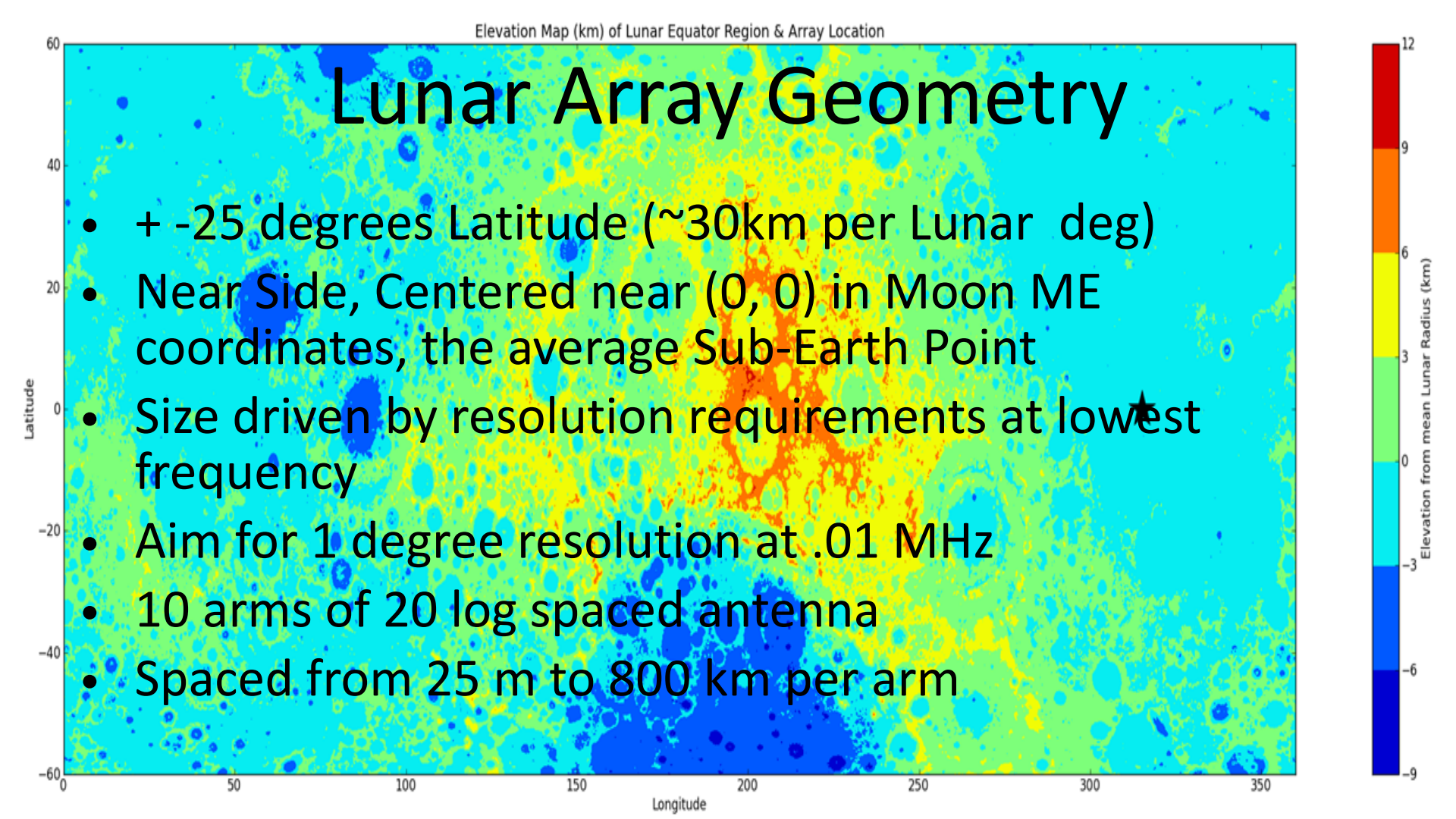
# Input Truth Models

- Electron Synchrotron Emission from Modeled Distributions from French ONERA Lab
- ~10-15 Jy total signal in the 0.01 – 1 MHz band at Lunar Distances in quiet periods
- Need a lot of effective collecting area

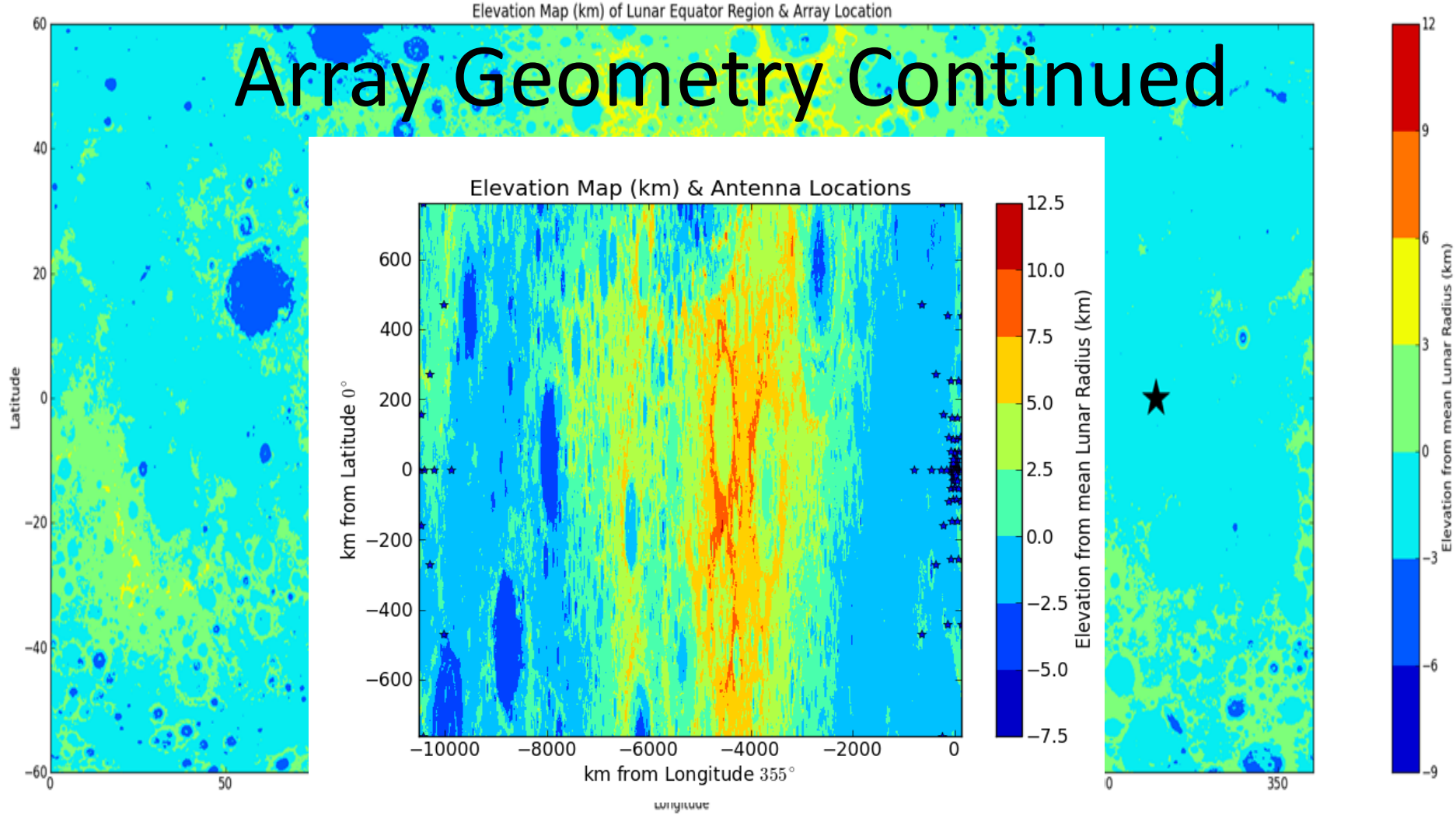


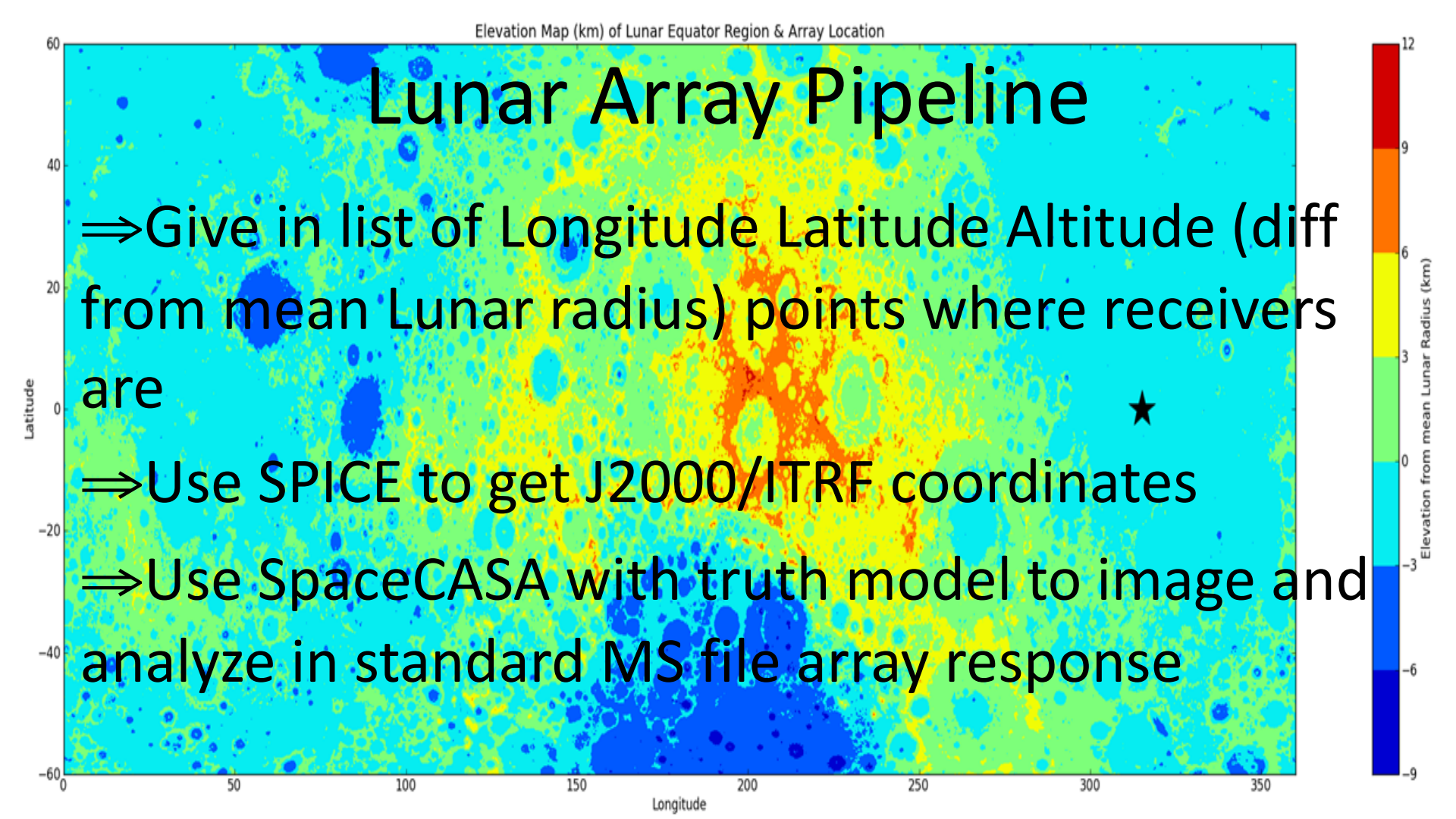



# Lunar Array Geometry

- + -25 degrees Latitude (~30km per Lunar deg)
- Near Side, Centered near (0, 0) in Moon ME coordinates, the average Sub-Earth Point
- Size driven by resolution requirements at lowest frequency
- Aim for 1 degree resolution at .01 MHz
- 10 arms of 20 log spaced antenna
- Spaced from 25 m to 800 km per arm

# Array Geometry Continued



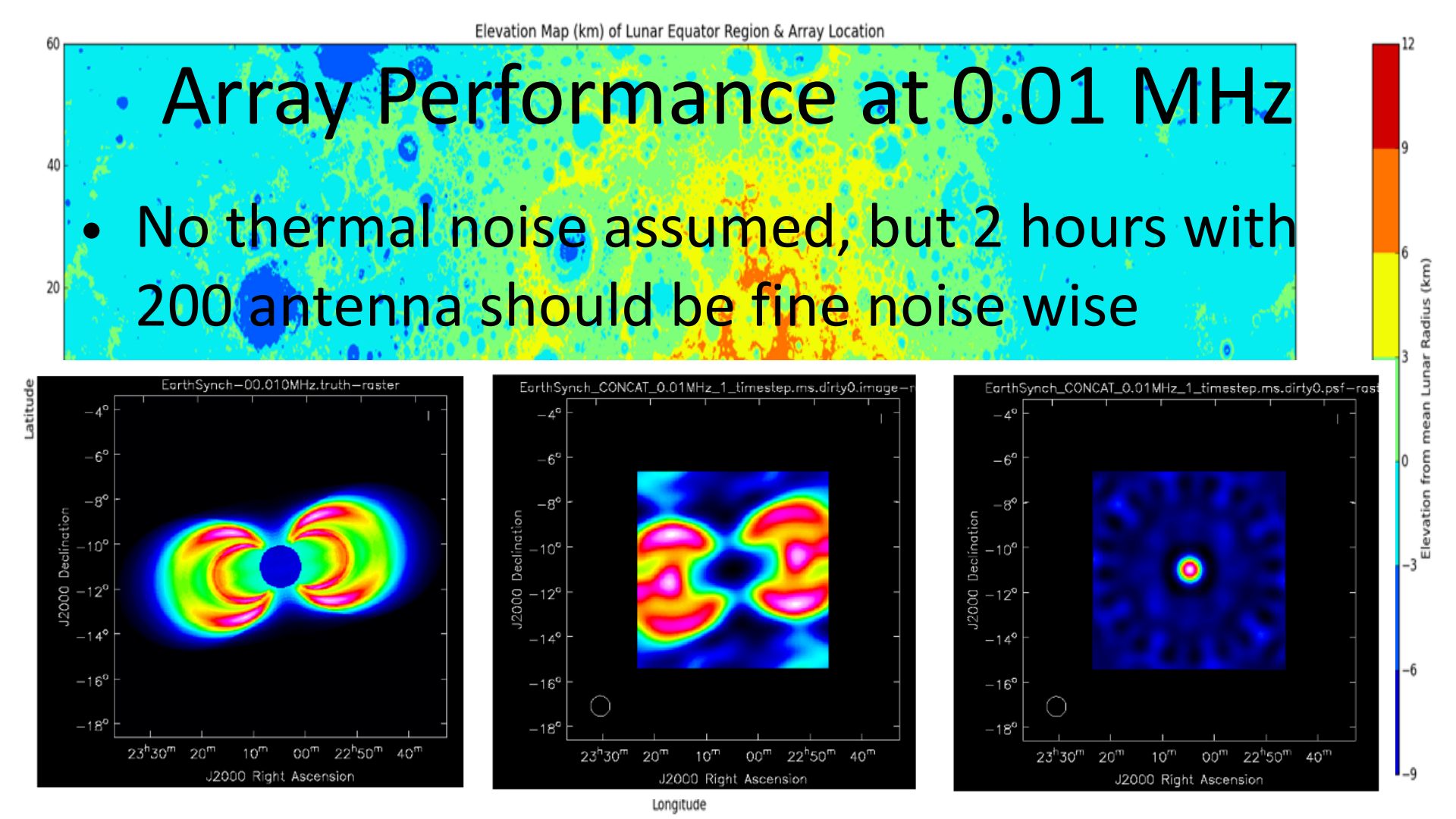



# Lunar Array Pipeline

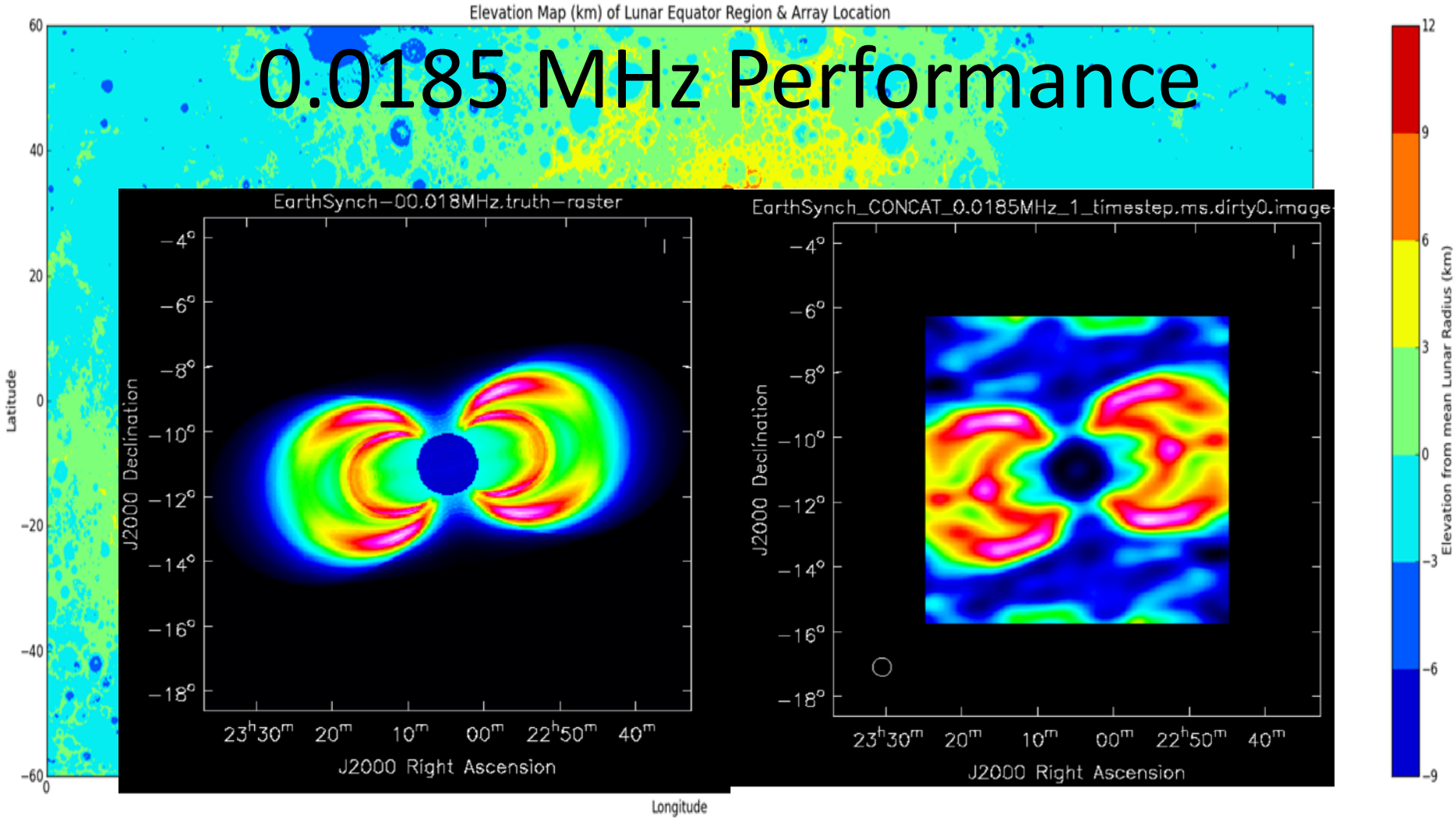
⇒Give in list of Longitude Latitude Altitude (diff from mean Lunar radius) points where receivers are

⇒Use SPICE to get J2000/ITRF coordinates

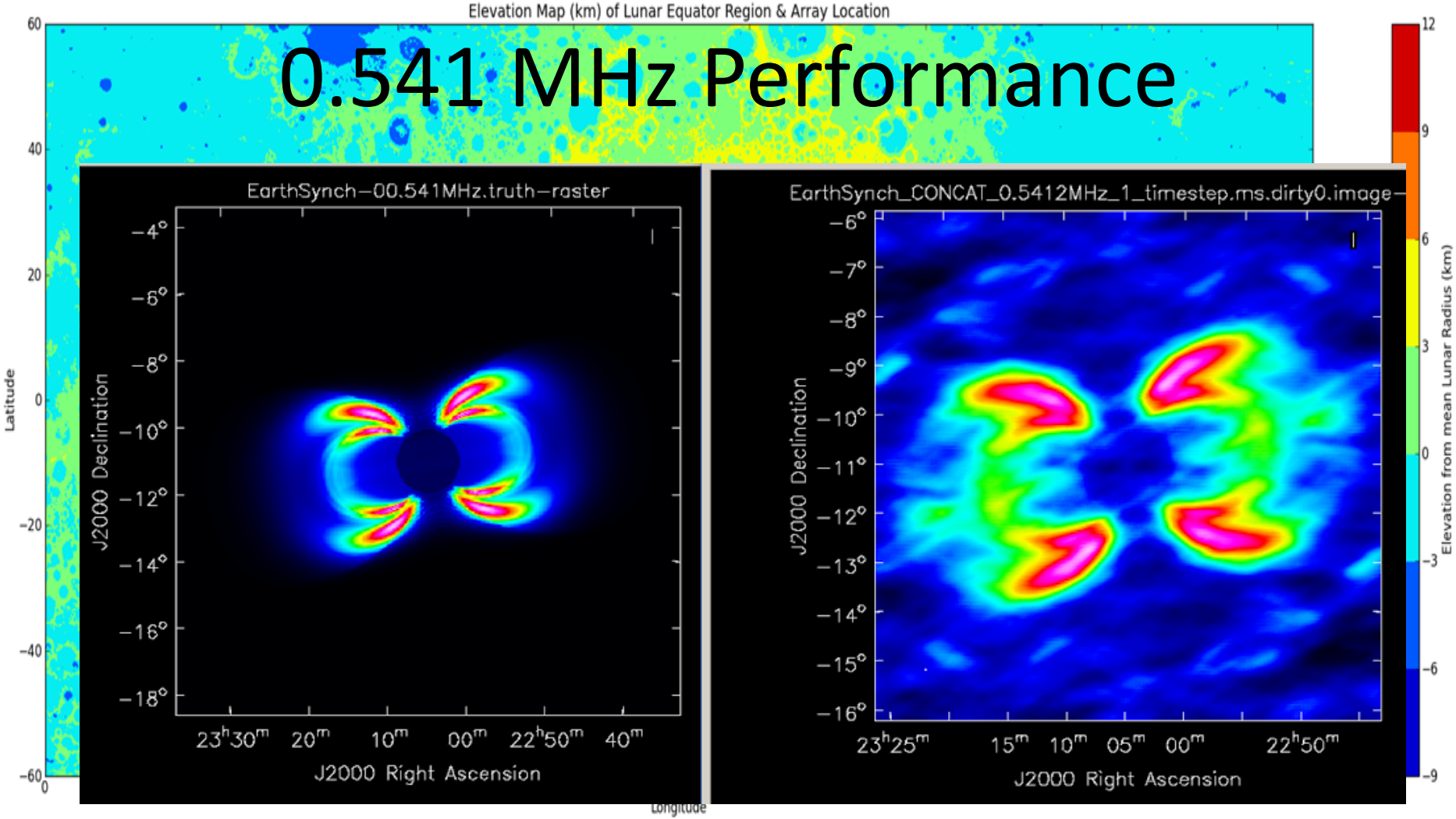
⇒Use SpaceCASA with truth model to image and analyze in standard MS file array response

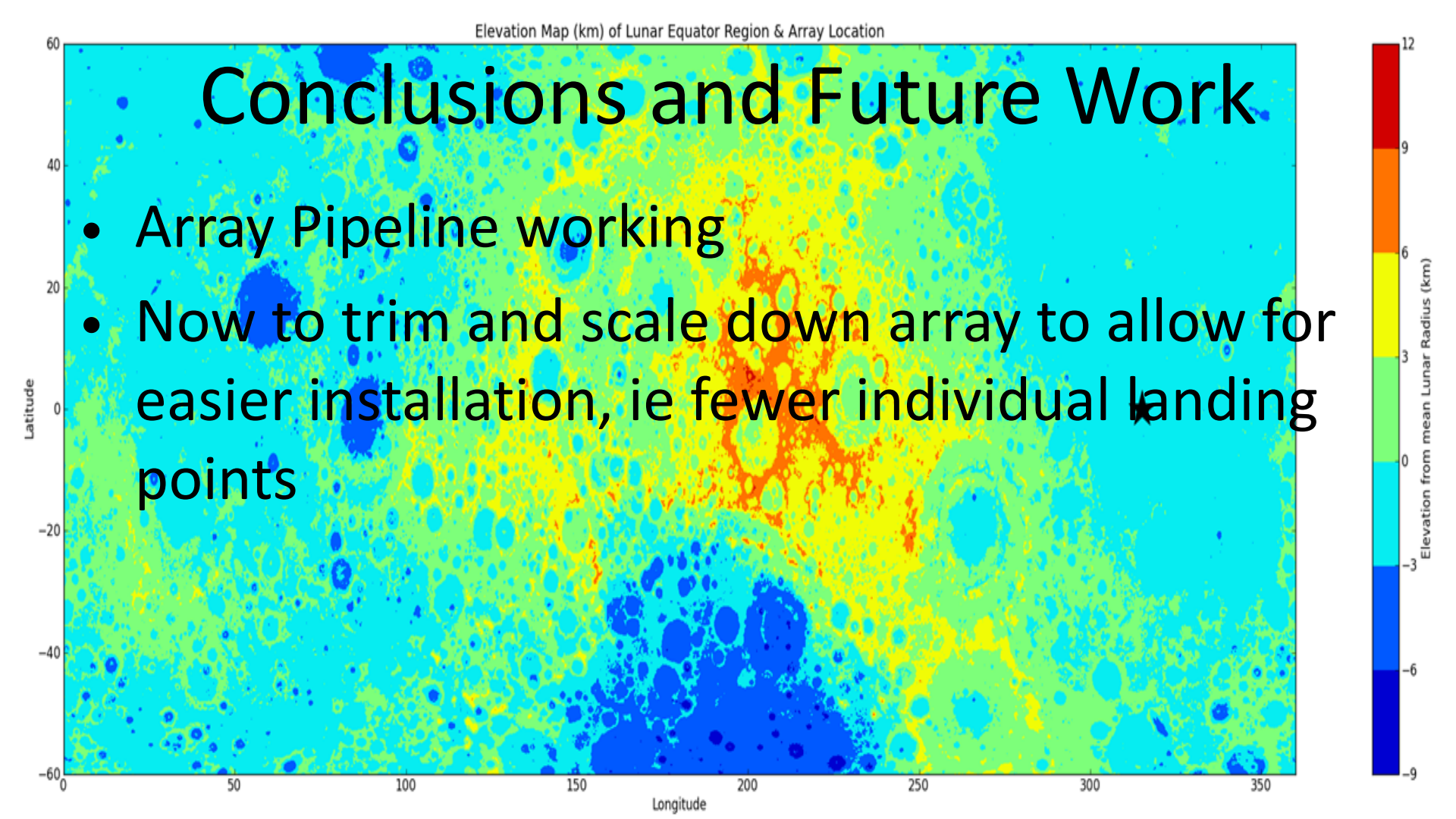

Elevation Map (km) of Lunar Equator Region & Array Location
60
40
20
Array Performance at 0.01 MHz
• No thermal noise assumed, but 2 hours with 200 antenna should be fine noise wise
12
9
6
3
0
-3
-6
-9
Elevation from mean Lunar Radius (km)
EarthSynch−00.010MHz.truth−raster
EarthSynch_CONCAT_0.01MHz_1_timestep.ms.dirty0.image−r
EarthSynch_CONCAT_0.01MHz_1_timestep.ms.dirty0.psf−rast
Latitude
J2000 Declination
J2000 Right Ascension
Longitude

# 0.0185 MHz Performance



# 0.541 MHz Performance






# Conclusions and Future Work

- Array Pipeline working
- Now to trim and scale down array to allow for easier installation, ie fewer individual landing points