

MICHIGAN FIREBALL OF JANUARY 17, 2018

BILL COOKE AND DANIELLE MOSER

NASA METEOROID ENVIRONMENT OFFICE

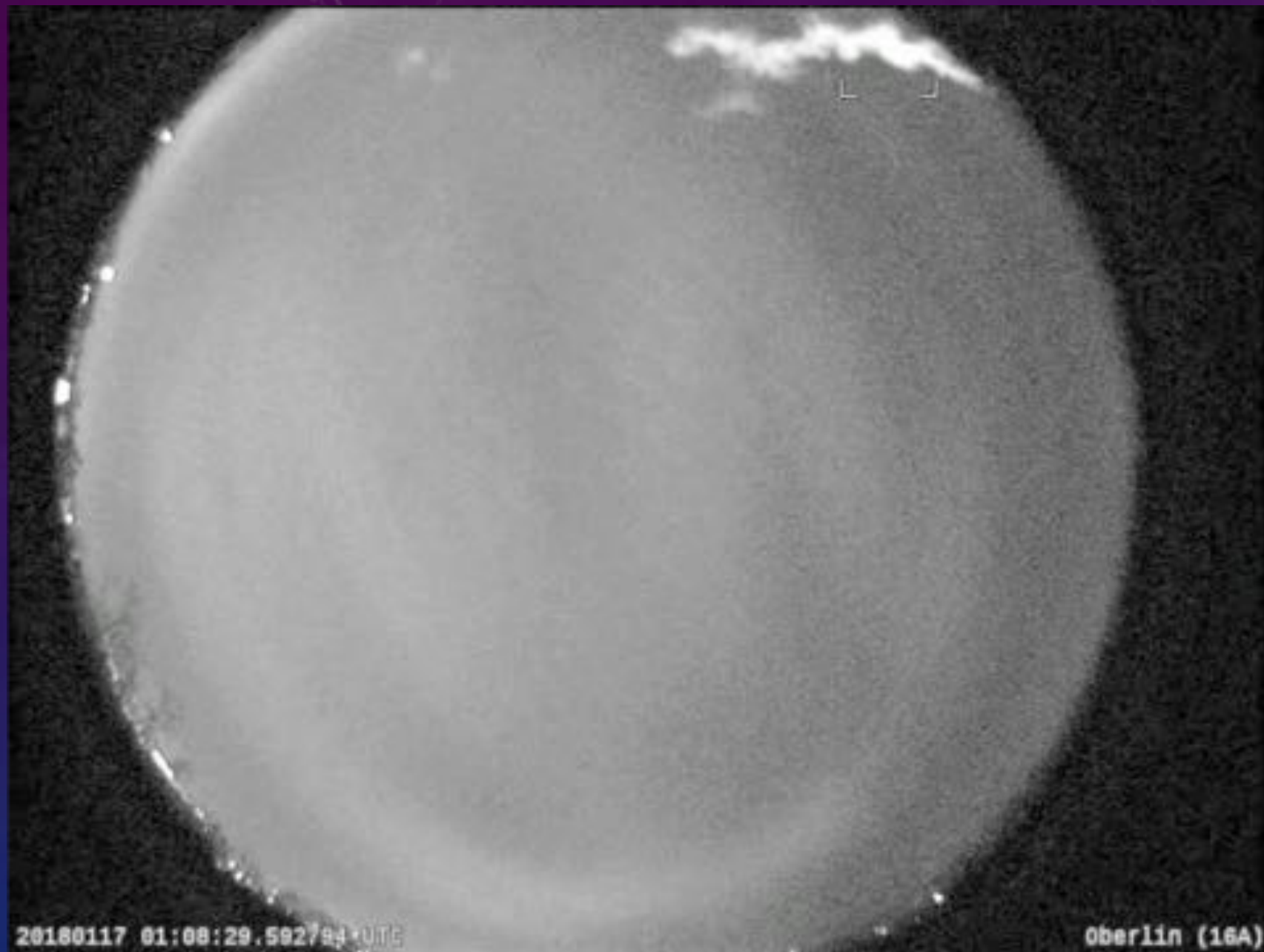
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BASIC OVERVIEW

- Occurred on January 17, 2018 at 01:08:30 UTC (2018 January 17 7:08:30 PM CST)
- Over 600 eyewitness accounts
- Caught on security and dash cameras throughout the region
- Detected by the NASA all sky meteor camera at Oberlin College
- Superbolide class event (superbolides have a magnitude of -17 or brighter, in between the Full Moon and Sun in brightness)



American Meteor Society (AMS) observer heat map



CAM6

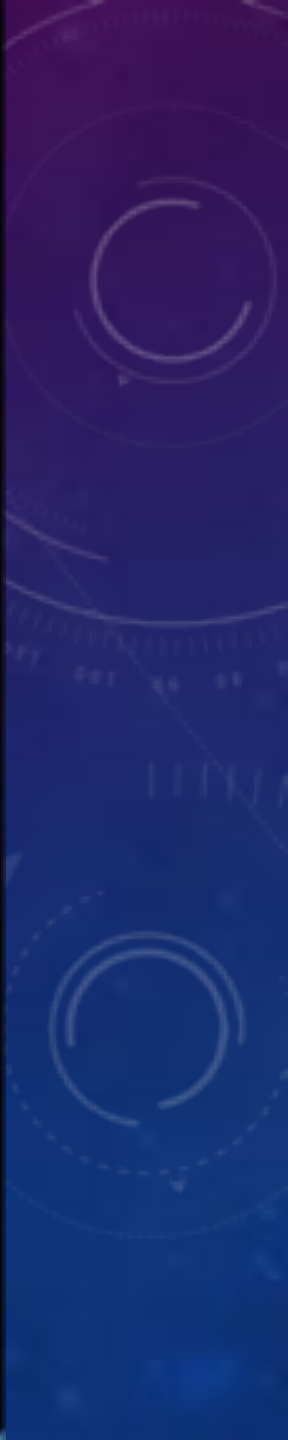


Toledo

01/16/2018 20:14:30



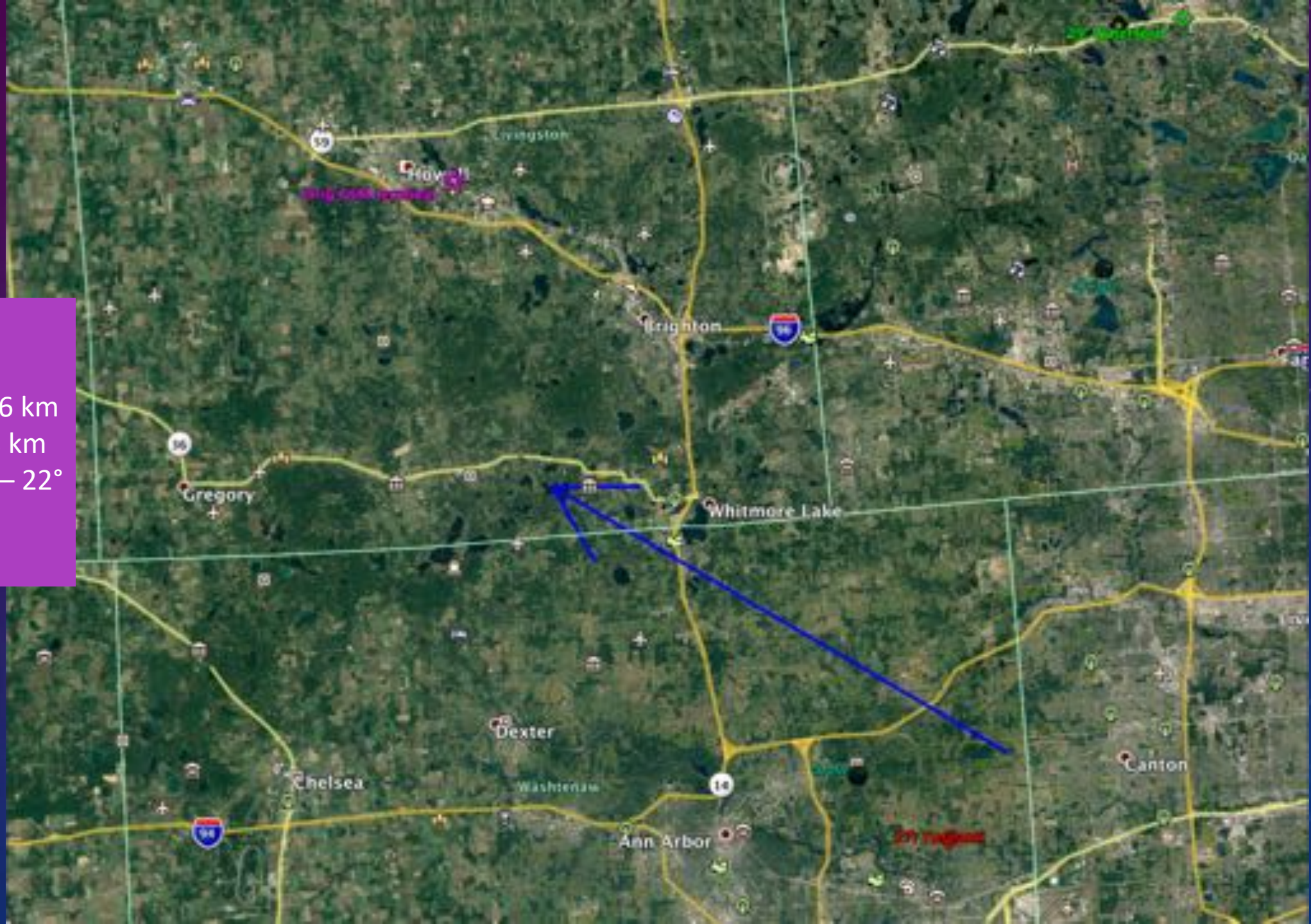






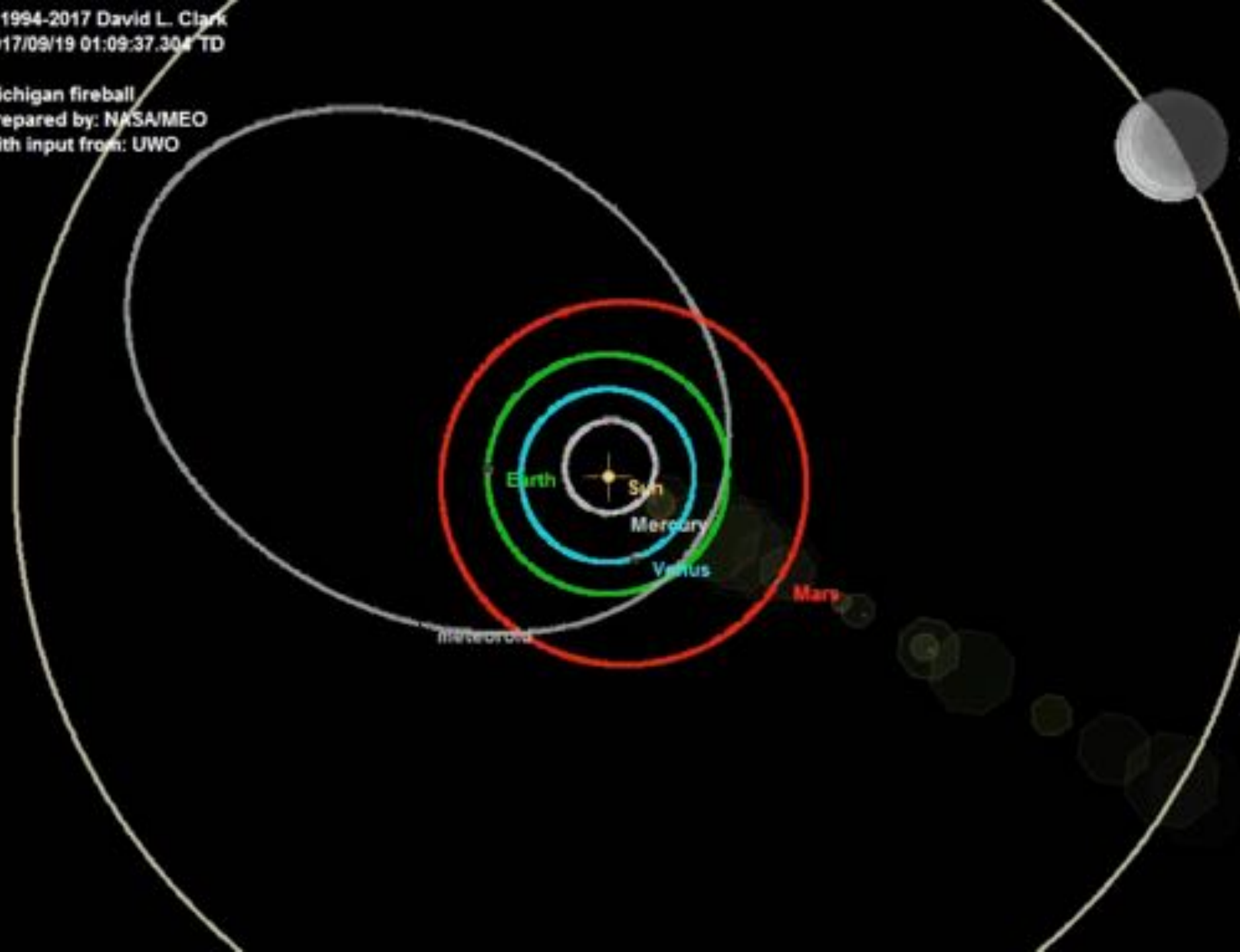
WHAT WE KNOW

Speed – 15 km/s
Start height (video) – 86 km
End height (video) – 18 km
Very steep entry angle – 22°
from vertical

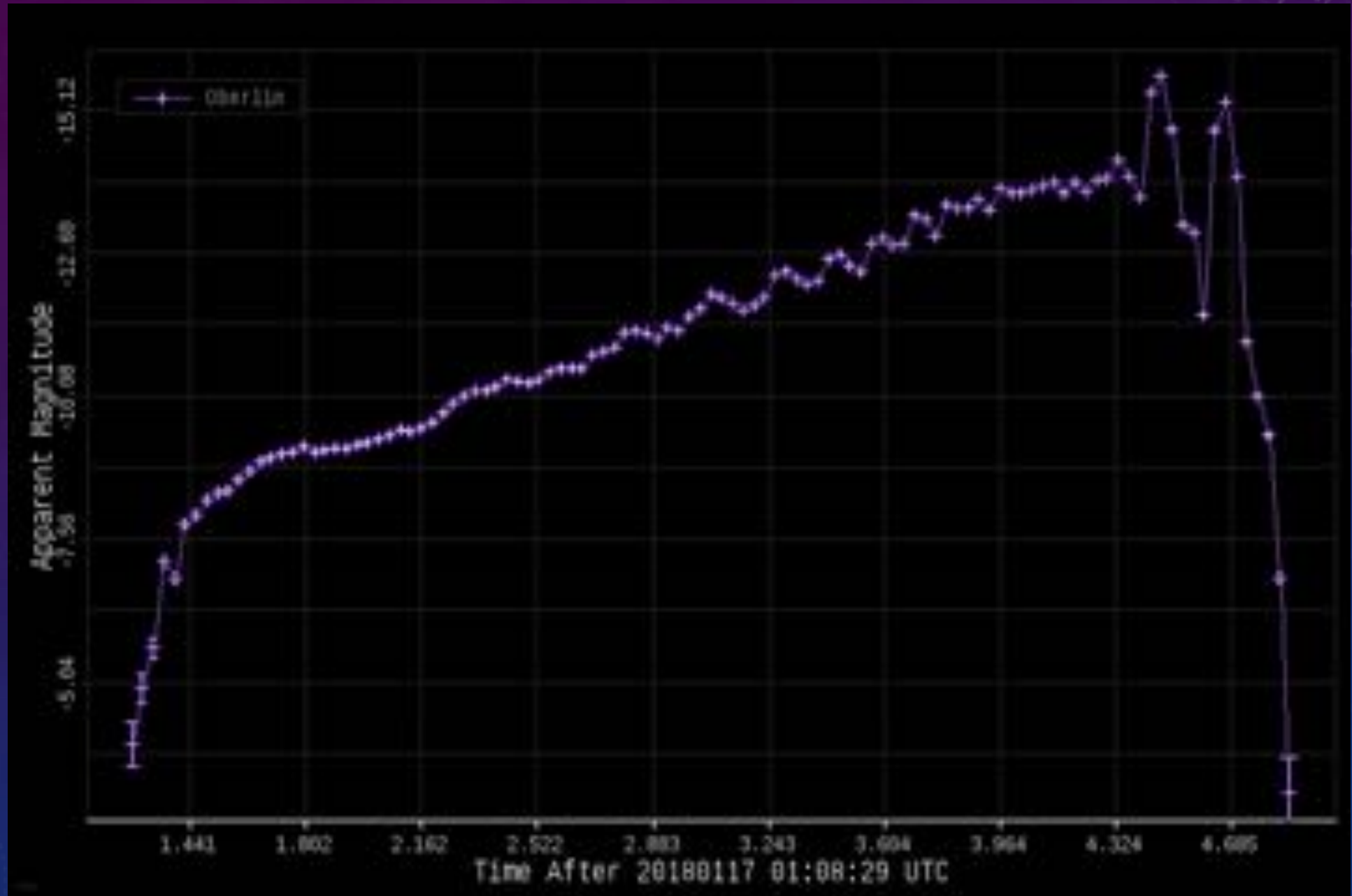


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2017/09/19 01:09:37.304 TD

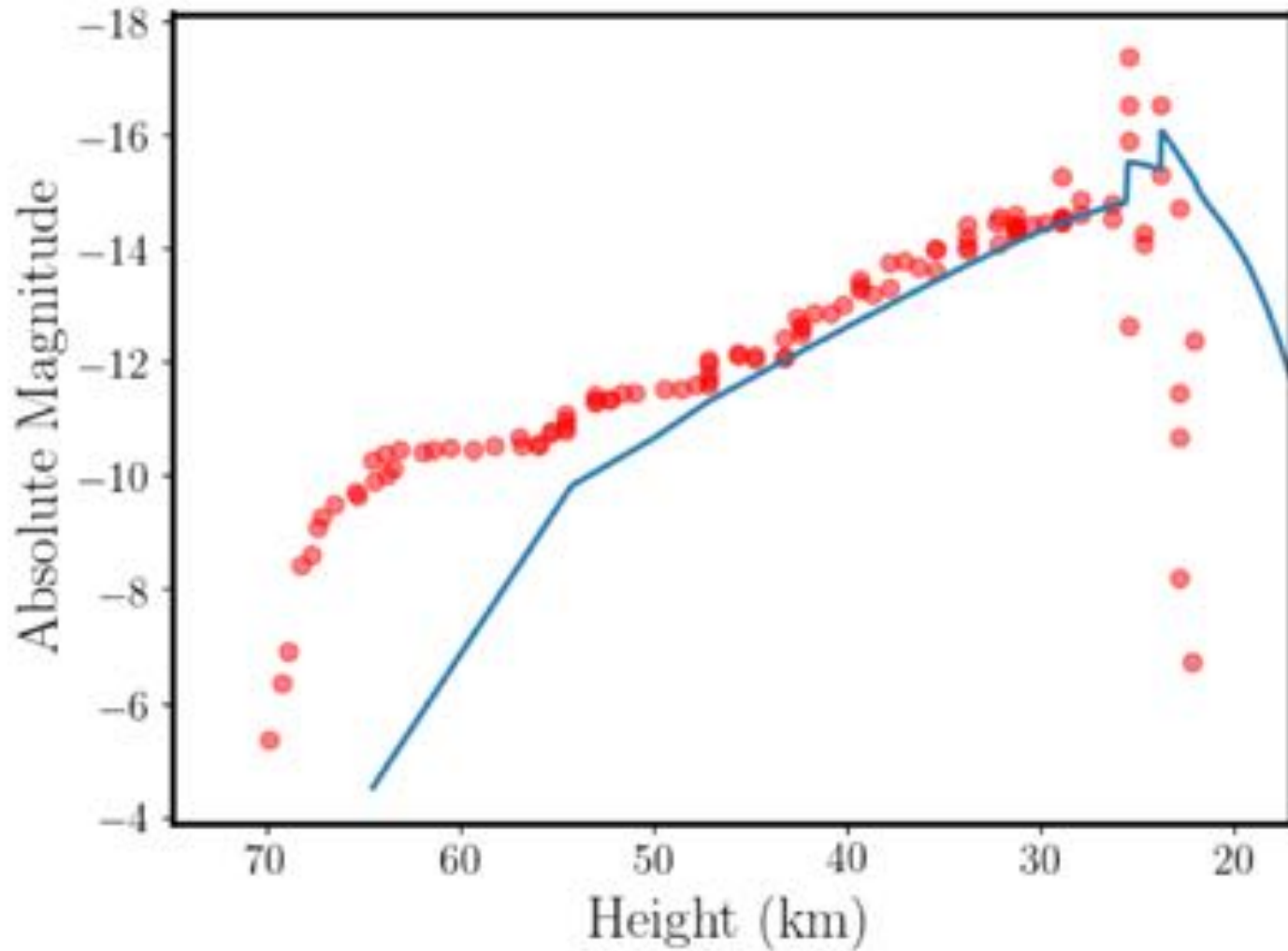
Michigan fireball
Prepared by: NASA/MEO
With input from: UWO



Light curve



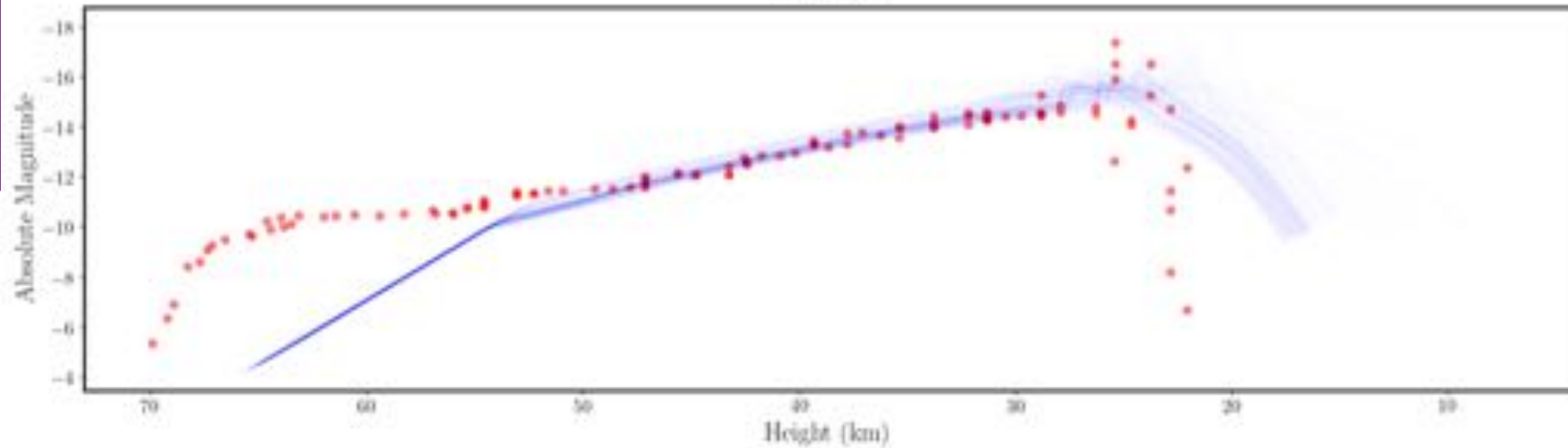
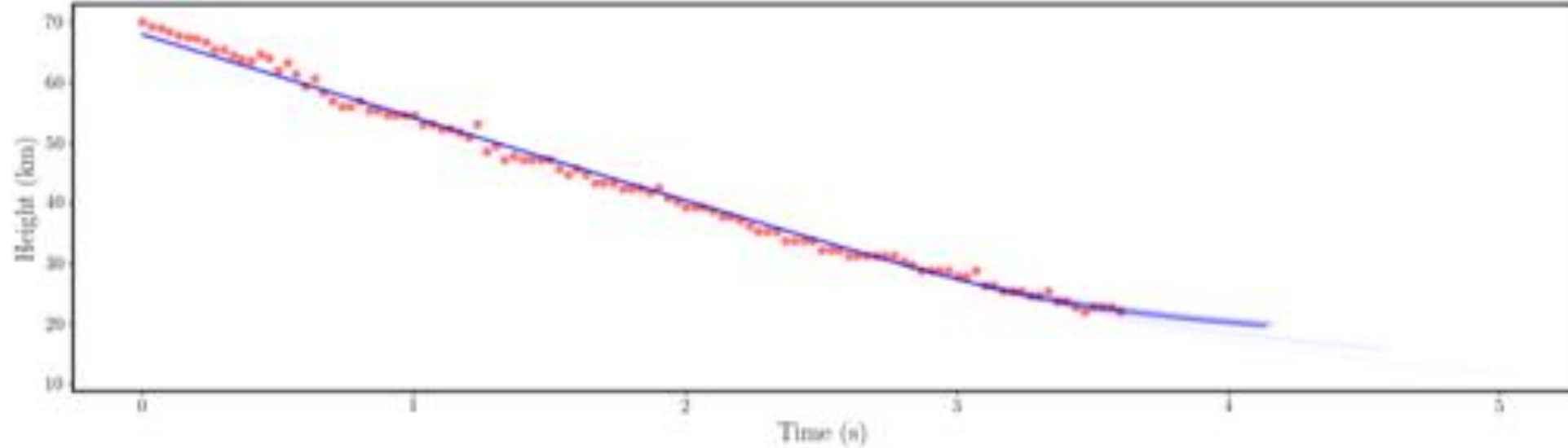
MANUAL TPFM MODEL FIT



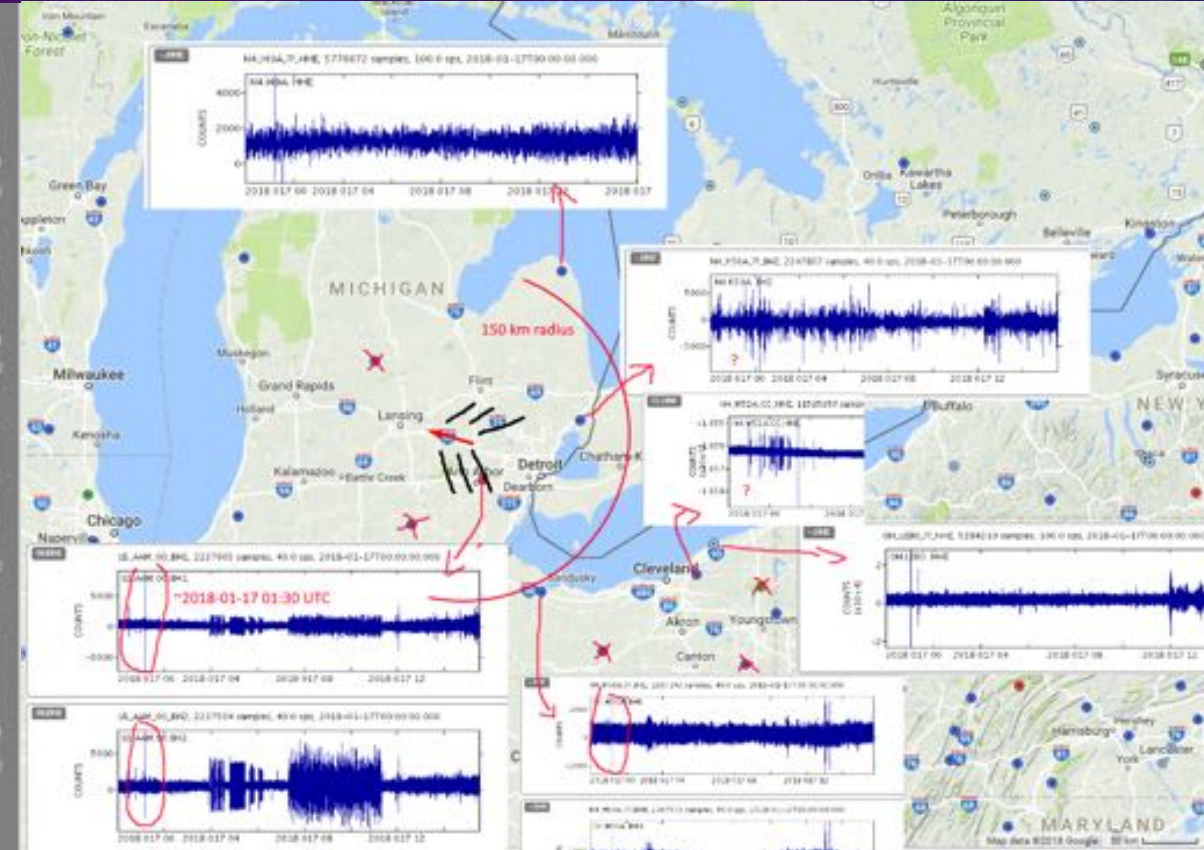
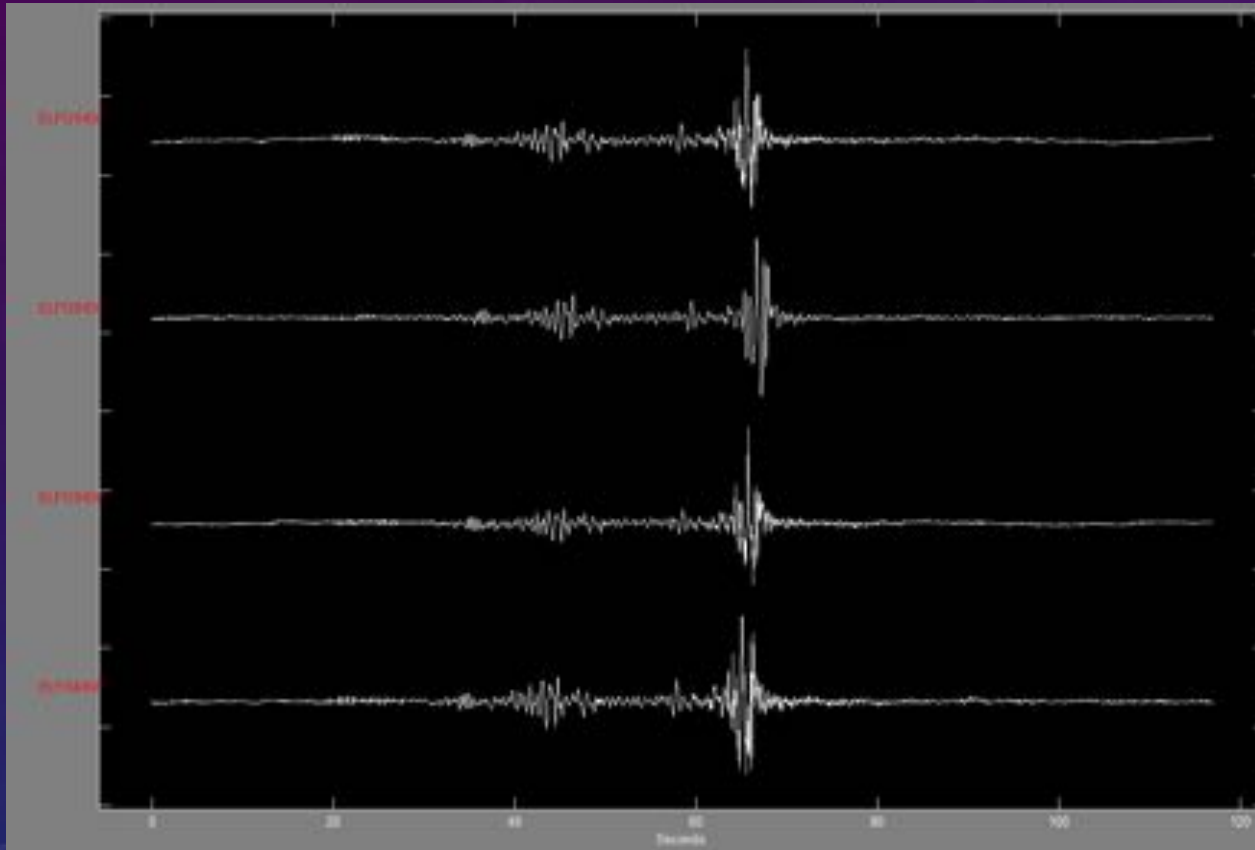
Diameter = 68 cm
Strength = 2.7 Mpa
Bulk density = 3700 kg m⁻³
Mass = 609 kg
KE = 16.4 tons TNT

MCMC TPFM RESULTS

RINF: 0.311 - -0.020 + 0.039 (meters)
VINP: 14.904 - -0.006 + 0.004 (km/s)
ZR: 22.479 - -0.003 + 0.008 (degrees)
NUMBMAX: 256.000 - 0.000 + 0.000
SFINF: 1.209 - -0.005 + 0.007
MU: 0.667 - -0.008 + 0.007
POR CLASS: 1 (ordinary chondrite)
STRMOD: 1.267 - -0.171 + 0.140
TSTROVER: 2.583e+06 - -6.071e+05 +
1.230e+06 (Pascals)
SIGMA_HEIGHT: 1.125 - -0.070 + 0.082
(km)
SIGMA_MAG: 1.260 - -0.184 + 0.168
(magnitude)



INFRASOUND AND SEISMIC SIGNATURE



Energy upper limit of 50 tons TNT; nominal close to 10 tons TNT

Event caused a magnitude 2 tremor

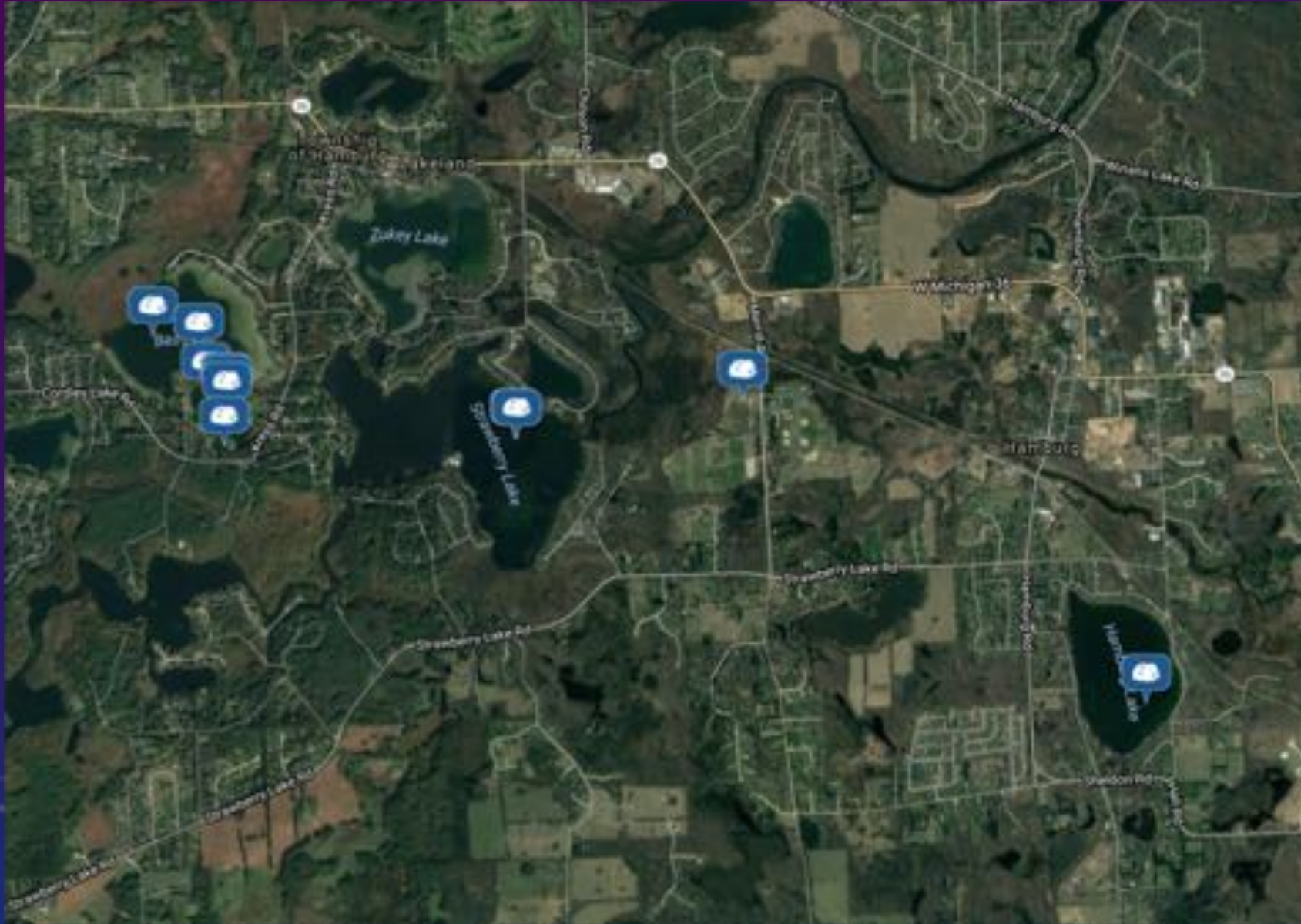
Dark flight
calculations



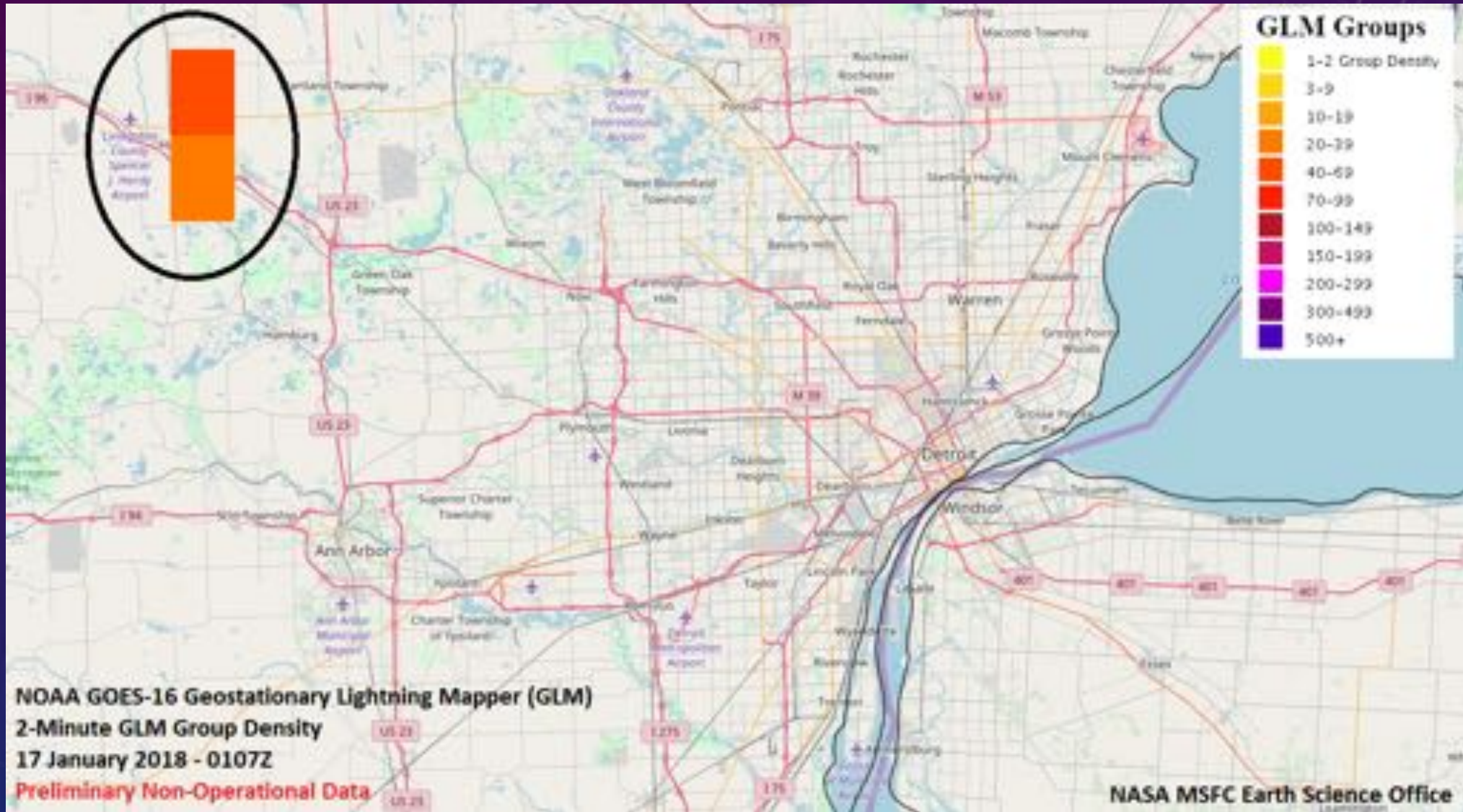
Doppler radar signature of falling meteoritic dust

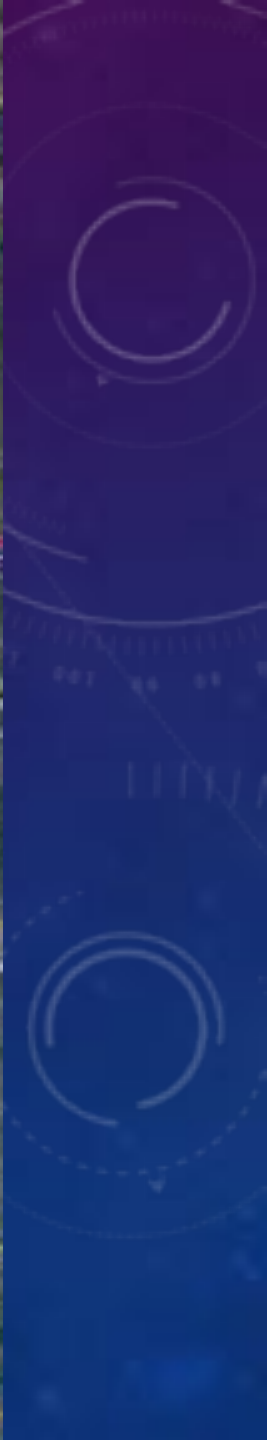
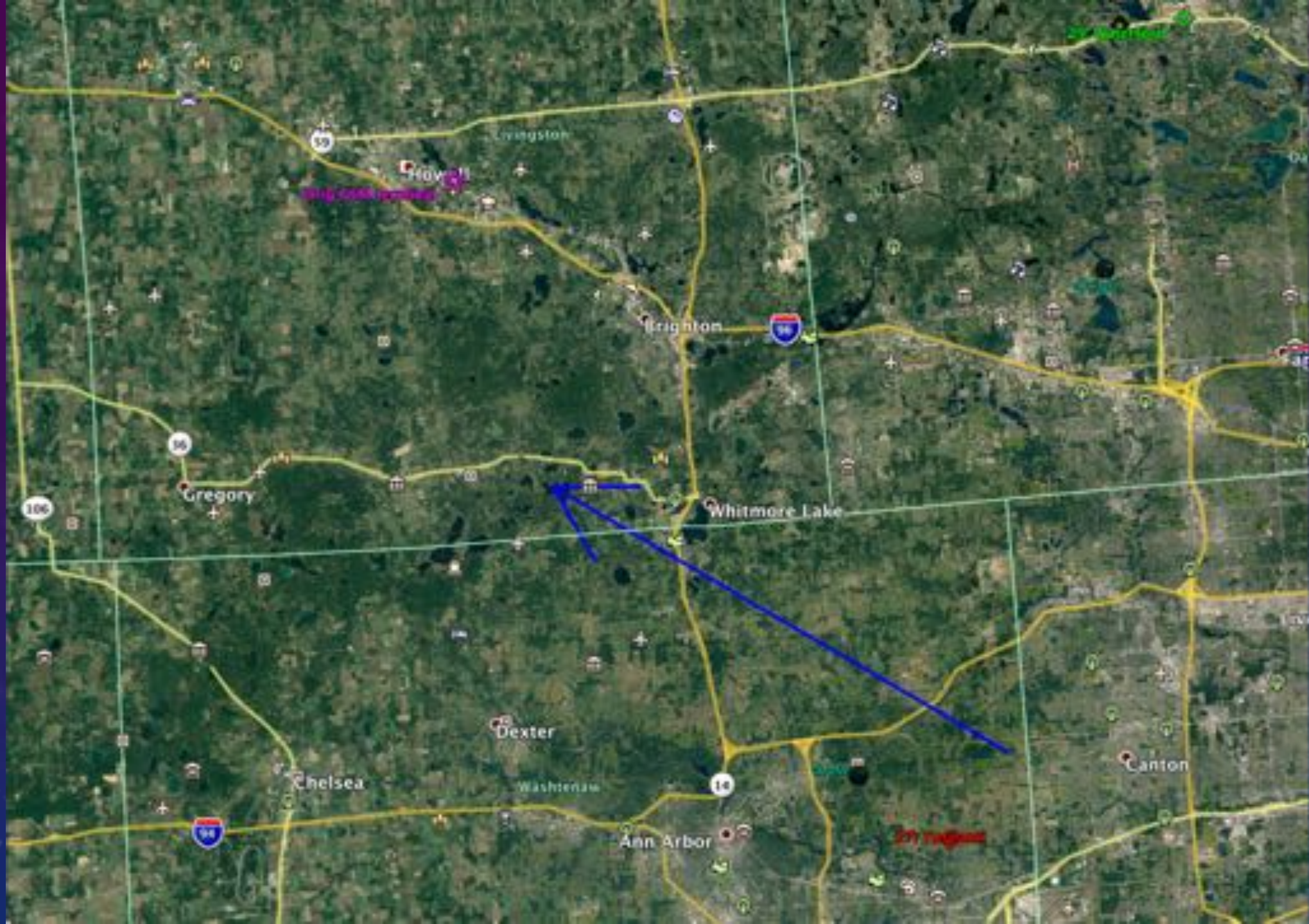


METEORITE FINDS



GLM DATA





GLM level 2 match to light curve

