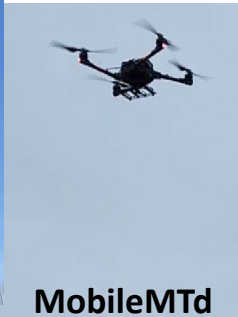
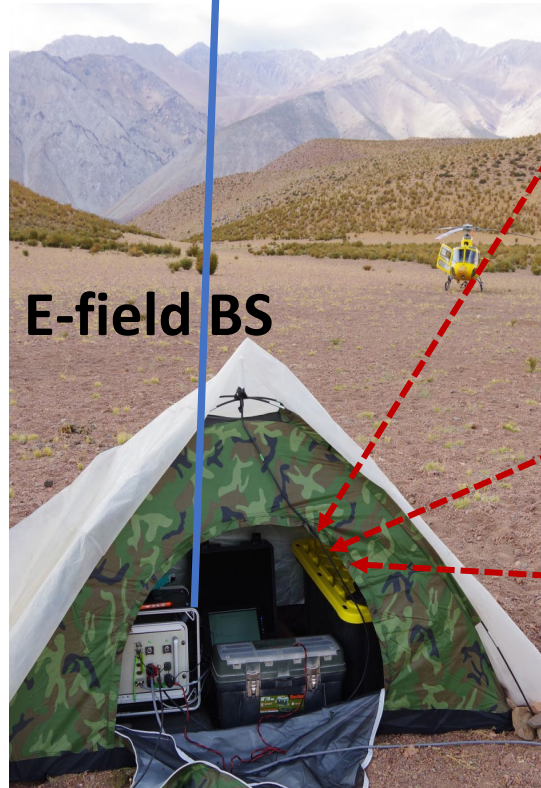
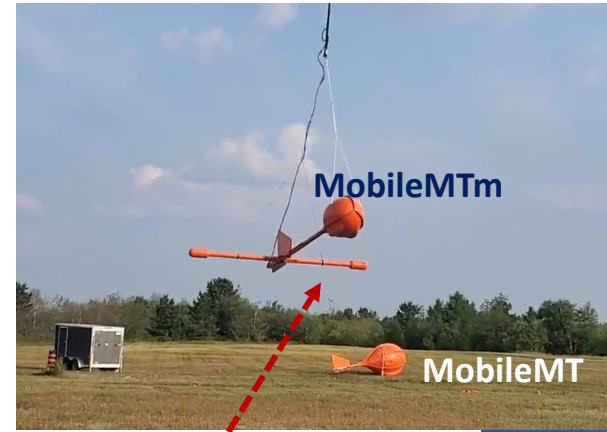
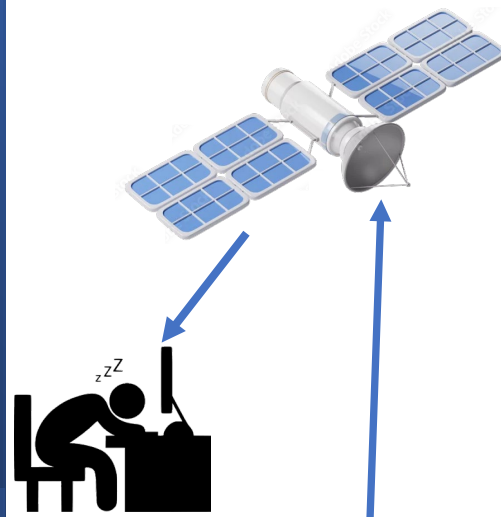


# CONFIGURATIONS OF NATURAL FIELD AIRBORNE MOBILEMT SYSTEM – TECHNICAL FEATURES, DIFFERENCES, AND APPLICATIONS

ALEXANDER PRIKHODKO\*, ANDREI BAGRIANSKI, PETR KUZMIN  
Expert Geophysics Limited

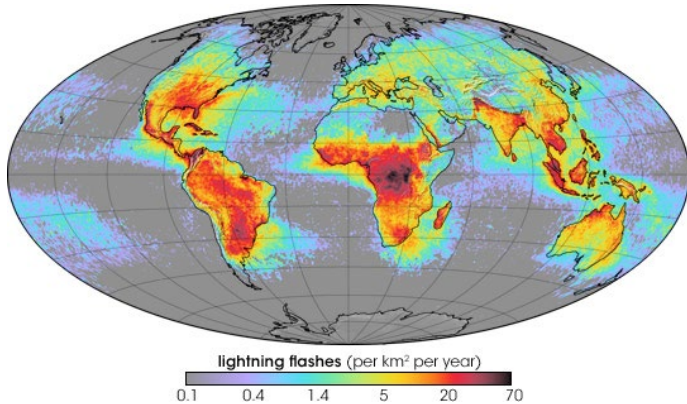
# MobileMT modifications



## Primary field

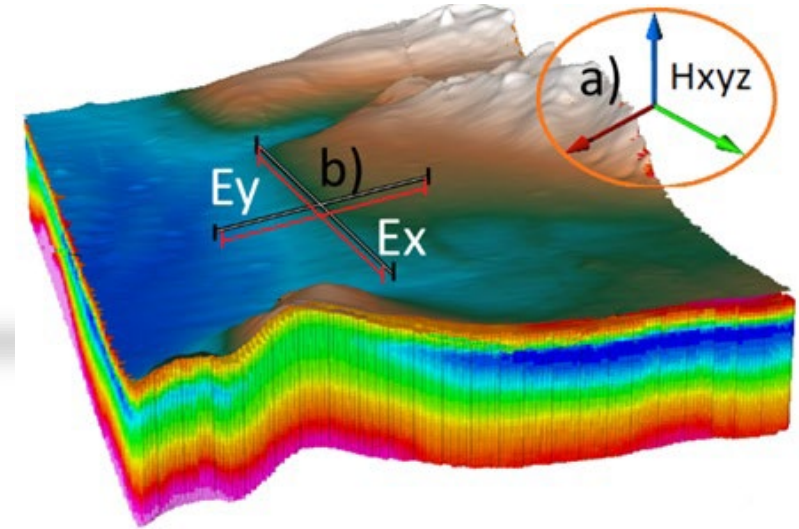
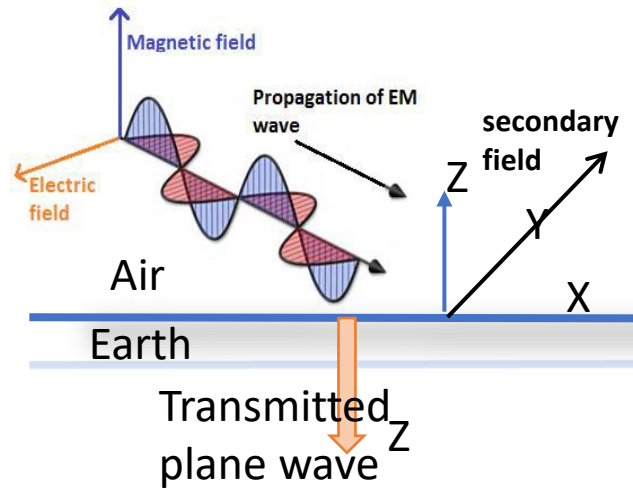


A typical lightning flash is **about 300 million Volts and about 30,000 Amps** (weather.gov)  
On Earth, the lightning frequency is **approximately 44 ( $\pm 5$ ) times per second**, or nearly 1.4 billion flashes per year (Lightning - Wikipedia)

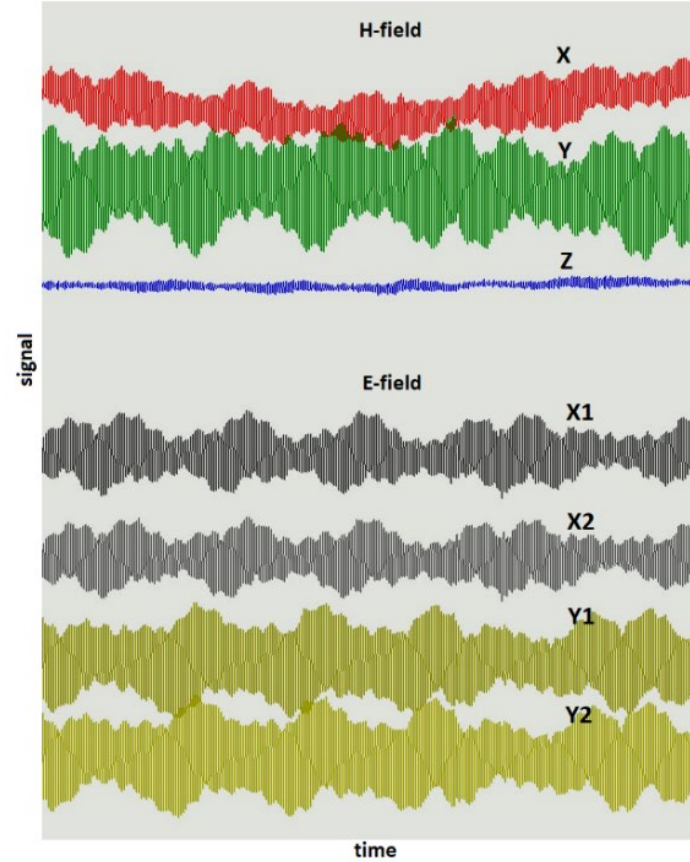
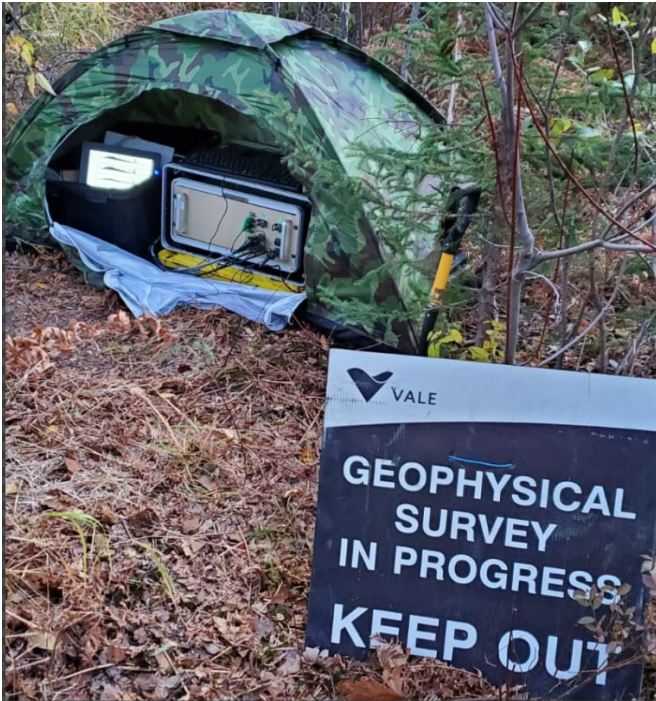
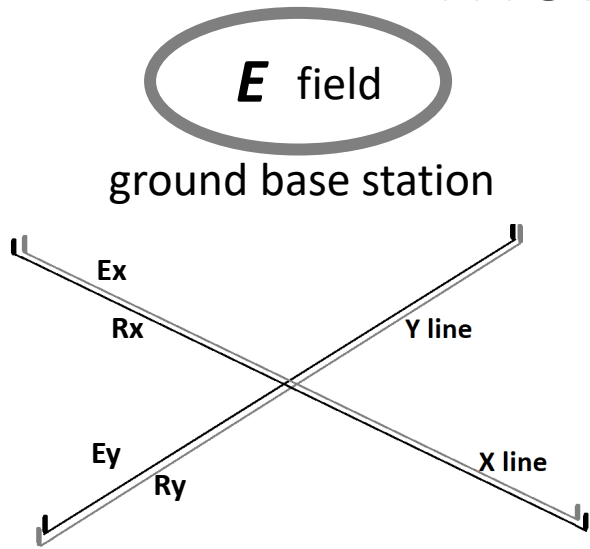


Average yearly counts of lightning flashes per square kilometer, based on data collected by NASA satellites between 1995 and 2002. (NASA, Visible Earth)

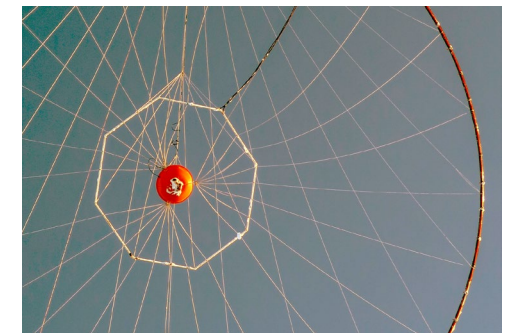
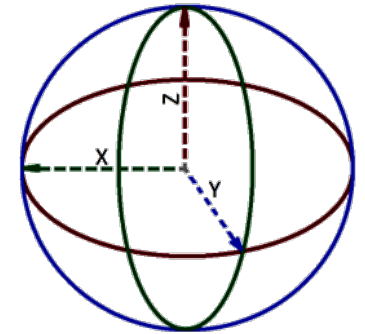
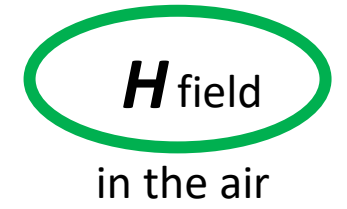
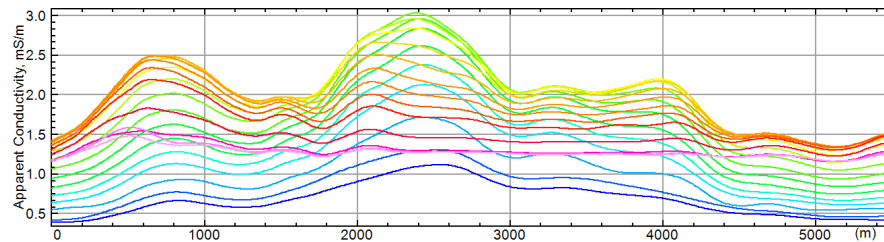
## MobileMT technique - broadband total-field airborne natural source audio-frequency magnetotellurics

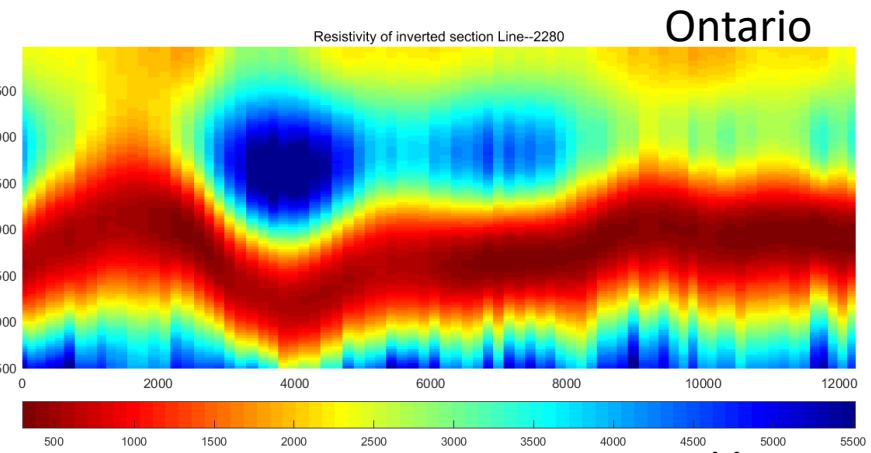
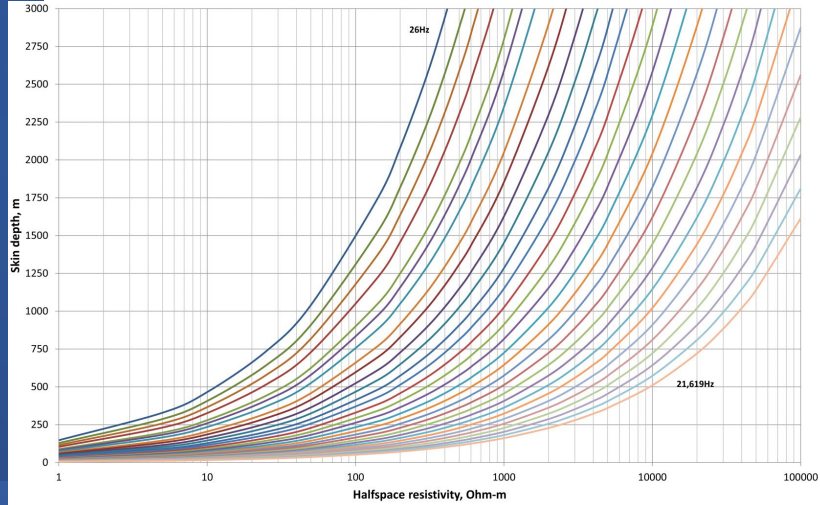
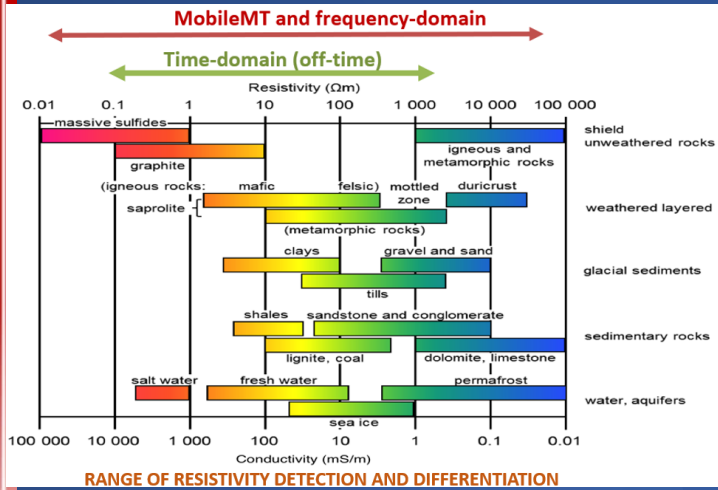


# MobileMT technical configuration

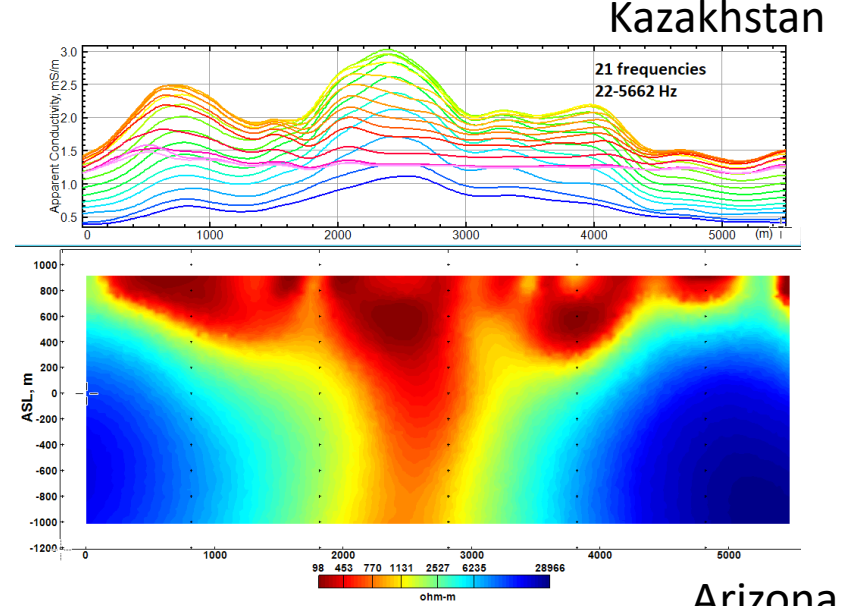
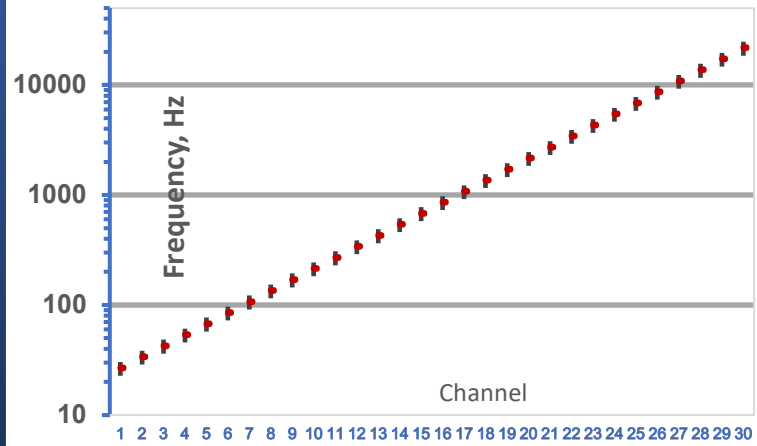


OUTPUT: Apparent Conductivity

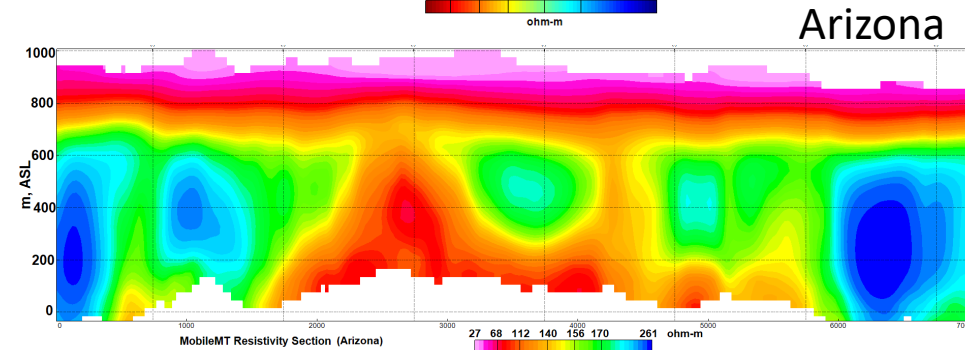
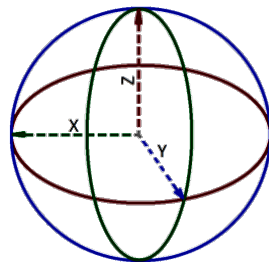




MobileMT recorded frequency windows



# Advantages of the natural field method

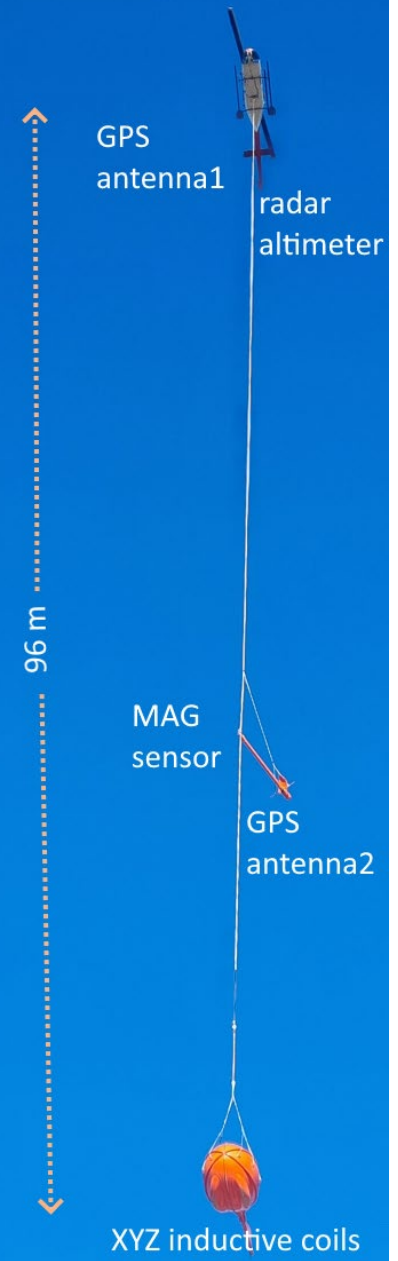


# MobileMT – primary system

Three orthogonal induction coils (1.4 m diameter each);  
26 (22) Hz – 21,000 Hz;  
Survey ground speed 90 km/hour;  
Nominal terrain clearance ~60 m  
Air platform weight 250 kg  
Complimentary data: magnetic field, VLF

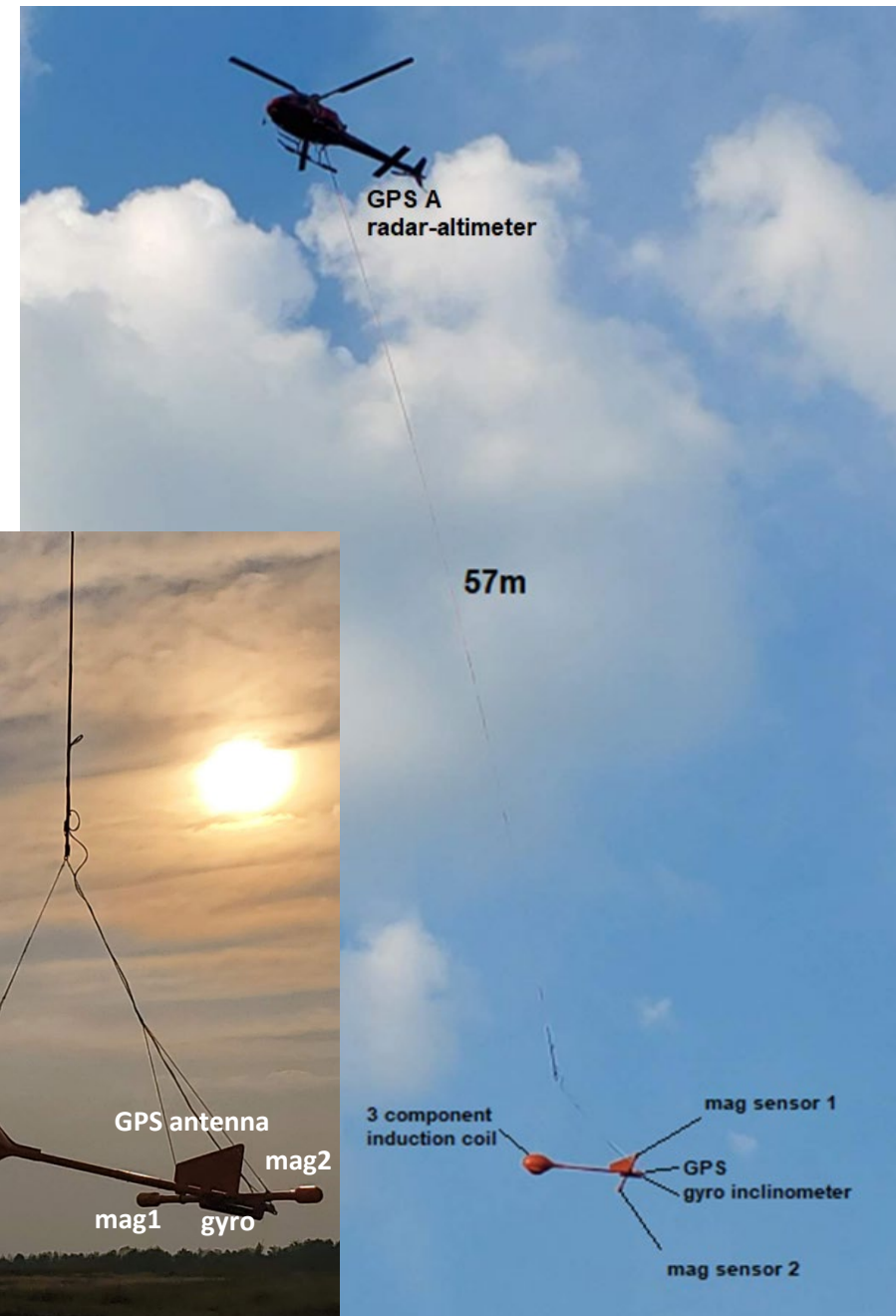


Applicable for a wide range of commodities



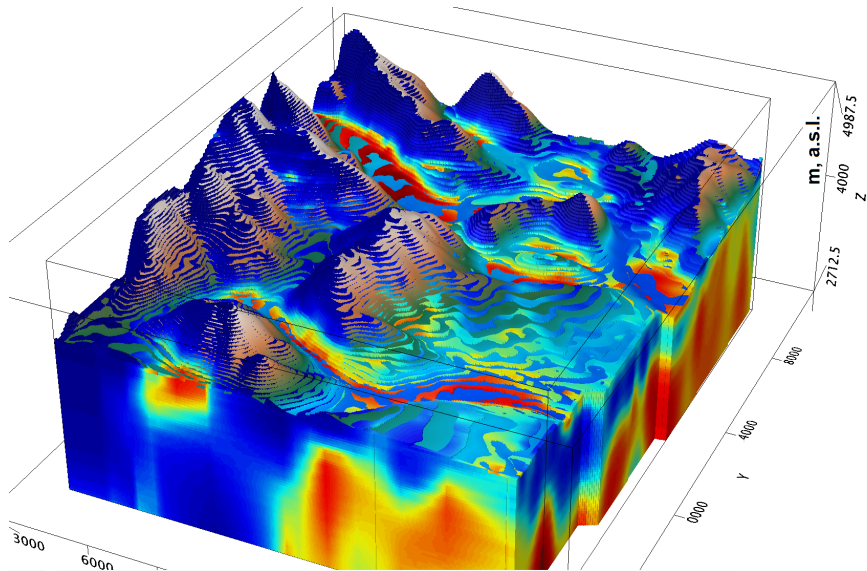
# MobileMTm compact version

- Three orthogonal induction coils (0.7 m diameter each);
- 50 Hz – 21,000 Hz;
- Survey ground speed 90 km/hour;
- Nominal terrain clearance ~50 m;
- Air platform weight 150 kg;
- Magnetic horizontal gradiometer supported by gyro;
- Spectrometry on demand;
- Precise positioning.



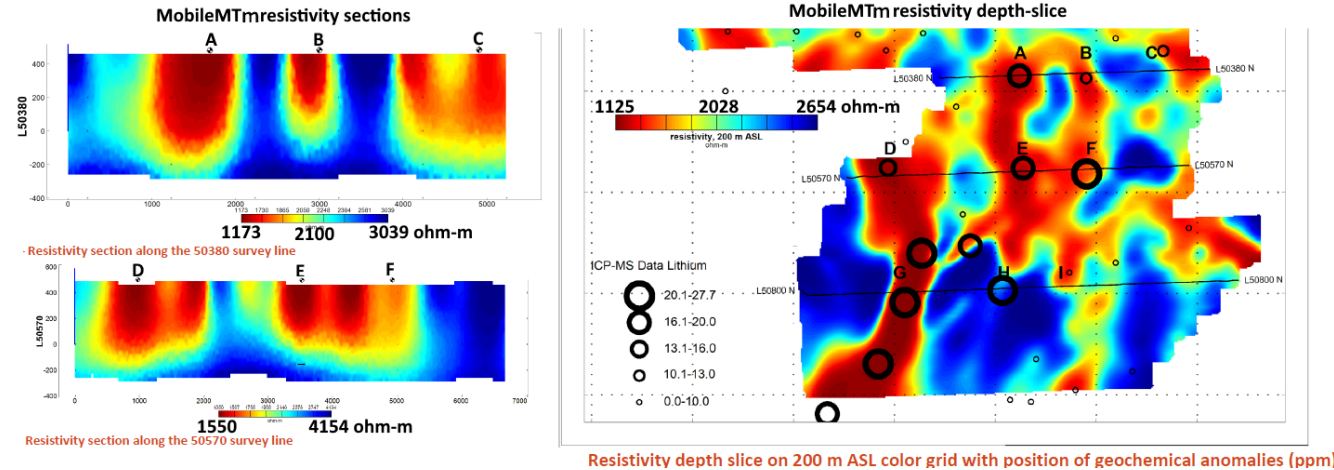
# MobileMTm applications

Areas with high altitudes >4000 m a.s.l.



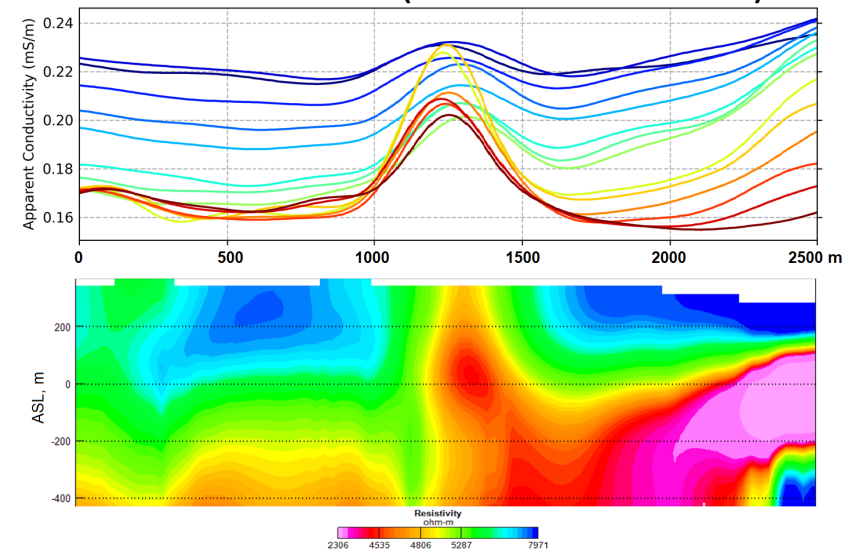
Compact targets

Pegmatites (Northern Ontario)



Resistivity depth slice on 200 m ASL color grid with position of geochemical anomalies (ppm)

Kimberlites (Northern Ontario)



MobileMT surveys with spectrometer included





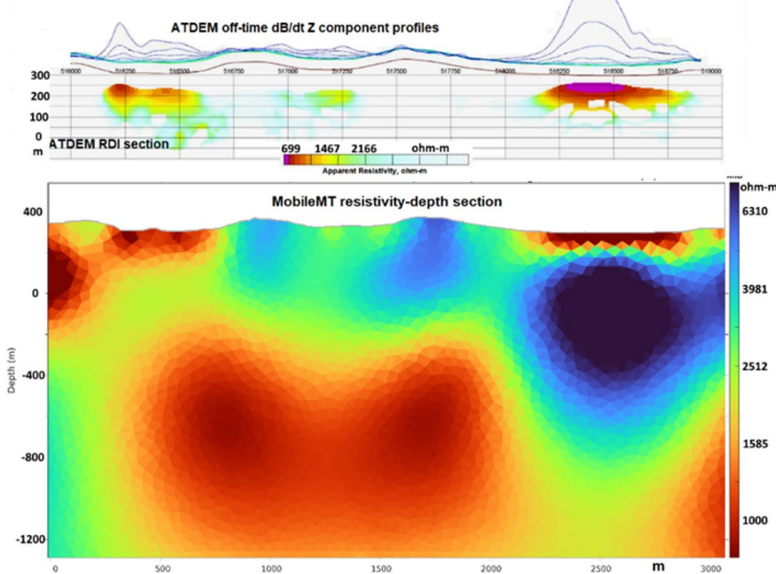
# TargetEM hybrid (time- domain + AFMAG+VLF) system

Three orthogonal induction coils  
(1 m diameter);  
80 Hz – 21,000 Hz (Tr off);  
8000-21,000 Hz (Tr on);  
Tow cable 50 m;  
Survey ground speed 90 km/hour;  
Nominal terrain clearance ~40 m;  
Streaming data;  
VLF is extracted;  
AFMAG data is extracted with a  
combination of an E-field base  
station.



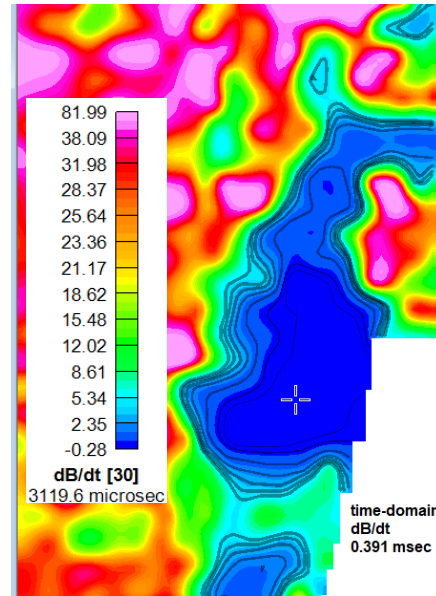
# TargetEM+AFMAG+VLF (from streaming data) applications

## Resistive environment



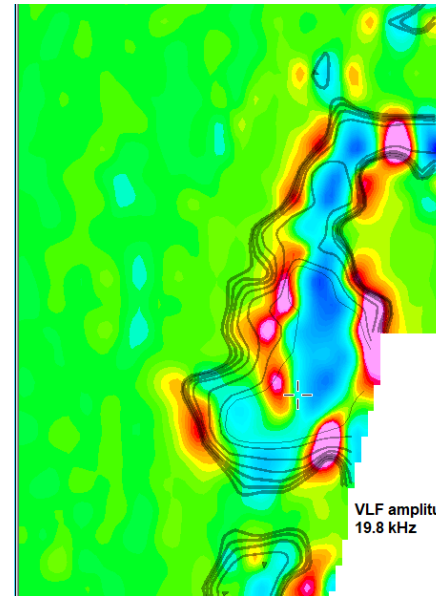
Airborne TDEM z dB/dT profiles and corresponding resistivity depth image (top); MobileMT resistivity section (bottom) over the same survey line. Northern Ontario

## IP effect



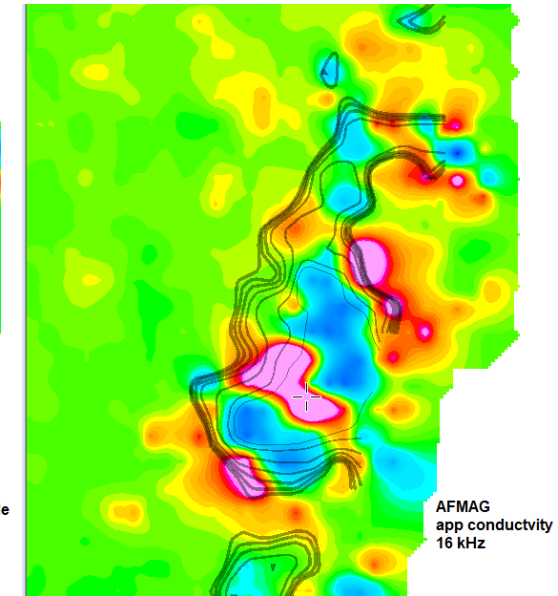
time-domain  
dB/dt  
0.391 msec

## VLF

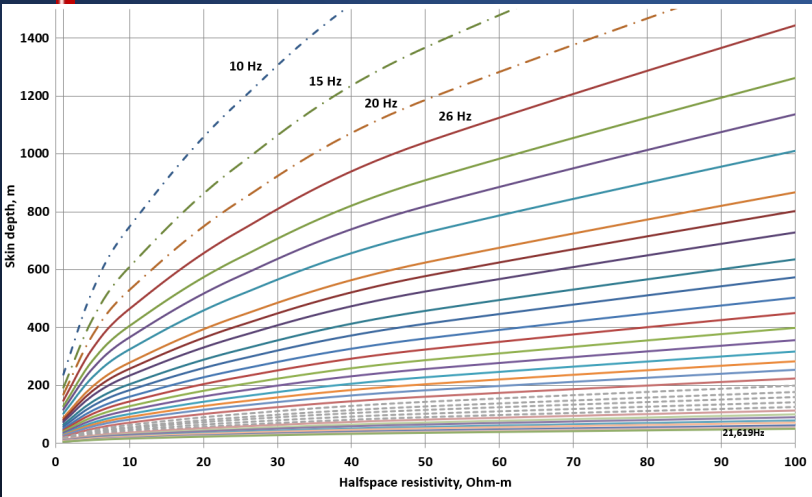


VLF amplitude  
19.8 kHz

## AFMAG

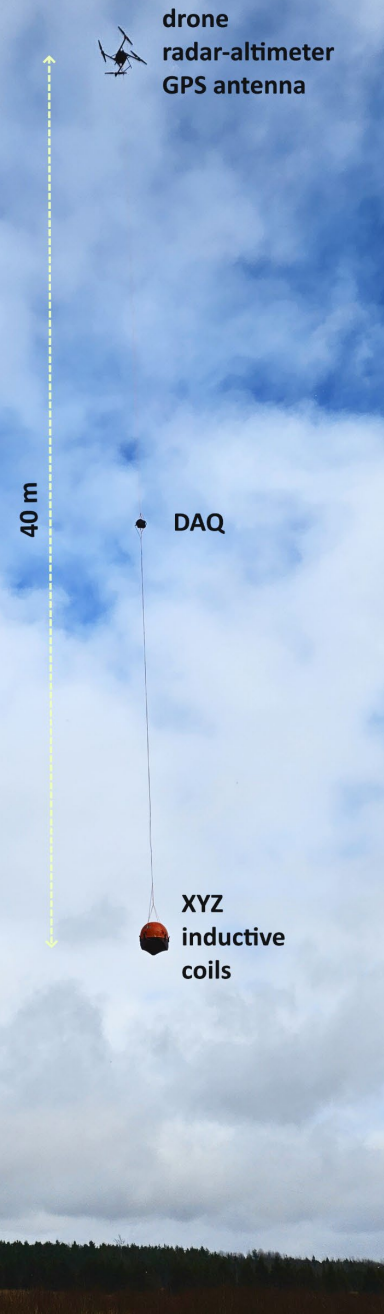
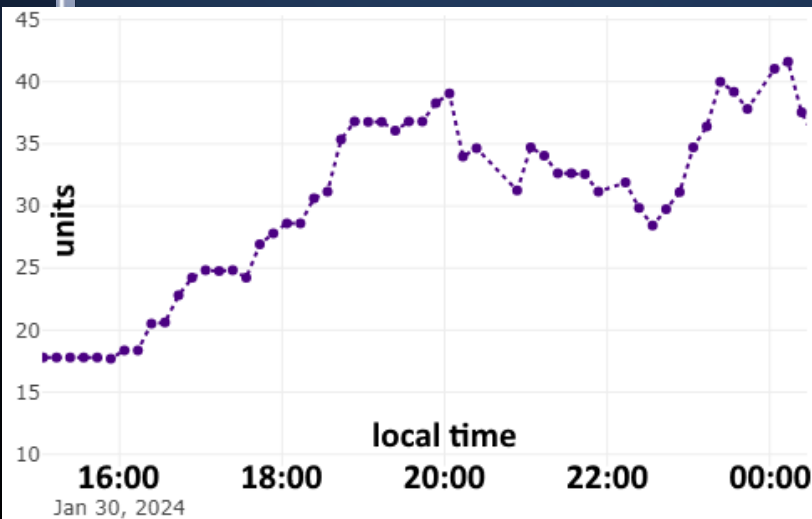


AFMAG  
app conductivity  
16 kHz



XYZ coils 40 cm diameter;  
 Terrain clearance 20-30 m;  
 Frequency range: 15(10?) Hz – 21,000 Hz  
 Ground speed 20-30 km/hour

# MobileMTd – drone modification



# Conclusions

- Broadband, total field, passive airborne electromagnetic method advances exploration capabilities of airborne geophysics
- The method can be used in a variety of modifications depending on geoelectrical and terrain conditions, as well as in support of time-domain EM
- The introduced drone modification of the method is designed to get high-quality data, including on the lowest possible frequencies, to penetrate a highly conductive environment. In addition, the drone modification can be exploited during nighttime periods with the best natural signal.



**THANK YOU**