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Environmentally friendly low impact, low carbon footprint, low power electromagnetic technique for mineral exploration undercover

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1) Introduction

Geophysicists in the 21st century now accept their commitment to being a sustainable and responsible surveyor of the Earth's subsurface. Reducing our carbon footprint on our route to Net Zero in the face of the challenges presented by the global pandemic and the subsequent return to work, fieldwork and international air travel is not an easy task. Whatever our geophysicist tool of choice we can take some basic steps to help, such as:

1. Protect the environment by lessening our impact through monitoring and reducing our carbon emissions
2. Raise awareness within our own organisation of things that colleagues can do to reduce their personal carbon emissions as well as reducing carbon emissions within our organisations
3. Engage colleagues in environmental issues and initiatives
4. Identify environmental causes that we can support; and
5. Publicly hold ourselves accountable for our carbon footprint by publishing our carbon impact on our websites and public domain media channels.

Above all, we can develop and use our geophysics tools and technology in an environmentally way. Adrok have been developing a low carbon, low impact geophysics offering for the past two decades. Over the past five years we have been letting our clients know what our carbon footprint levels are for each geoscientific survey. Multiple surveys have been performed in Northeast England for a geothermal and lithium brine exploration using its novel electromagnetic (EM) technologies. This poster explores Adrok's EM technology in more detail through a geophysical lens and an environmental lens.

2) Green exploration surveys

Adrok's non-destructive Atomic Dielectric Resonance (ADR) technology is based on the principle that different materials will reflect and absorb electromagnetic (EM) radiation (radio waves, microwaves) at specific frequencies and energy levels. The ADR geophysical system transmits a pulse of EM energy containing a multispectral (patented) wave packet that resonates and reacts with the subsurface materials. The reflections from the subsurface are recorded as a time domain trace and provide information about the location and composition of the materials encountered.

Specification of Adrok's EM System in the field:

- transmits pulsed EM waves into the ground in the frequency range of 10kHz to 300GHz;
- carrier waves (or "Standing Waves") are the high frequencies within the transmitting antenna, modulated by resonances in transmitter result in a pulse with spectral content of 1MHz to 100MHz.
- Pulse Repetition Frequency (PRF) range is 10-200kHz;
- power emitted is less than 5 milliwatts (mW). This is extremely low power and does not damage the solid material it propagates.
- power consumption of the system is 250W;
- power supply to transmitter is 15v DC Li-Ion battery;
- batteries are rechargeable and recyclable;
- majority of raw materials used in the system are selected on recyclability and reusability.

In January and June 2012, the ADR Scanner was independently assessed for signal strength and non-destructiveness by military personnel. E-field measurements were recorded in Volts per metre (V/m). H-field measurements were recorded in milliamps per metre (mA/m). The measurements showed that E-field readings were very weak at less than 1.0V/m at 0.1m to 2m ranges away from the Transmitting antenna. Similarly, their findings showed that the H-Field readings were very weak at less than 10.0 mA/m at 0.1m to 2m ranges away from the Adrok Scanner's Transmitter. Based on the results of this assessment, E3A can conclude that none of the E-field, H-field or power flux density occupational reference levels were exceeded during the trial. Such low readings would not cause any harm to the ground or surrounding vegetation or fauna.

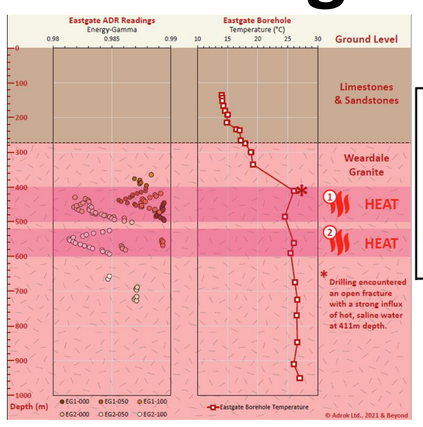
The UN defines sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." The goals are independent but interconnected. To highlight how Adrok are advancing the SDGs in their internal and external activities, ingraining them in their strategies and activities, and how effectively they are communicating this we have performed an SDG mapping exercise to better identify Adrok's opportunities, strengths, and weaknesses as a potential contributor to the achievement of these goals. This Independent Assessment showed that Adrok contribute positively to 10 of the 17 SDGs.

https://www.adrokgroup.com/technology/deeper-faster-greener-cheaper

3) Case Use: Northeast England

Adrok's EM technology is environmentally friendly non-destructive way to see below the ground surface for geology. The method of deployment, on the ground, as opposed to airborne or downhole, means that there are zero emissions generation. The only carbon footprint is created by the transportation of the two-person survey crew and equipment to and from survey location (ideally not be aeroplane, preferably by car or train) and a small amount of carbon generation from computer data processors.

In this Northern England Case Study, the interpreted results show that the technology can identify lithology as well as the highest temperatures below the ground and prognose their depths with reasonable accuracies. Moreover, the technology demonstrates repeatability in measurements over space and time. The field measurements show encouraging potential for the technology to be applied as a pre-drilling tool to find basement deep undercover and to help find onshore geothermal lithium plays around the world, given the ease of survey deployment and low environmental footprint.



Authorize
We start projects that help minimize harm to our planet

Identify
We select low-carbon solutions for applying to our projects

Analyze
Data processing and analyses tools consume low energy

Develop
We develop workflows and practices that will continually improve our relationship with our environments

Carbon Footprint
Our typical geoscience surveys generate a small carbon footprint of 4.72 tCO2e