Short Exposure to a Magnetotelluric Anomaly Changes Water pH by Unknown Mechanism

Kim Horsevad

[1]Horsevad Independent Technical Research & Analysis, Tryvej 96, DK-9750 Denmark, www.horsevad.net
kim[at]horsevad.dk

Abstract: ***Water subjected to the presence of a magnetotelluric anomaly shows consistent and significant shift in pH, even when fully shielded against magnetic, electric and electromagnetic fields during exposure. Results indicate presence of a yet unknown mechanism of influence from magnetotelluric anomalies.***

Keywords: Stray Current, Magnetotelluric Anomaly, Water, pH

1. Introduction

Earlier this year we undertook a study designed to explore the feasibility of using water pH measurements as a tool for investigating the effects conferred on water by short exposure to a magnetotelluric anomaly. The findings revealed a suitable methodology and encouraged further research into the subject.

The current study utilize the findings from the previous project to further quantify the changes in water pH seen even after short exposure to a magnetotelluric anomaly.

2. Literature Survey

We have earlier investigated the existence of magnetotelluric anomalies related to underground propagation of stray current in conductive strata of subsoil [1] and proposed a magnetic survey methodology enabling objective technical detection and mapping of such magnetotelluric anomalies [2].

Initial exploration of effects on water pH was done by measuring changes in impedance characteristic for water exposed to a magnetotelluric anomaly [3]. While this methodology produced very detailed results it is extremely difficult to obtain a clean dataset free from confounding errors, as the parallel-plate capacitor measurement fixture is very sensitive to even small variations in either mechanical manipulation or temperature fluctuations. On this basis we developed a methodology for using water pH measurements as a proxy for investigating changes in water structure following exposure to a magnetotelluric anomaly [4].

It is noted that using water pH measurements for investigations of water structure is a fully established standard in other areas of research [5, 6]

3. Problem Definition

This study aims to document and quantify changes in water pH conferred on the water following a short exposure to a magnetotelluric anomaly.

4. Methodology

a) Magnetotelluric anomaly

The extent and orientation of the utilized magnetotelluric anomaly was surveyed and charted using the methodology described in [2].

b) pH measurement

Measurement of pH was conducted using the methodology described in [4], except for the reading time, which were prolonged to be sure that the measurement reached stability.

pH is measured with HI2020 edge® Multiparameter pH Meter (Hanna Instruments, www.hannainst.com) equipped with HI-11310 digital pH electrode (Hanna Instruments, www.hannainst.com). The instrument is equipped with automatic temperature compensation.

Water samples in the first measurement series was measured in 30ml polyethylene beakers, with the tip of the probe submerged 2cm.

For the second measurement series the measurements was done directly in 15ml Nalgene bottles, with the tip of the probe submerged 2cm.

Measurements for each sample was followed for 70 minutes to reach stability.

The instrument was 5-point calibrated daily during the measurements.

c) First measurement series

The first measurement series was conducted using 20 x 300ml distilled water (Frederiksen Scientific, www.frederiksen-scientific.dk) stored in 500ml Simax borosilicate Erlenmeyer flasks. 10 of these ("Exposed") was placed in the middle of a magnetotelluric anomaly and 10 of these ("Control") was placed nearby, but outside the magnetotelluric anomaly. The samples was exposed for 30 minutes and afterwards stored indoor at a neutral location measured to be free from magnetotelluric anomalies.

d) Second measurement series

In order to explore possible mechanisms of influence from the magnetotelluric anomaly the experiment was repeated with the exposed samples shielded from both electric, magnetic and electromagnetic fields.

For magnetic shielding a “Zero Gauss Chamber” (INTEGRITY DESIGN & RESEARCH CORP, Vermont, US) was utilized. The shielding effectiveness for both AC and DC magnetic fields was verified with a sensitive magnetometer (IDR-322, INTEGRITY DESIGN & RESEARCH CORP, Vermont, US)

For Faraday-type shielding of electrical fields and electromagnetic fields commercial threaded and capped galvanized pipes in 3” and 4” was utilized.

Full shielding was obtained by placing the zero gauss chamber inside a 3” capped galvanized pipe and finally enclosing this in a 4” capped galvanized pipe.

Shielding effectiveness for electrical and electromagnetic fields was verified with a flux density meter (FA735 Field Analyzer, Envionic, Enschede, The Netherlands)

Shielding effectiveness for electromagnetic fields was furthermore verified by placing a mobile phone inside the enclosure and observing that it lost connection already in the first pipe. 20x15ml distilled water (Frederiksen Scientific, www.frederiksen-scientific.dk) was stored in 15ml bottles (Nalgene, USA). 10 of these ("Exposed") was sequentially placed in the middle of a magnetotelluric anomaly while inside the shielding structure and 10 of these ("Control") was placed nearby, but outside the magnetotelluric anomaly. The samples was exposed for 30 minutes and afterwards stored indoor until measurement.

5. Results & Discussion

a) First Series

The hypothesis developed from the results of the initial study [4] was confirmed by the first series of experiments. Even a relatively short exposure (30min) yields small but very consistent and statistically significant pH shift.

Table 1: Results from first measurement series demonstrates consistent and fully significant difference between exposed and unexposed samples.

	"Control"	"Exposed"
1	6,987	6,683
2	6,964	6,726
3	6,909	6,784
4	6,949	6,706
5	6,966	6,784
6	6,929	6,681
7	6,967	6,679
8	6,989	6,793
9	6,924	6,632
10	6,931	6,611
Mean	69,515	67,079
T-test $P_{(two\text{-}tailed)}$ at alpha=0,05: 0,00014		

Presence of a magnetotelluric anomaly consistently and significantly shifts water pH downwards.

b) Second Series

The results from the second series hints at a phenomenon which deserves further research, as the results are virtually identical with the results from the first series, even with both magnetic, electric and electromagnetic fields fully shielded. The only possible explanation, barring experimental errors, is a yet unknown mechanism of influence emanating from the magnetotelluric anomaly.

Table 2: Results from second measurement series mirrors results from first series, even though the exposed samples was fully shielded.

	"Control"	"Exposed"
1	6,887	6,676
2	6,831	6,626
3	6,961	6,762
4	6,865	6,743
5	6,821	6,776
6	6,846	6,689
7	6,935	6,617
8	6,883	6,777
9	6,955	6,619
10	6,948	6,603
Mean	69,105	67,079
T-test $P_{(two\text{-}tailed)}$ at alpha=0,05: 0,00013		

Difference between mean of exposed and unexposed in first series and second series is very similar, hinting at a phenomenon where the shielding enclosure not even attenuates the unknown influence mechanism.

At current, we cannot quantify and measure this influence mechanism directly, only the presence of the magnetotelluric anomaly proposed as the source of the unknown influence can be directly measured. It is therefore possible that such unknown influence mechanism might exist in other locations, possibly even causing the observed, but unexpected, variation in measured pH for even the unexposed samples.

Such unknown mechanism might also be acting as a confounding error in unrelated research work incorporating sensitive pH measurements.

6. Conclusion

We observe that even a short (30min) exposure to a magnetotelluric anomaly produces consistent, significant and measurable changes in water pH.

We furthermore observe that the effects conferred on the water was virtually unchanged in the second series, where the water samples was fully shielded against both electric, magnetic and electromagnetic fields. This was unexpected and extremely interesting.

If this effect can be confirmed in further studies this would indicate the presence of a yet unknown mechanism of influence between the magnetotelluric anomaly and water.

7. Future Scope

The possible presence of an unknown mechanism for the observed changes in pH deserves further attention. Further studies, utilizing a wider array of sensors to fully investigate such mechanisms are already being planned.

Farmers affected by stray current propagated along magnetotelluric anomalies has, for a long time, anecdotally complained about phenomenon where animals refuse to drink water which has been subjected to presence of magnetotelluric anomalies. The results obtained in the present study provides an analytical background for understanding and researching this phenomenon in a more quantifiable perspective. Collaborative research combining technical measurements and veterinarian observation and analysis of farm animals at exposed locations would probably be very worthwhile.

References

[1] Horsevad, Kim. 2019. "Analysis of Stray Current, its Aetiology, Propagation, Relevant Measurement Protocols and Mitigative Efforts at a Pig Farm in Northern Denmark", International Journal of Science and Research (IJSR), Volume 9 Issue 1, January 2020, 1234 – 1244

[2] Horsevad, Kim. 2021. "Electrotechnical characterization of a stray current propagating magnetotelluric anomaly", International Journal of Science and Research (IJSR), Volume 10 Issue 1, January 2021, 315 – 322

[3] Horsevad, Kim. 2019. "Pilot Study Indicating Possible Effects on Water Impedance Characteristics from Stray Current", International Journal of Science and Research (IJSR), Volume 8 Issue 5, May 2019, 1154 – 1157

[4] Horsevad, Kim. 2019. "Exploration of Water pH Shift When Influenced by Short Exposure to Magnetotelluric Anomaly", International Journal of Science and Research (IJSR), Volume 11 Issue 1, January 2022, 246-249

[5] Ying-Ya, L, et al. pH-Dependent Water Clusters in Photoacid Solution: Real-Time Observation by ToF-SIMS at a Submicropore Confined Liquid-Vacuum Interface. Frontiers in Chemistry, VOLUME 8, 2020, pp731

[6] Johansson B, Sukhotskaya S. Allometric Scaling Behaviour – A Quantum Dissipative State Implies a Reduction in Thermal Infrared Emission and Fractal Ordering in Distilled Coherent Water. WATER 3, 100-121, Jan 8 2012, pp100-121

Author Profile

Kim Horsevad is the owner and chief technical analyst at Horsevad Independent Technical Research & Analysis (www.horsevad.net). Current research aims for developing methods for quantifying interactions between electromagnetic fields and biological systems.