

September 21st 2021
Castricum, The Netherlands
Newsletter 2021-Q3

Dear readers,

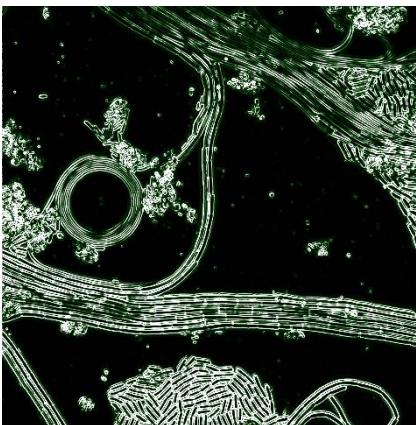
With this newsletter we like to inform you about our day to day business, current projects, performance characteristics of our products and new product development. Enjoy reading!

The Phytocene project



For an artistic research project called Phytocene, 2 **soil Redox probes** from **SWAP instruments** (ORP-30-3-S) were used to monitor the soil Redox potential in a millésimé hemp plantation from March to July 2021.

Musician and artist Agoria, sound designer Nicolas Becker and biophysicist Nicolas Desprat 'translated' the soil Redox data into music. The music that is broadcasted from the data measured in the soil is based on a library of sounds that has been designed by the artists. Each element of the library is then chosen according to the values of the Redox data that are received. A real-time broadcast of the **sound piece** can be listened to on <https://agoria.dev/hempfm/>



In addition, soil samples of the hemp field were filmed over time under a microscope in the laboratory of the Ecole Normale Supérieure in Paris. The collected Redox data and microscope images – showing soil microbiological life - were then converted into a seven-minute video and soundscape. The artwork was presented on June 26th in the exhibition spaces of Le Marais and sold on 13 July 2021 in the New Now auction by Phillips, international art auction house.

The **artwork** can be watched here: <https://www.instagram.com/tv/CREqUMUqk1H/>

Custom-made Redox probes



We offer both **standard** and **custom-made Redox probes**. The following specs can be varied/realised **upon request**:

- ✓ Analog (mV ORP) or SDI-12 output
- ✓ Number of Redox electrodes (Pt rings)
- ✓ Positions and distance between electrodes
- ✓ Probe and cable length
- ✓ With or without integrated temperature sensor and reference electrode

For the Phytocene project (see article above) we have made analog **soil Redox probes** with a probe length of 30 cm, Redox electrodes at 5, 10 and 20 cm below the soil surface, 20 meter PUR screened cable and an integrated reference electrode. This has been realised in **close consultation** with the **customer**.

If you are interested in custom-made probes, please contact us at info@swapinstruments.com.

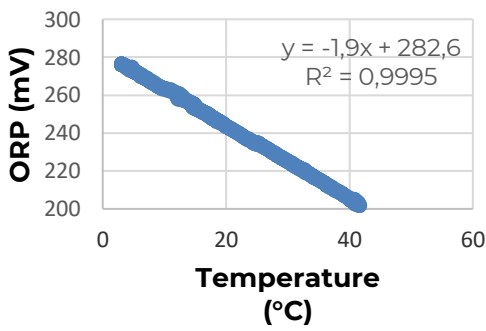
Redox measurements: temperature effect



Redox (ORP) measurements are influenced by temperature, but in general cannot be compensated for this effect. Redox measurements reflect all oxidation and reduction reactions taking place at the surface of the Redox electrode. Since many chemical species can be involved in these reactions - each with their own temperature dependency - it is **not possible to define a single temperature compensation factor**. However, if a sample consists of a single or dominant (high poise) redox species, temperature compensation can be applied. The **equation for the temperature correction** is as follows:

$$\text{ORP}_{T_compensated} \text{ (at } 25\text{ }^\circ\text{C)} = \text{ORP}_{\text{measured}} + T_{\text{factor}} \times (25 - T_{\text{measured}})$$

Hanna ORP test solution: Temperature effect on ORP measurement

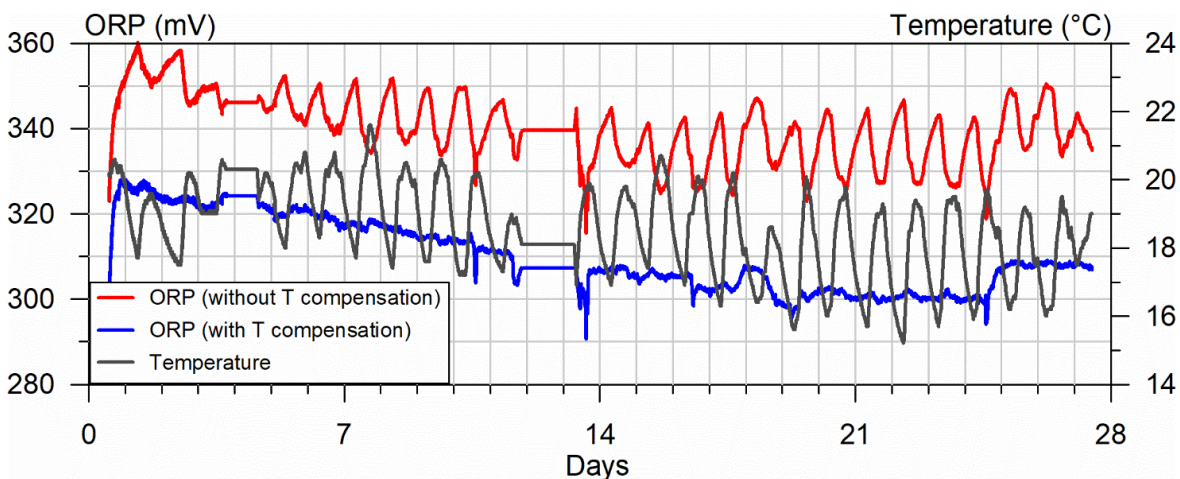


The figure on the left shows the **relationship** between the **temperature (°C)** and the measured **ORP (mV)**, logged with the SWAP ORP-30-1-D (vs. 3 M KCl gel Ag|AgCl reference electrode), in Hanna ORP test solution 240 mV. The established temperature correction factor for Hanna ORP test solution 240 mV is -1.9 mV/°C.

SWAP instruments also observed temperature effects in soils. In the figure below the temperature effect on the ORP measurements with SWAP ORP-30-1-A (vs. 3 M KCl gel Ag|AgCl reference electrode) in a sandy soil is shown. Both the uncorrected and temperature-corrected ORP values (at 25 °C) are presented.

Based on your (field) ORP and temperature data, you can determine if your ORP measurements can be temperature corrected. For additional information, please contact us at info@swapinstruments.com.

Sandy soil



If you are interested in our products or would like to receive some additional information, please contact us at info@swapinstruments.com or visit our website www.swapinstruments.com.