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Leibniz-Institut für Angewandte Geophysik (LIAG)
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01.07.2020
http://idw-online.de/de/news750382

Forschungsprojekte, Kooperationen
Elektrotechnik, Geowissenschaften, Informationstechnik, Meer / Klima, Umwelt / Ökologie
überregional

Groundwater protection on Spiekeroog Island - first installation of a salt water monitoring system

LIAG and OOWV cooperate for sustainable groundwater Management. Spiekeroog. Scientists of the Leibniz Institute for Applied Geophysics (LIAG) have installed for the first time a saltwater monitoring system (SAMOS) on the Spiekeroog Island in cooperation with the Oldenburgisch-Ostfriesischer Wasserverband (OOWV). Using a geoelectric measuring system, changes in the salt/fresh water boundary in the protective dune area of the island are monitored continuously. The real-time evaluation provide crucial information for sustainable water management by OOWV.

Since fresh water is lighter than salt water, so-called freshwater lenses are formed in the subsoil of islands, bounded by the surrounding salt water. Sustainable use of these freshwater resources is a special challenge on North Sea islands like Spiekeroog. The influence of climate change and an increase in tourism will cause a rising demand for water on the island. The resulting need for increased groundwater abstraction may cause a detrimental shift in the freshwater-saltwater boundary underground. The consequence would be an increasing salinization of the groundwater, which could endanger the entire water supply of the islands.

In order to better control the position of the fresh- saltwater boundary under Spiekeroog, LIAG scientists, together with the OOWV, have installed the SAMOS monitoring system: A vertical array of electrodes, around 24 meters in length, was placed in a borehole at a depth of around 50 metres. This was then linked to a measuring station at the surface. Electrical resistance, which is directly related to the mineral content of the ground water, is measured daily. With an integrated solar panel, this monitoring system is self-sufficient in terms of energy and can thus collect data over the long term. The go-CAM project explicitly enables the digital, timely and practice-oriented processing of the data. The OOWV can view and further use the data at any time.

"Maintaining an overview of the salt/freshwater boundary under Spiekeroog is crucial for sustainable water use," explains Dr. Helga Wiederhold, LIAG project manager of go-CAM. "We need a long-term measurement series to understand its development. If too much water is pumped out, salt water can rise. If the chloride concentration exceeds the legally permissible limit, the groundwater can no longer be used as a resource. With our saltwater monitoring system SAMOS, we can show our cooperation partner OOWV exactly whether the salt water boundary is shifting and, if it is, give early warning".

Dr. Konstantin Scheihing, go-CAM project manager for OOWV, sees the installation of the SAMOS measuring station as a crucial step towards long-term sustainable groundwater management on Spiekeroog: "As a public water board, we have the responsible task of ensuring the sustainable management of groundwater resources in the region while maintaining the high water supply security for our customers. The research cooperation with LIAG and the installation of the SAMOS monitoring system is a further important element for us to fulfil this responsibility towards our customers and the environment in the best possible way".

In addition, the monitoring of the freshwater-saltwater boundary is of high relevance for other coastal regions of Northern Germany. Ultimately, the climate-induced rise in sea level and other influences on climate change as well as demographic changes all have an impact on groundwater recharge. Within the go-CAM project, the saltwater monitoring system was also installed at a site for drinkwater production near Jever, Germany.

Video (German): https://youtu.be/xSdXiIZbyBY

Background Information

About SAMOS
The salt water monitoring system SAMOS has been developed specifically by LIAG to investigate and monitor the possible intrusion of saltwater into groundwater aquifers. The system was first used on Borkum in 2009. Direct current resistance measurements are carried out by using a vertical array of electrodes that is permanently installed in a borehole.

Further Information:
https://www.leibniz-liag.de/en/research/methods/electromagnetic-methods/geoelectrics/samos.html

About go-CAM
The core objective of go-CAM is to develop, implement, and apply multi-criteria governance optimisation for sustainable water use in coastal regions around the world. Within this inter-institutional cooperation for the installation and scientific support of the measuring station, another important measuring site of the go-CAM research project is being created on a North Frisian island. The joint project "go-CAM - implementing strategic development goals in coastal aquifer management" is funded by the Federal Ministry of Education and Research (BMBF) within the GRoW (Global Resource Water) joint programme. The project go-CAM was initiated by Prof. Dr. H. M. Schöniger from the Leichtweiß-Institute for Hydraulic Engineering and Water Resourcesat the TU Braunschweig.

Further Information:
https://www.leibniz-liag.de/en/research/projects/third-party-funded-projects/go-cam.html
https://bmbf-grow.de/en/joint-research-projects/go-cam
https://bmbf-grow.de/en

About LIAG
The Leibniz Institute for Applied Geophysics (LIAG), based in Hanover, Germany, is an independent, non-university research institution. Using methods of applied geophysics, future-oriented questions of public relevance are investigated. The main focus of the research work is the exploration of the usable subsurface and the development of measuring and evaluation methods. The institute has over 50 years of experience in geophysical research. LIAG concentrates its thematic research in the research area "Groundwater Systems", among others, and has many years of experience of coastal salinization in Germany and in international projects. https://www.leibniz-liag.de/en/index.html

About OOWV
The Oldenburgisch-Ostfriesischer Wasserverband (OOWV) is Germany's largest water supplier in terms of area, supplies over one million customers with drinking water and disposes of the wastewater of about 500,000 customers. OOWV operates 15 waterworks and 46 sewage treatment plants. The supply area lies in the northwest of Germany and extends from the East Frisian islands to the Dammer Hills. https://www.oowv.de/home/

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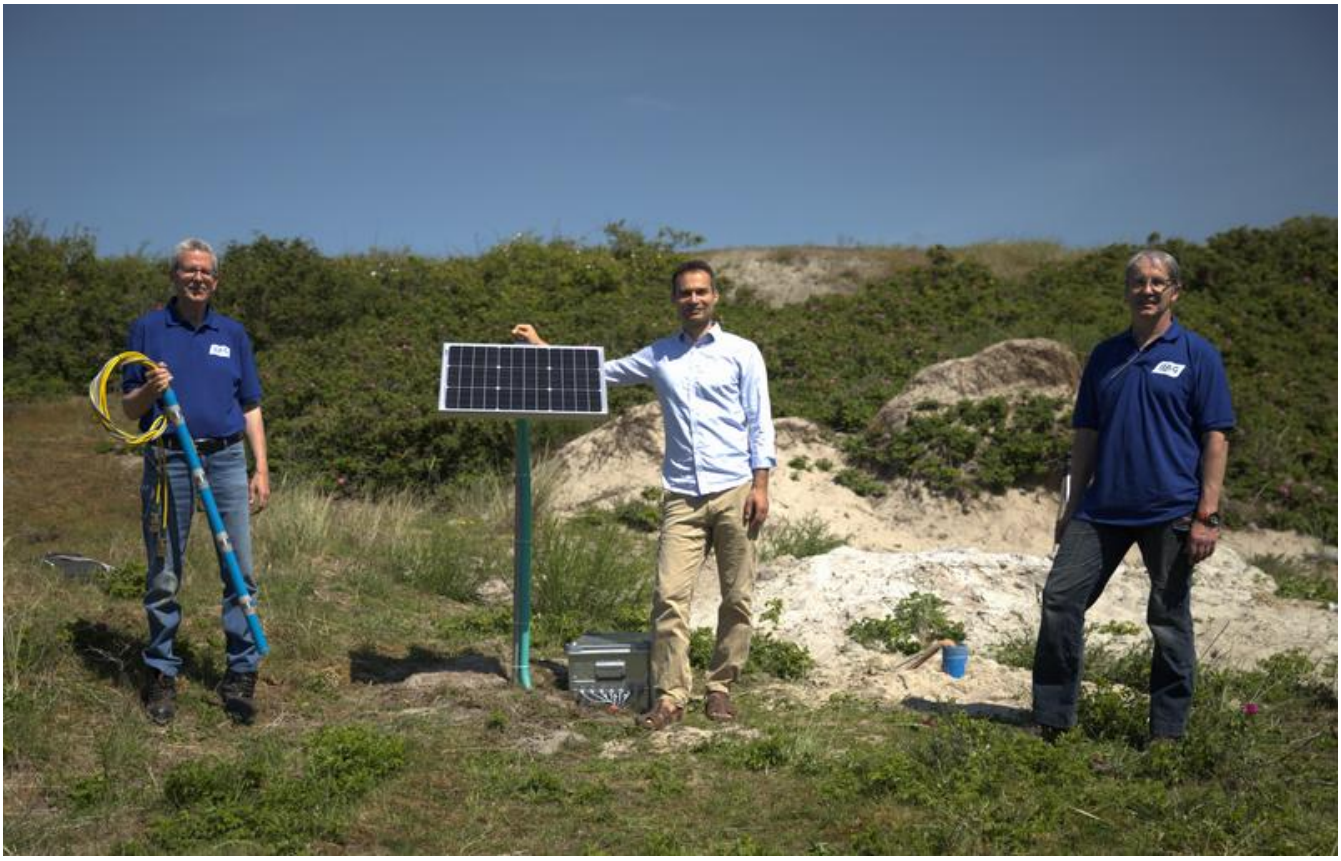
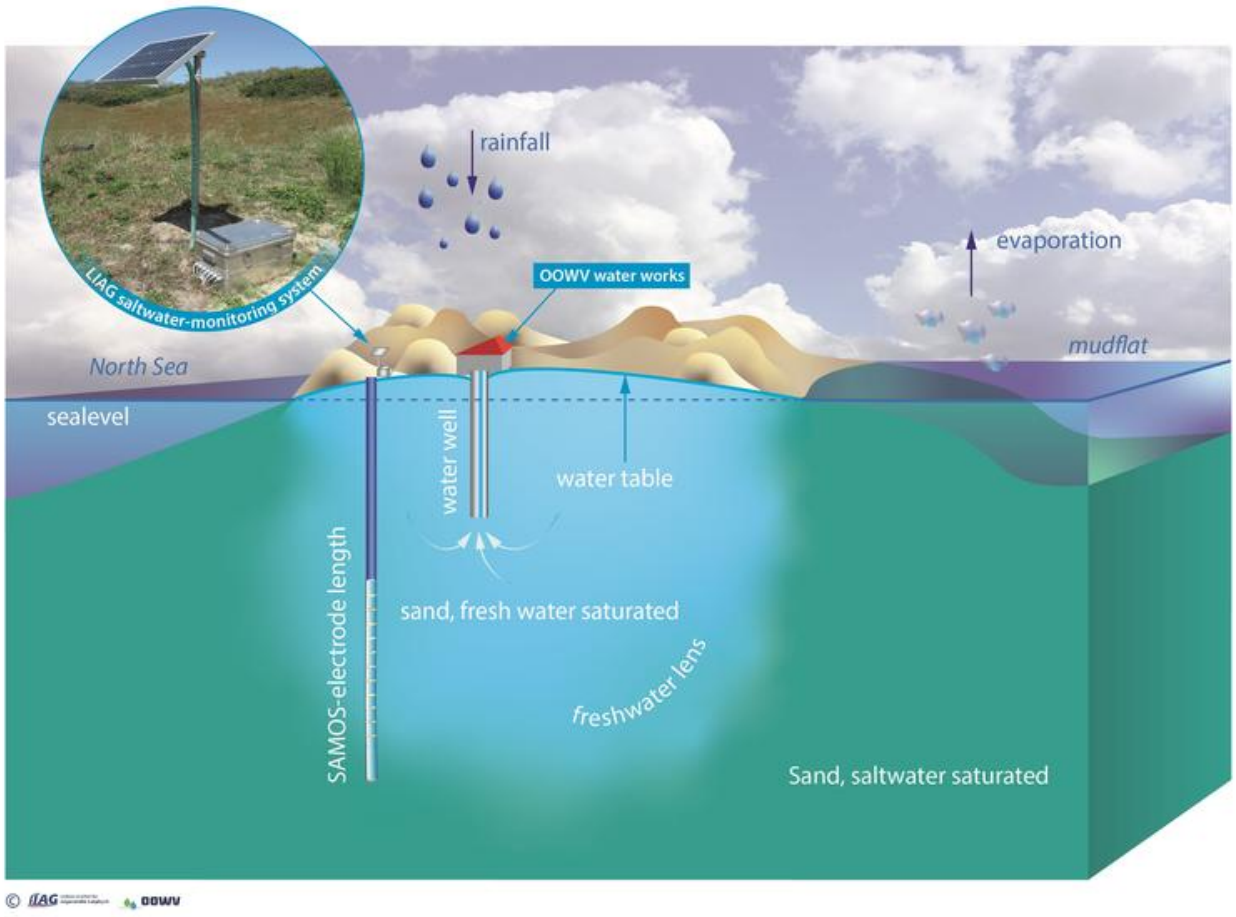
Anhang SAMOS-electrode length for monitoring the saltwater http://idw-online.de/de/attachment80278



In front of the salt water monitoring system on Spiekeroog (from left): Michael Grinat, LIAG geophysicist, Dr. Konstantin Scheihing, OOWV project manager go-CAM, Robert Meyer, LIAG electrical engineer



Explanation graphic Spiekeroog salt - fresh water monitoring