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Was verbindet die Arktis mit dem Fläming?

Am Beispiel eines Schülerprojektes: „Coole Klassen in Brandenburg Potsdam Mittelmark"

Conrad Kopsch

AWI Potsdam

Im Rahmen des Internationalen Polarjahres unterstützte das AWI das Projekt „Coole Klassen", welches zum Ziel hat, die Polargebiete wegen ihrer großen Bedeutung des Klimawandels in den Schulen zu thematisieren. Schüler kennen teilweise elementare Unterschiede zwischen Arktis und Antarktis nicht, sie nehmen die Polargebiete normalerweise nur bedingt oder kaum wahr. In den Schulbüchern der Sekundarstufen taucht das Wort „Permafrost" noch nicht einmal auf. Ein wesentliches Ziel des Internationalen Polarjahres (IPY) ist daher neben den wissenschaftlichen Forschungsarbeiten der Wissenstransfer auf breiter Basis in die Öffentlichkeit und speziell in die Schulen. Damit sollen vor allem junge Menschen erreicht und für das System Erde sensibilisiert werden.
Die Wissenschaftler in Potsdam führen Expeditionen in die Antarktis und Arktis durch. Verstärkt widmen sie sich der Arktisforschung - insbesondere den Dauerfrostgebieten Sibiriens und der arktischen Inselgruppe Spitzbergen, da hier der Schlüssel zum Verständnis des Klimageschehens in Europa liegt.
Mittels eines virtuellen Klassenzimmers wurden die Schüler und Lehrer vom 10. bis 22. September 2009 täglich ab 10.00 Uhr für eine Stunde mit der Lehrerin auf Spitzbergen in Verbindung gebracht. Im Rahmen des Unterrichts konnte sie so über eine Videoanlage direkten Kontakt in die Klassenzimmer dieser drei Schulen halten.
Die Mädchen und Jungen der Grundschule erhielten durch das virtuelle Klassenzimmer Gelegenheit, die arktische Flora und Fauna kennen zu lernen. Während sich die Belziger Oberschüler mit der Thematik Permafrostböden befassten, haben sich die Gymnasiasten dem Klima und der Atmosphäre widmet.
Ziel des Projektes war es, den Kindern und Jugendlichen ein neues Bild der Polarregionen zu vermitteln und sie auch für Klimaveränderungen zu sensibilisieren, sie darauf aufmerksam machen. Die Wirkung des Projekts sollte dem Unterricht an den Schulen langfristig positive Impulse geben und eine Kooperation zwischen Schulen und Forschern auch zukünftig sicherstellen.
Ob uns das gelungen ist, konnte man am 5. März 2010 im Alfred Wegener Institut Potsdam erfahren. Vor Forschern und Wissenschaftlern des AWI's stellten alle drei Schulen ihre Erkenntnisse vor, so z.B. Was verbindet die Arktis mit dem Fläming? Wir glauben, man war beeindruckt von dem was die Schüler zeigten.
Das AWI –Potsdam unterstützte das Projekt in allen Belangen der Logistik, stellte die Internetseite zur Verfügung, übernahm die Satellitenübertragung.

The Influence of Natural and Anthropogenic Agents on the Chemical Composition of Soils in the Maritime Antarctic

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One characteristic feature of Antarctica is the initial stages of its primary soil formation, when the upper layer of the pedosphere engaged in soil formation is thin and the properties characteristic of mature soils have still not formed. Soil formation processes on King George Island, as well as on other maritime Antarctic islands, are peculiar in that it is connected with:

- cryogenesis – permafrost-affected soil formation;
- soil forming rocks – sea alluvium, eluvium, and slide-rocks of magmatic or sedimentary bedrocks;
- biological characteristics of microbial, phyto- and zoocenoses;
- global and local technogenic influences caused by distant and direct impacts of human activity;

Up to date, there still persists the question of the role of natural and anthropogenic agents during soil formation processes on ice-free areas in the maritime Antarctic.
Eight stationary experimental 4 to 9 m^2 areas were established during the 30th Polish and 10th Ukrainian expeditions (11/09/2005 – 02/09/2006) at two ice-free locations near Admiralty Bay (Point Thomas oasis, near the polish base "Arctowski") and Keller Peninsula near the Brazilian station "Ferraz" on King George Island, the South Shetland Islands). The main area selection criterion was the distance to ocean and glacier edge, so that we expected to obtain some information on soil properties in different ecological conditions. Based on anthropogenic load, these eight areas

were divided into two groups. The first group included areas not exposed to any direct anthropogenic or technogenic load. The second group contained areas under uncontrolled extensive anthropogenic and technogenic load – fuel and architectural material unload sites, areas transformed by building, etc.
To assess the role of natural agents in the formation of the chemical properties of soils, a modeling experiment with artificial guano and water supply was launched on an area without any direct anthropogenic load. The experimental plots were as follows:
1 – control;
2 – daily one-time watering with 1 L of sea water;
3 – treatment with 1 L guano solution (approx. 100 g dry guano per 1 L of water).
The area of each plot was $1m^2$. Treatment lasted for one month.
Soil analysis of the studied stationary areas revealed significant fluctuations in the chemical composition. The causes of such fluctuations become more evident from the modeling experiment with sea water and guano. Both agents led to an increase (compared to control) in the organics content, total nitrogen and phosphorus, as well as active forms of nitrogen, phosphorus, potassium and sodium. Besides, there was a tendency towards lower contents of alkaline-earth metals that are soluble in ammonium acetate buffer. The most profound changes in soil fertility were observed as a result of systematic guano treatments, and the high increase in alkaline metals (potassium and sodium) during the experiment led to lower acidity with pH 3.6 (plot 6a) through pH 4.2.
Both sea water and guano solution were found to alter soil trace elements and microelement contents. Acid-soluble forms of iron decreased by 26-38%, and lead, cadmium, nickel and zinc increased significantly. Sea water treatment resulted in zinc accumulation and lower copper content, which appears to stem from the chemical composition of the water and a higher intensity of phytocenosis development.
Technogenic aspects cannot be excluded as potential agents of soil chemical composition alterations. To assess putative technogenic influence, we used soil from an area that had just become free of ice and, at the time of the experiment, was still not covered with vegetation. Comparison of this area with a nearby one that became free of ice back in the 1970s revealed that with time, beside changes in the contents of the most common nutrients resulting from their biological turnover, the soil contents of copper, zinc, iron, manganese, lead and cadmium had increased. Inasmuch as the acid-soluble fraction of trace elements and microelements is thought to be the most informative in regard to technogenic effects on soil quality, an increase in their contents in areas far away from the zones of direct anthropogenic influence may indicate an increase in global technogenic effects.
Soil analysis of samples from areas with high anthropogenic impact (fuel and building material unload and storage places, as well as areas affected by building) revealed elevated concentrations of soil lead, zinc, alkaline-earth metals, as well as the respective acidity alteration (pH 7.2). Such anthropogenically induced changes in soil chemistry may provide for migration of trace elements all the way up to higher trophic levels, which is in accordance with data on trace element content in the feathers of Antarctic penguins. Therefore, the soil heterogeneity within the studied oases on King George Island seems to result from concerted effects of natural and anthropogenic agents isolation of which requires further studies.
Our field work was supported by the Antarctic Biology Department of Polish Academy of Sciences and by National Antarctic Center of Ukraine.

Variations of a large, high elevation glacier during the last century: Fedchenko Glacier, Pamir

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The high Pamir is extensively coverd by glaciers and the most prominent, Fedchenko Glacier is one of the largest mountain glaciers in the world. Observations date back to 1928, when a Russian/German expedition carried out a detailed survey of the entire region. Since then repreated surveys allow direct comparisons of glacier changes,at least for large parts of Fedchenko Glacier. Based on recent remote sensing data and results of geodetic/geophysical measurements in 2009, the evolution of the glacier can be reconstructed for the last eight decades. Ice thickness was determined on several cross profiles in the accumulation zone and the surface velocity was determined by repeated GPS observations and feature tracking techniques. The geometry changes derived from these new investigations and the old surveys are related to the