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Global Connections

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APECS

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Subsurface Chlorophyll-a Maxima (SCMs) in the Southern Ocean

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Our review of the literature has revealed Southern Ocean subsurface chlorophyll maxima (SCMs) to be an annually recurrent feature throughout the basin. Most of these SCMs are different to the “typical” SCMs of the tropics, which are maintained by the nutrient-light co-limitation of phytoplankton growth. Rather, we have found SCMs to be more likely formed by diatoms, eddies, sea-ice retreat, photo-acclimation and subduction events. At a local scale, these SCMs can facilitate increased carbon export, primary production and food availability for higher trophic levels.

A large portion of Southern Ocean SCMs appear to be sustained by the presence of deep diatom-dominated communities that form under severe iron-limitation in the upper mixed layer. The ability of diatoms to buoyancy regulate must play a role in the development of these SCMs to facilitate selective sinking after the initial spring bloom or naturally iron fertilised blooms. These SCMs remain largely unobserved and it seems that ship-based sampling may not be able to fully capture the biomass associated with these deep diatom-dominated communities.

The implications of these SCMs for Southern Ocean ecology will only be revealed with their basin-wide observation. This will only be achieved through an integrated observation system that is able to harness the detail of ship-based sampling and the observational capacity of fluorometers on autonomous platforms. The main challenge towards achieving this is the uncertain translatability of fluorescence to chlorophyll-a concentrations. Until this is resolved, the reporting of subsurface fluorescence maxima could still yield valuable insights in SCMs with careful interpretation.

Investigating glacial-isostatic adjustment on basis of geodetic GNSS observation campaigns in Dronning Maud Land, East Antarctica

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Quantifying glacial isostatic adjustment in Antarctica is crucial to understand past and future land and ice-sheet evolution, and to correct estimates of ice-mass change from satellite gravimetry. Direct observables to constrain the GIA modelling are provided by geodetic GNSS measurements on bedrock. In central Dronning Maud Land (DML), East Antarctica, our group started GNSS observation campaigns already in the mid-1990s. The coverage was extended to western DML in 2001/2002 and 2004/2005. Almost all GNSS sites were set up in the mountain range that stretches nearly parallel to the coast over a distance of more than 1,000 km.

Within an ongoing project funded by the German Research Foundation we started to realize repeating GNSS measurements during the last Antarctic season. In the area of Heimefrontfjella six sites were re-measured where first observations were made in 2004/2005. We will discuss the results gained so far for central DML as well as first results for the region of Heimefrontfjella. For this, we applied both the "differential GNSS" (DGNSS) and "precise point positioning" (PPP) method using the Bernese GNSS Software v5.2. Hence, we are able to infer uplift rates for a time span of up to 20 years (central DML) and 15 years (Heimefrontfjella), respectively. We will examine the instantaneous elastic effect which is predicted using time series of ice-mass changes based on multi-mission satellite altimetry (Schröder et al. 2019). Thus, the separation of the instantaneous elastic deformation effect and long-term GIA will be discussed taking recent GIA models into account.

Electrochemical Regeneration of Granular Activated Carbon and its Opportunities in Water Treatment

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Remediation of contaminated groundwater via adsorption onto Granular Activated Carbon (GAC) has been deployed in Antarctica for nearly two decades. This technology has many advantages including its ability to sorb a wide variety of compounds, from organics to heavy metals, and to host biodegrading bacterial communities. However, one its key disadvantages is its inability to be efficiently regenerated in-situ, with the process occurring over long time periods. Thus requiring it to be dug out and replaced, incurring a human, energy, environmental and financial cost.

Electrochemistry is now being explored as a way to regenerate the adsorptive surface of the carbon; extending its life and reducing the cost of replacement. There are key challenges to overcome before this technology can be deployed on the Antarctic continent including suitable operating conditions, effects on downstream processes and targeting appropriate contaminants of concern. Here we present an overview of the current knowledge base for the technology and its supporting theories, and examine how the process will be scaled up to allow for field deployment.

The deployment of electrochemical regeneration of GAC has the potential to be a key technology in the campaign to restore Antarctica's pristine ecosystem and beauty.

The European Polar Board – coordinating, promoting and advancing European Polar research

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The European Polar Board (EPB) is an independent organisation focused on major Arctic and Antarctic strategic priorities. EPB Members include European research institutes, government ministries, funding agencies, scientific academies and Polar operators. Since 2015, the EPB has been an independent legal entity, with its Secretariat hosted by the Dutch Research Council (NWO) in The Hague. Established in 1995, the EPB was an Expert Board of the European Science Foundation formed to provide strategic advice on Arctic and Antarctic issues.

The EPB helps to nurture the strong and cohesive European Polar research community, and envisions a European wherein policymaking at different scales affecting or affected by the Polar regions is informed by independent, accurate, and timely advice from the EPB. The EPB's Mission is to improve European coordination of Arctic and Antarctic research by optimising the use of European research infrastructure, to promote multilateral collaborations between our Members, and to provide a single contact point to engage with the European Polar research community.

Much of the EPB's work is conducted through Action Groups. These include the Action Groups on Infrastructure, International Cooperation, and Environmental Impacts of Polar Research and Logistics, and the Policy Advisory Group. In addition, the EPB is engaged in a variety of activities with partner organisations. These include the joint EPB-European Space Agency project CHOICEe, the EPB-APECS webinar series, participation in EU-funded Polar projects such as EU-PolarNet, SO-CHIC and INTERACT III, and as a partner of the EU Polar Cluster.

For more information on the EPB, visit www.europeanpolarboard.org.

A New Approach: The Syllabus On Polar Regions Towards Education And Outreach

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Over the last decades, global mean temperature keep rising largely due to greenhouse gases which is produced by industrial activities. Global-climate-change has started to have observable effects on the environment not only frost-free season for agriculture, but also polar regions, even double affect on Arctic ocean as ice-melting-feedback loop. Regarding summer temperatures, it is projected to continue rising a reduction of soil moisture in terms of increasing the heat waves. Besides, precipitation patterns, increasing severe weather events will cause the living creatures which are ended up with either forced-migration or forcing into the danger due to lack of food-sources.

Considering rapid dramatically changings on future modellings, researches show that eighteen of the nineteen warmest-years on record for the planet have occured since 2000. On the other hand, it is possible cutting to greenhouse emissions eventually slow down if for instance, the countries take action to decrease their carbon-footprints. In this case, Turkish Students' Polar Research Team(PolSTeam) provides a new view to implement through the schools. Considering global-climate-change and the polar-regions as the best actors in changing, there is a syllabus have prepared including Arctic and Antarctic creatures, sea-ice changes affected by increasing heat wave around the atmosphere, ocean current system and the other parameters to give main idea towards global-climate-change. PolSTeam has already reached over millions of people in order to raise awareness under the education and outreach activities since 2015. This study also will help to understand how the Polar-syllabus impact the students in order to decrease their carbon-footprints.

B

Badhe, Renuka 489
Baldry, Kimberlee 572
Boyd, Philip 572

Buchta, Eric 1229
Bury, Naomi 792
Busch, Peter 1229

E

Eberlein, Lutz 1229

H

Hill, Nicole 572

Horwath, Martin 1229

K

Knöfel, Christoph 1229

N

Nolan, Joseph 489

O

Ozsoy, Burcu 1195

S

Scheinert, Mirko 1229

Strutton, Peter 572

V

Vural, Deniz 1195



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