2014
Jan Lenaerts

BENEMELT: Melting ice shelves in East Antarctica

Ice shelves are the floating extensions of the ice sheet, and aid to keep the ice upstream in place. When future climate becomes warmer, however, increasing surface melt on these shelves will destabilize them.
This enhances the probability of increasing ice loss from Antarctica and subsequent sea level rise. In this project, we want to understand how much snow melts currently on these ice shelves, by how much that melt will increase in the future, and how that will impact ice shelf stability. To that end, we will observe the weather on these ice shelves, measure the amount of surface melt from the ground and from satellites, and analyze how snow characteristics change in response to melt.
All these observations will be combined to improve climate models, which will provide an estimate of present-day and future surface melt on the East Antarctic ice shelves. The BENEMELT project will bring together climate researchers from Belgium and The Netherlands.

2012
Reinhard Drews

The Buttressing Effect: Why ice shelves are essential (Be:Wise)

Almost three-quarters of the Antarctic ice-sheet boundary is in contact with the ocean. Floating ice shelves extend the continental ice seawards and provide an interface for the interaction of ice and ocean.
The projects focuses on the Roi Baudouin ice shelf. The aim of the project is to examine the ice-dynamical role of grounded features, which are enclosed by the ice shelf, and which buttress the ice flow from the East-Antarctic ice sheet.
The Roi Baudouin ice shelf is confined by two ice rises with a local flow regime, and two pinning-points with a width of only a few kilometers. Notwithstanding, the latter seem to define the seaward edge of the ice shelf and impact ice-flow in the hinterland. The aim is to investigate the connection between the flow-dynamics of ice shelf with the locally grounded counterparts. This will be done in a combined approach of satellite remotesensing with on-site ground-penetrating radar and GPS measurements.
The envisaged geophysical parameters are strain-rates, internal ice properties, surface velocities and characteristics of the bedrock interface. Preliminary studies indicate that the pinning-points of the Roi Baudouin ice shelf become partially afloat during high-tide. Therefore, time-series can be collected, which directly measure the effect of a de- and re-attachment from an ice shelf to a pinning point. This makes the Roi Baudouin ice shelf a unique field site for a case study, which delivers important insight into the operation of the buttressing effect. Larger-scale effect of ice-shelf buttressing, in terms of grounding-line migration and/or in terms of controlling the mass flux from the grounded ice sheet, are not fully understood. However, since the contact area between ice shelf and local highs in bedrock elevation is susceptible to changing ocean characteristics, it is important to quantify this buttressing effect, in order to evaluate whether or not it is a key to understand rapid variations in ice-sheet geometry.

2010
Steven Goderis

Antarctic micrometeorites as clues to the early Solar System and planetary evolution:

MICROMETA (micro-meteorites from Antarctica).

Of all the material reaching Earth from space (30,000 to 40,000 metric ton/year), only a small part will survive the heating and shock experienced upon entry in the atmosphere. The large majority of this material rains on Earth in the form of rounded extraterrestrial particles less than 2 mm in size, known as micrometeorites. Although meteorites in general provide us with essential information on the origin and evolution of the planets and the Solar System, micrometeorites that originate from the most primitive objects still remaining in the Solar System raise an even higher scientific interest. However, the difficulties in collecting and analysing micrometeorites hampered routine research so far. Two developments have changed this situation in recent years. The analytical possibilities tominimize the required amount of material for isotope analyses have significantly improved. Powerful isotope tracers (such as for example ^{53}Mn-^{53}Cr, ^{146}Sm-^{142}Nd, and ^{182}Hf-182W) can shed light on the terrestrial planets' accretion rate, on the timing of core formation and the evolution of the mantle and crust, while stable isotopes of lighter elements (O, Mg, Si, Fe, Cu, Zn) can provide important information on the source of the micrometeorites and on the processes they underwent in space. Secondly, only a few years ago huge quantities of very well preserved micrometeorites of various sizes and types were recovered in cracks of eroded granitic nunataks in the Frontier Mountains of Victoria Land in Antarctica, where they most likely accumulated for close to 1 million year. In these collections, the largest size fraction of more than 1 mm is very well represented and makes it possible for the very first time to carry out high precision isotope measurements. Combining these research developments and the existing Belgian cosmochemical capabilities with the unique location of the PE station in an area expected to yield important accumulations of micrometeorites in cracks, crevices, joints or fractures of the neighbouring lithologies, the emerging field of micrometeorites is a complementary addition to the existing meteorite program, and will give to Belgium a prominent role in the meteoritics and planetary science field, with collaborations worldwide.

2008

Dr Elie Verleyen

Deglaciation, ice-sheet thickness and climate change in Sør Rondane (East Antarctica) during the late Quaternary - **DELAQUA**

In order to better understand how present and future climate anomalies will affect the cryosphere and the biological communities inhabiting Antarctic ecosystems, we need regional reconstructions of past climate change based on paleoecological records and information regarding former ice-sheet dynamics. To date,
climate change studies have mainly been based on ice core records from the central Antarctic Plateau, while the coastal areas largely remained unstudied. These areas however, and especially their lakes, are true Antarctic biodiversity hotspots, hosting many endemic species. These coastal areas are in addition very sensitive to climate change, with recent evidence suggesting that some lakes are close to complete desiccation or have significantly altered foodwebs.
The current proposal aims to study the history of past changes in climate, ice sheet thickness and lacustrine biological communities in the Sør Rondane Mountains, one of the most understudied ice-free regions in Antarctica. We will adopt a multidisciplinary approach involving both geomorphological and paleolimnological analyses, in close collaboration with national and international partners. We will conduct a field campaign during the Austral summer of 2009–2010 to carry out field measurements and lake sediment coring. We will produce detailed geomorphological maps based on field measurements and the interpretation of aerial photographs. The deglaciation history of the region will be assessed using cosmogenic nuclide dating of exposed boulders in moraines, complemented with radiocarbon and optically stimulated dating of lake sediments from lakes and paleolakes. Lake sediment cores will be studied using a full range of proxies, including geochemical and sedimentological indicators (major and trace elements, magnetic susceptibility, total carbon and nitrogen content, grain size, p-wave velocity, gamma density, electrical resistivity, color imaging and gamma spectroscopy). We will apply our inference models and indices developed during previous projects to quantitatively reconstruct past climate related environmental changes (i.e. lake productivity, moisture balance). These data will be complemented with radiocarbon and optically stimulated luminescence dating of raised lacustrine shorelines to reconstruct past lake level changes. Molecular markers, biogeochemical proxies (fossil pigments) and microfossils will be used to study past changes in biological community structure in response to the reconstructed environmental changes. Our results are expected to provide important background information to study the evolutionary history, biodiversity and biogeography of Antarctic biological communities. They will allow to detect glacial refugia and to test competing ice-sheet models. In addition, the data will enable us to better predict the effect of future climate anomalies on lacustrine systems and their unique biota in east Antarctic nunataks.