Acceptance speech

20 June 2024

Dorthe Dahl-Jensen, awardee in the Climate Change category (16th edition)

Thanks for the award, thanks to the BBVA Foundation and to the international selection committee.

It is an amazing honor to receive the award together with my friends and colleagues Jakob Schwander, Thomas Stocker, Jean Jouzel and Valérie Masson-Delmotte. We come from three of the research groups that have been instrumental in building the research field of ice core science. We stand on the shoulders of Willi Dansgaard, Hans Oeschger and Claude Lorius. With us we have strong teams of brilliant young and emerging researchers. Without doubt, drilling ice cores is a research field where we need to work together.

Understanding and extracting the wealth of climate information from 3 km long and crystal-clear majestic ice cores drilled from the surface to bedrock of the large ice sheets in Greenland and Antarctica has been an innovative and challenging journey. The ice is purer than distilled water, but everything that has been added is very well preserved in the frozen ice. Throughout the last 60 years, the research field has developed. Water isotopes reveal temperature changes during cold glacial periods and warm interglacials. The precipitation has changed, the concentrations of impurities from the ocean and the continents have varied, and radioactive isotopes from the atmosphere like Beryllium10 and Chloride36 tell us how the sun's intensity has changed.

It is truly fascinating to look into ice cores and see millions of small air bubbles. Small bubbles of air trapped in the surface snow as it slowly compressed and transformed into ice. A miracle – we have small trapped air bubbles of the past atmosphere reaching 800,000 years back in time.

By extracting the air, the past atmospheric concentration of greenhouse gases like carbon dioxide, methane and nitroxide can be reconstructed. We see that also far back in time changes in greenhouse gases were related to changing surface temperatures. During glacial periods with cold oceans, more carbon dioxide was trapped in the ocean to be released when the ocean warmed. The very well dated ice cores allow for detailed understanding of the interplay between astronomical warming and the feedback between greenhouse gases and surface temperatures.

In the present anthropogenic time, higher concentrations of greenhouse gases than ever seen in the 800,000-year-old ice core records stand out clearly. As the lifetime of carbon dioxide in the atmosphere is more than 100 years, we have programmed the world to warm over many coming years. This knowledge really calls for us to reduce emissions in the future. At present, humans are playing with the global climate system in an experiment where we are all trapped inside.

Back to research and innovation. Novel gas measurements are still surfacing – one that really has me impressed is measurements of radioactive Krypton81 in the ice cores. Krypton81 is so rare that laser based atomic traps are used to detect single atoms. The measurements are used to date million-year-old ice. These very advanced measurements are a good example of how interdisciplinary our research is, using attosecond lasers, accelerators, high level chemistry, and always followed by mathematical and physical models on all scales including AI technology.

My last words are on fieldwork. The expeditions to Greenland and Antarctica with months spent together in small camps drilling ice cores. The comradeship and friendship I have with Jakob, Thomas, Jean and Valérie is invaluable. It is thus a great pleasure that these years we are drilling an ice core in Antarctica – the Beyond EPICA Oldest Ice Core – hoping to get ice that is more than one million years old. Let's cross our fingers for success here.

Thanks again to the BBVA Foundation and the selection committee, and thanks to all colleagues and friends around the world.