CENTRE FOR ICE AND CLIMATE

Our vision is to contribute to the knowledge of climate variations and global warming by producing new and innovative ice core data and use them for climate research through modelling

It's all about dating

High-precision dating of the new NEEM ice core from Greenland combined year-by-year to tree-ring data shows the impact of volcanic eruptions on climate over the last several thousand years. Together, the records show that massive tropical volcanic eruptions and large eruptions at higher Northern latitudes, identified by high sulphate concentrations in the Greenland ice cores, often caused 1-2°C widespread Northern-hemisphere summer cooling for up to 10 years as identified by reduced tree-ring layer thicknesses (Sigl, 2015). Large volcanic eruptions can thus cool the climate for a decade, but do not cause longer-term climate changes. The records were synchronized by aligning ^{10}Be variations in the ice cores with corresponding ^{14}C variations in tree-ring records.

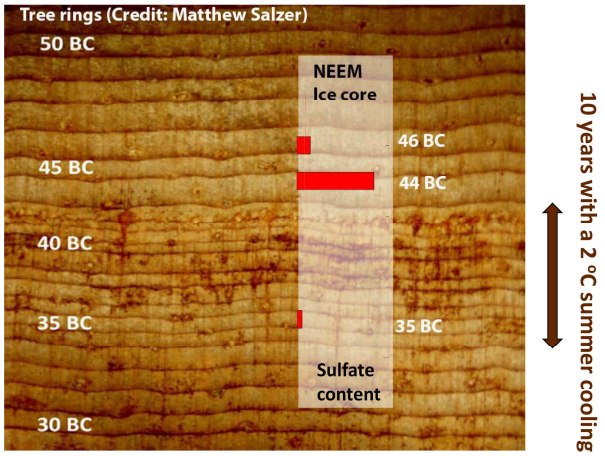

Figure 1: Tree-ring record showing 10 years of reduced layer thickness caused by cooling after the 44 BC volcanic eruption in the year of Julius Caesar's death.

Sea-level rise in Northern Europe

Probabilistic regional sea-level projections can be made by combining the major components of the global sea-level budget. In Northern Europe, sea-level rise is partly offset by vertical isostatic land rise, an effect from the last glacial termination.

The IPCC RCP8.5 scenario has been used to predict regional sea levels by AD 2100. The results show that the projected sea-level rise is not symmetrically distributed and that there is a higher probability of very high sea level rise than estimated in the 2013 IPCC report. For Copenhagen, the most likely sea-level rise in AD 2100 is 0.65 m with a 5% risk of values in excess of 1.6 m.

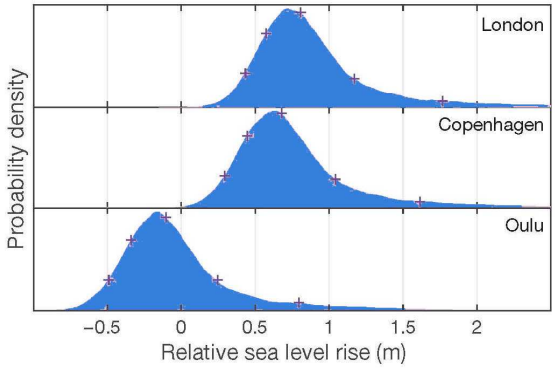

Figure 2: Probability density of relative sea-level rise using the IPCC RCP8.5 climate scenario for AD 2100 in London, Copenhagen and Oulu, Finland (Grinsted, 2015).

Two successes will pave our future path

2015 was an unusual year at Centre for Ice and Climate, as we had two major field seasons. As part of the international RECAP project, we used the Danish ice-core drill to retrieve a 584 m ice core from the Renland ice cap on the Greenland East coast, reaching more than 100,000 years back in time. After quite difficult logistics operations to pull out the camp, the Danish Air Force transported the ice cores to Denmark where they already the same fall were continuously analyzed for isotope ratios, impurities, and gas content.

In addition, we had the first EastGRIP field season, where we moved the deep drilling camp 500 km along the surface of the Greenland ice sheet to the new EastGRIP drill site located in the Northeast Greenland Ice Stream.

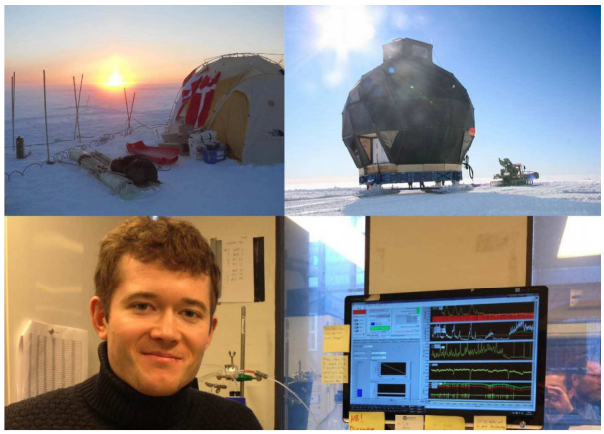

Figure 3: Top left: RECAP camp on Renland, East Greenland; Top right: Moving the dome to EastGRIP, Below: Marius Simonson at the Continuous Flow Analysis setup in the laboratory at Centre for Ice and Climate.