



Need for an European ice core storage and processing facility

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The polar ice sheets are not only a unique archive of the climate and the environmental conditions in the past they are also the primary cause of the sea level rise predicted for the next decades and centuries. Ice cores so far are drilled to reconstruct climate. This has been done extremely successfully during the past 30 years. However, the last two decades also showed some severe limitations of our core storage and processing capabilities. Having organized the processing of the EPICA-DML core drilled in Dronning Maud Land, of the Talos Dome core and a core from James Ross Island at AWI in Bremerhaven and having over 20 years experience in ice core projects one of my conclusions is there is a need of an European infrastructure not only to process ice cores but also to store them at temperatures as low as -50°C to avoid relaxation of the ice containing high pressure bubbles and decomposing air hydrates. Under long-term storage at -30°C the ice suffers severely and can hardly be used for analysis of the Milancovitch signal. At the same time when the number of computers increased the work in cold rooms decreased. The flow laws used in computer simulations to predict future sea level rise have been developed in the 1950ies and not significantly improved since then. Soon deformation experiments with ice will stop worldwide. However, there are serious gaps in our understanding e.g. of the air enclosure process (relevant to derive the phase relationship between the greenhouse gases and temperature and the Milancovitch signal used to date ice cores) and how disturbances start to develop in depths as deep as 60 to 70 percent of the ice thickness. It is still an open question whether these processes corrupt the climatic record in the ice. Hardly understood is also the role of the impurities in the ice. There is clear evidence now that impurities affect the ice flow in the deeper ice whether dissolved in the ice matrix or present in form of micro-inclusions. Unfortunately, the smaller the dimension the bigger the machine needed for analysis. There is a general tendency to believe that the future comes out of the computers but the last two winters proved something else. The commercial value of ice is mostly the damage it causes in the economy and in our daily life.

In this presentation the statement is made that Europe needs an infrastructure to concentrate some special work on polar ice in a joint infrastructure. Such an infrastructure should serve as a large and deep temperature storage. It should provide efficient processing capabilities not only for deep but also for large collections of shallow ice cores drilled during a pre-site survey. That infrastructure should house science hardly done elsewhere in Europe or the rest of the world, e.g. related to ice core physics. Additionally, it may serve as a platform of both commercially and socially motivated research to avoid damage by snow and ice during European winters.