



Surface and volume evolution of the Cook Ice Cap on Kerguelen Island since 40 years

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The glaciers and ice caps which surround Antarctica and Greenland contain a significant fraction of the land ice on Earth. Difficult to access, their response time to climatic fluctuations and their recent evolution are poorly known. These ice caps thus constitute a genuine climatic indicator. The objective of this study is to assess the changes of the extent and volume of the Kerguelen Island glaciers during the last forty years. Based on archive data (e.g. IGN map published in 1967, glaciological campaigns carried out in the Seventies) and on recent satellite data (Landsat, SPOT, SRTM, ICESat), we define successive outlines of the principal outlet glaciers to measure the pace of the retreat of the Cook Ice Cap. In order to understand the response of the Ice Cap to climatic forcing, we also analyzed the climatic data recorded by the Météo France station in Port aux Français.

The results reveal that all glaciers have retreated since 1965 although a strong variability exists from one outlet glacier to another. One striking result is the East/West asymmetry of the glacier retreat: west-flowing glaciers have lost 11,4% of their area while east-flowing glacier lost 28,2%. The dramatic retreat on the eastern side is illustrated by the retreat of Explorer's glacier front by 3150 m \pm 162 m since 1965 or an average of 75 m/yr. The Ampère glacier thinned on average by 125 m \pm 16 m in the frontal area, about -4,8 m/yr. Locally, the mean thinning rate during the last 40 years reached as much as 10 m/yr. In total, the ice cap lost 20% of its surface area over a period of thirty-eight years (1965-2003). The Cook Ice Cap is in recession since nearly one century and this trend accelerated since the years 1960-70 (Frenot et al. 1993). The analysis of most recent satellite images (from the years 2003 to 2007) shows that

the retreat continues today with the same speed or even slightly faster. The ice cap is thus far from its state of balance. If the current climatic conditions continue (high temperatures and relatively low level of precipitation) or if they are even amplified in the future, it is possible that the ice cap will totally disappear.