

**ICE VOLUME, MASS BALANCE AND ICE VELOCITY CHANGES IN HURD PENINSULA GLACIERS, LIVINGSTON ISLAND, DURING THE PERIOD 1956-2000, IN RESPONSE TO REGIONAL WARMING**

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Johnsons and Hurd are the two main glacier units of Hurd Peninsula ice cap, in Livingston Island, South Shetland Islands, Antarctica. They presently cover an area about 9 km<sup>2</sup>. Johnsons is a tidewater glacier flowing northwards, while Hurd glacier, flowing southwards, ends on emerged land.

The purpose of this research is to estimate the changes in ice volume during the period 1956-2000, and its comparison with the regional meteorological records and with the trends in mass balance and ice velocity observed during the last decade.

With such aim, we have constructed digital elevation models (DEM) for the glacier surface from aerial photographs taken by the British Antarctic Survey in 1956, and from our geodetic (theodolite and differential GPS) measurements in 1999-2000. Detailed radio-echo sounding (18 MHz) done in 1999-2001, showing maximum ice thickness about 200 m, also allowed us to construct a DEM for the glacier bed.

The comparison of DEMs has allowed estimating the changes in ice volume during the period 1956-2000. We estimate these to be about  $-0.10 \text{ km}^3$ , which represents a 10% decrease from the 1956 total volume of  $1.03 \text{ km}^3$ . Ice thickness changes range from +18.47 to  $-60.23 \text{ m}$ ; ice thinning, together with front retreat, is almost overall, being the thickening limited to a narrow area within Johnsons glacier.

These changes are consistent with the regional meteorological records, showing trends of  $+0.05 \text{ }^\circ\text{C a}^{-1}$  and  $-0.05 \text{ }^\circ\text{C a}^{-1}$  for the minimum and maximum temperatures, respectively, together with a slight increase in precipitation, and are also consistent with the trends observed in the mass balance and ice velocity time series from the net of stakes covering Johnsons and Hurd glaciers, spanning the last 10 and 5 years, respectively.