Signals of climatic variations in the northern most part of the Antarctic Peninsula and the South Shetlands Islands

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This paper explores climatic and cryospheric data sets to examine signals of climate variations in the extreme north of the Antarctic Peninsula (north of 64° S) and its offshore islands. Glaciers and ice caps of four islands (Brabant, Joinville, King George, and Nelson) show a non-uniform reduction for the period 1956-2001. For example, King George Island (KGI) has lost 7.1% (89 km^2) of its ice cover since 1956. On the other hand, on Nelson Island, separated from the former island by a narrow strait, the amount of ice lost is almost imperceptible. Further south and nearer to the Antarctic Peninsula, Joinville Island's loss is also restricted (0.6% of a total area of 1477 km^2, from 1990 to 2000). Glacier retreat on these three islands shows a clear general pattern: ice loss occurred mainly in outlet tidewater glaciers flowing to the southeastern coasts and mainly in bays and other well protected areas. On the other hand, in mountainous and irregular Brabant Island, no glacier retreat has been detected from 1989 to 2001. Having this in mind, we considered the influence of sea occurrence in bays and in other sheltered coasts. At least at Admiralty Bay (KGI), sea ice cover area decreased from 1977 to 1999. This trend was concomitant to an air temperature and wind speed increase and a greater frequency of northerly and north-westerly winds, advecting relatively warmer air masses from lower latitudes. On the other hand, the greatest amount of the ice loss in Admiralty Bay (22 km^2 since 1956) occurred before 1980. Rather than a common response to an observed general atmospheric warming trend (0.022°C a^{-1} from 1948 to 1995 in Admiralty Bay), glacier retreat in the region results from an interplay of ice front and coast morphologies, sea ice extend and variations in other climatic parameters such as precipitation. Further, from 1998 to 2005, the mean annual air temperature declined about 1°C.