RELIEF INLET QUADRANGLE, VICTORIA LAND, ANTARCTICA 1:250,000

(Antarctic Geomorphological and Glaciological Map Series)

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The Relief Inlet quadrangle is the second product of a cartographic project involving the geomorphological and glaciological survey of Victoria Land, and conducted in the framework of the Italian National Antarctic Research Program (PNRA). The map covers the southern portion of Terra Nova Bay and the northern margin of the Scott Coast (75° S–76° S, 162° E–166° 30' E). Three of the major outlet glaciers of Victoria Land flow into Terra Nova Bay (the Priestley, Reeves and David glaciers). The Priestley and Reeves glaciers drain the SE portion of the Talos Dome area and part of the northern Victoria Land névées, and merge to form the Nansen Ice Sheet (the name given by the first explorers, although it is technically an ice shelf). The David Glacier, the largest outlet glacier in Victoria Land, flows from eastern Dome C and southern Talos Dome, and drains the inner part of the plateau; its seaward extension, the Drygalski Ice Tongue, extends into the Ross Sea for almost 100 km. Local ice fields, within a few tens of kilometres of the Transantarctic Mountains, feed the floating glacier tongues along the Scott Coast (Clarke, Cheetham, and Harbord Ice Tongues).

Geomorphological and glaciological features are represented on a satellite image mosaic with a spatial resolution of 30 m (Landsat TM images 062-113 and 062-114, January 17, 1990). The image was georeferenced by identifying the ground control points determined through GPS measurements. It was rectified to a Lambert Conformal Conic cartographic projection (standard parallels 72° 40'S and 75° 20'S, WGS84) using a linear conversion matrix with a RMS error of less than two pixels.

The origin, spatial distribution, extension and density of landscape features and superficial deposits are represented. Features originated from several morphogenetic agents are distinguished and mapped with different colours and symbols. The map also gives information on the chronological sequence of landforms and deposits. Particular attention is devoted to glaciological features, and selected ice-thickness radar profiles are reported.

The David Glacier is the main outlet glacier in Victoria Land. It coincides with a subglacial trench which crosses the Transantarctic Mountains and links the Ross Sea Basin to the internal Wilkes Subglacial Basin. As most of the David Glacier basin lies below sea level, it is considered a marine-based glacier (Orombelli, 1991). The David Glacier is fed by two main flows, a northern one from the Talos Dome and a major southern flow from Dome C (Frezzotti 1993, Frezzotti and others 2000). Measurements derived from remote sensing analysis (image tracking) and field surveys (GPS) have provided ice velocity data for David Glacier-Drygalski Ice Tongue and Nansen Ice Sheet (Frezzotti 1993, Frezzotti and others 1998, 2000). The ice thickness of the David Glacier close to the grounding line ranges from 1,100 to 1,750 m (Frezzotti and others 2001, Tabacco and others 2000). Frezzotti and others (2000) estimated the ice discharge at the grounding line of the David Glacier (7.8 ±0.7 $km^3\ a^{-1}$), the Priestley Glacier (0.77 ±0.13 $km^3\ a^{-1}$) and the Revees Glacier (0.52 ±0.06 $km^3\ a^{-1}$); the authors also determined that basal melting and freezing rates for the Drygalski Ice Tongue and the Nansen Ice Sheet range from -16.4 ±5.8 to 8.6 ±12.0 m a^{-1}. Frezzotti and Mabin (1994) to determine a reasonably complete history of the 20th century behaviour of Drygalski Ice Tongue by examining historic maps and records, aerial photographs and satellite images. The only major calving event occurred in 1957 when the outer 40 km of the ice tongue broke away. The analysis of changes in the ice front and calving behaviour along this coast was reported by Baroni and others (1989) and Frezzotti (1992, 1993, 1997a). The surface wind field inland of the intense coastal katabatic wind regime at Terra Nova Bay was studied through both remote sensing and numerical techniques (Bromwich and others 1990, Frezzotti 1997b). The Drygalski Ice Tongue borders Terra Nova Bay to the south. Persistent offshore katabatic winds that prevent the accumulation of sea ice, and the Drygalski Ice Tongue that blocks the influx of sea ice from the south are both responsible for the formation and maintenance of the Terra Nova Bay polynya (Kurtz and Bromwich 1985, Frezzotti and Mabin 1994).