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GPS-ASSISTED PHOTOGRAMMETRY FOR MAPPING PRODUCTION IN ANTARCTICA

ABSTRACT: MARSELLA M. & VITTUARI L., *Gps-Assisted Photogrammetry for Mapping Production in Antarctica.* (IT ISSN 0391-9838, 1997).

In 1993 an airborne Gps-assisted photogrammetry project was carried out in the Victoria Land region (Antarctica) with the performance of 12 aerial photography missions. Successful application of Gps photogrammetry allows for reduction of the number of ground control points (Gcp). The benefits of airborne Gps in the production of high-accuracy spatially referenced data deserves particular attention when operating in difficult environments, such as polar regions for glacier monitoring or mapping purposes. Gps determined positions of photo centers and control points can be used during the aerotriangulation procedure preliminary to the photogrammetric plotting. A comparison between the digital and analytical aerotriangulation approach is made in the paper. Furthermore an images auto-correlation algorithm was tried out for the automatic production of the ice shelf Digital Terrain Model (Dtm) and relative ortophoto production.

KEY WORDS: Gps, Digital Photogrammetry, Mapping, Glacier Monitoring.

RIASSUNTO: MARSELLA, M. & VITTUARI L., *Fotogrammetria assistita dal Gps per la produzione di cartografia in Antartide.* (IT ISSN 0391-9838, 1997).

Nel 1993 é stato realizzato un progetto di fotogrammetria aerea assistita dal Gps nella Terra Vittoria (Antartide) tramite l'esecuzione di 12 rilievi aerei. L'impiego della fotogrammetria assistita dal Gps permette la riduzione del numero di punti di controllo da stabilire a terra rendendo tale tecnica particolarmente adatta a zone remote o di difficile accesso, quali quelle polari nell'ambito del monitoraggio di ghiacciai o di produzione di cartografia. Le posizioni dei centri di presa e dei punti di controllo determinate tramite il Gps possono essere utilizzate nelle fasi di triangolazione aerea che precedono la restituzione fotogrammetrica. Nel presente lavoro è stato confrontato l'approccio digitale con quello analitico per le fasi di triangolazione aerea. Inoltre è stato sperimentazione un algoritmo di correlazione automatica di immagini in grado di produrre il Modello Digitale del Terreno (Dtm) della piattaforma di ghiaccio e la relativa ortofoto.

TERMINI CHIAVE: Gps, Fotogrammetria *digitale*, Cartografia, Monitoraggio di ghiacciai.

INTRODUCTION

The impact of the Global Positioning System (Gps) technology adopted in support of photogrammetric mapping is both in the convenient establishment of high accuracy ground control and in the determination of camera station positions at the instant of exposure. Gps derived photo centers can be introduced as observations with the image coordinates into «combined» block adjustment reducing the number of required ground control points. Therefore, the benefits of airborne Gps in the production of high-accuracy spatially referenced data deserves particular attention when operating in difficult environments, such as in polar regions, where the establishment of ground control points is extremely onerous because of both logistic and economic requirements.

Unfortunately, the performance of the Gps technique in polar as well as equatorial regions, is not optimal (Seeber, 1993; Vittuari, 1994) and, indeed, the stringent accuracy demands for large scale photogrammetry are hardly satisfied, while the requirements for small scale photogrammetry can be easily met.

In 1993 using the latest satellite-based Gps technology, an airborne Gps controlled photography project was carried out in the Victoria Land region of Antarctica. The main objective of the program was the collection of images over the Convoy Range, Ross Island and Browns Peninsula regions. The project also aimed at demonstrating improved

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