# ICE FLOW AND SEDIMENTARY DYNAMIC OF UNION GLACIER MORAINES, ELLSWORTH MOUNTAINS, WEST ANTARCTICA

**Costa, V[1], Rosa, K.K.[2], R. Vieira[1,2]**

**[1]Sedimentary and Environmental Processes Laboratory – UFF - Brazil**

**[2]Polar and Climate Center – UFRGS – Brazil**

## OBJECTIVE

This work aims to show the influence of the ice flows on the formation of moraines in Union glacier, at the confluence of Elephant Head and Rossman Cove valleys (Fig. 1).

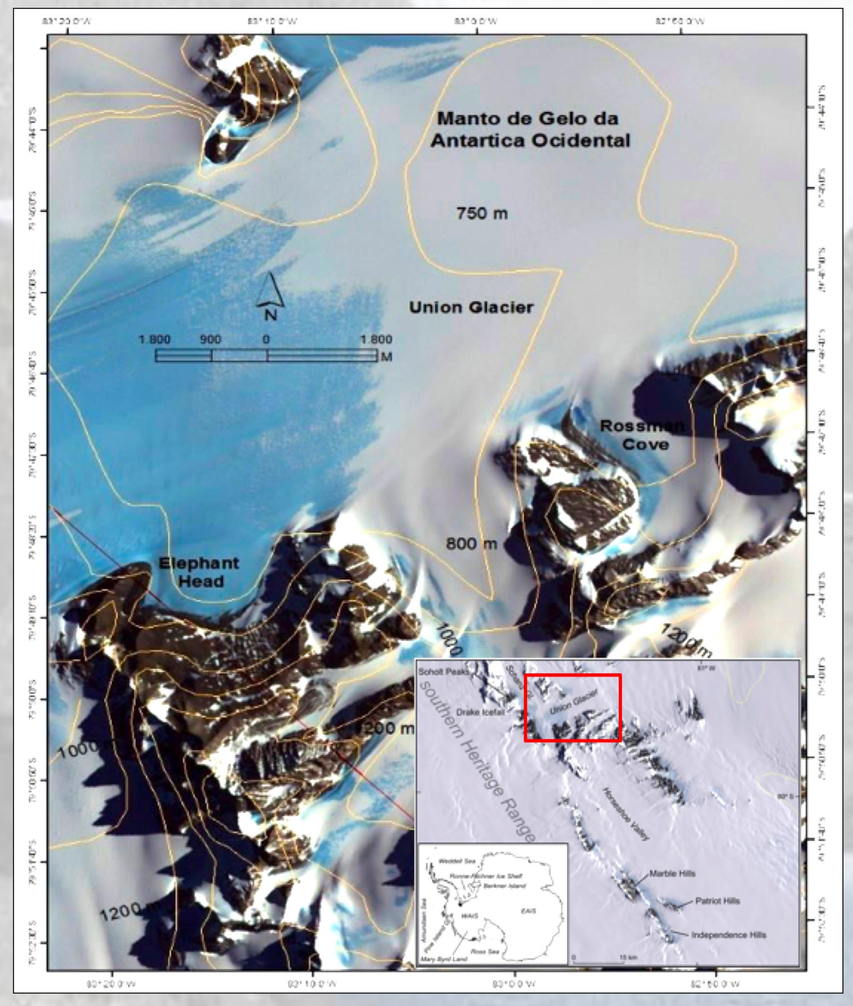


**Figure 1. Location of the Elephant Head and Rossman Cove valleys on the Union glacier, southern part of the Ellsworth Mountains, Antarctica. Aster images (2007).**

## METHODS

- Cross-correlation algorithm of optical satellite images (ASTER 2006/2010) - glacier displacement analysis (Fig. 2) using IMCORR software in Linux system.

- Glacier surface velocity - determinate through the displacement data; the average of vectors displacement divided by the temporal interval of the two images (629 days).

- Flow vectors map (Fig. 3) - produced with satellite image vectors, and 3D perspective by the digital elevation model (ASTER GDEM-USGS) - ArcGis 10.1 software.

- 3D image (Fig. 4) – using software Global Mapper 17 based on ASTER imagery and ASTER GDEM.

## RESULTS AND DISCUSSION

The vectors identified in the central part of the Union glacier (Fig. 2), point to a confluence of the Schanz glacier. Arcuate crevasses indicate the direction of the central flow of the Union glacier. The stream follows the glacier in a northeasterly direction, however not towards the glacial margin where the supraglacial moraines develop, but adjacent to the ends of the mountain formations, Based on the glacier flow (Figure 3a-b), it is inferred that the sediment cover of the supraglacial moraines at the confluence of Elephant head valley may record the thinning processes of the ice sheet at Union glacier. The ice thickness change can be related to exposition of surrounded steep slopes, which started to contribute with debris. This debris cover protects moraines from ablation. Similar process could be applied to the supraglacial Rossman Cove moraines (Fig. 4), where moraines have developed next to the hills. However, the sequence of moraine crests and the northeast direction of the tail argues for influence of Union glacier flow on the structure of deposit, represented by the debris accumulation and deformation of the moraine.

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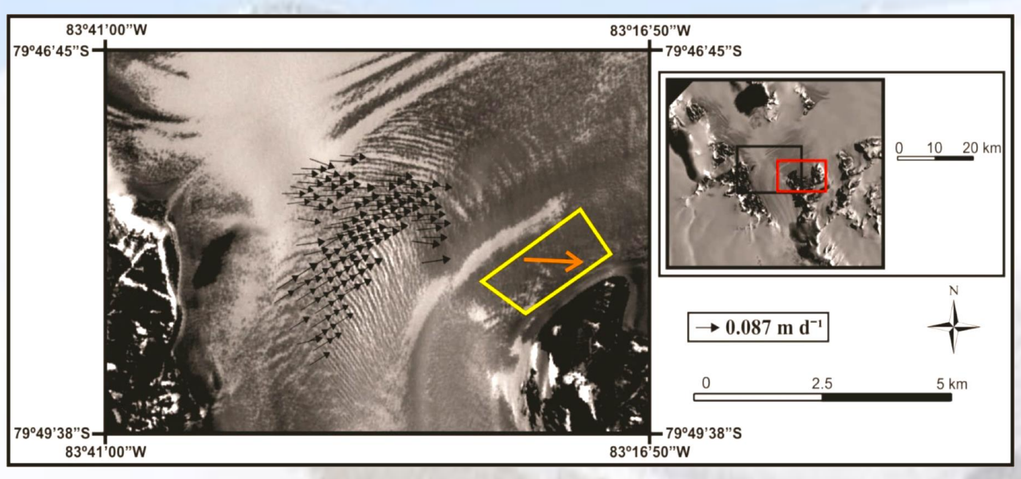


**Figure 2. Direction of the central flow of the Union glacier using the logarithm of cross correlation. The arrows describe the direction of the displacements calculated at 0.087 m / d.**

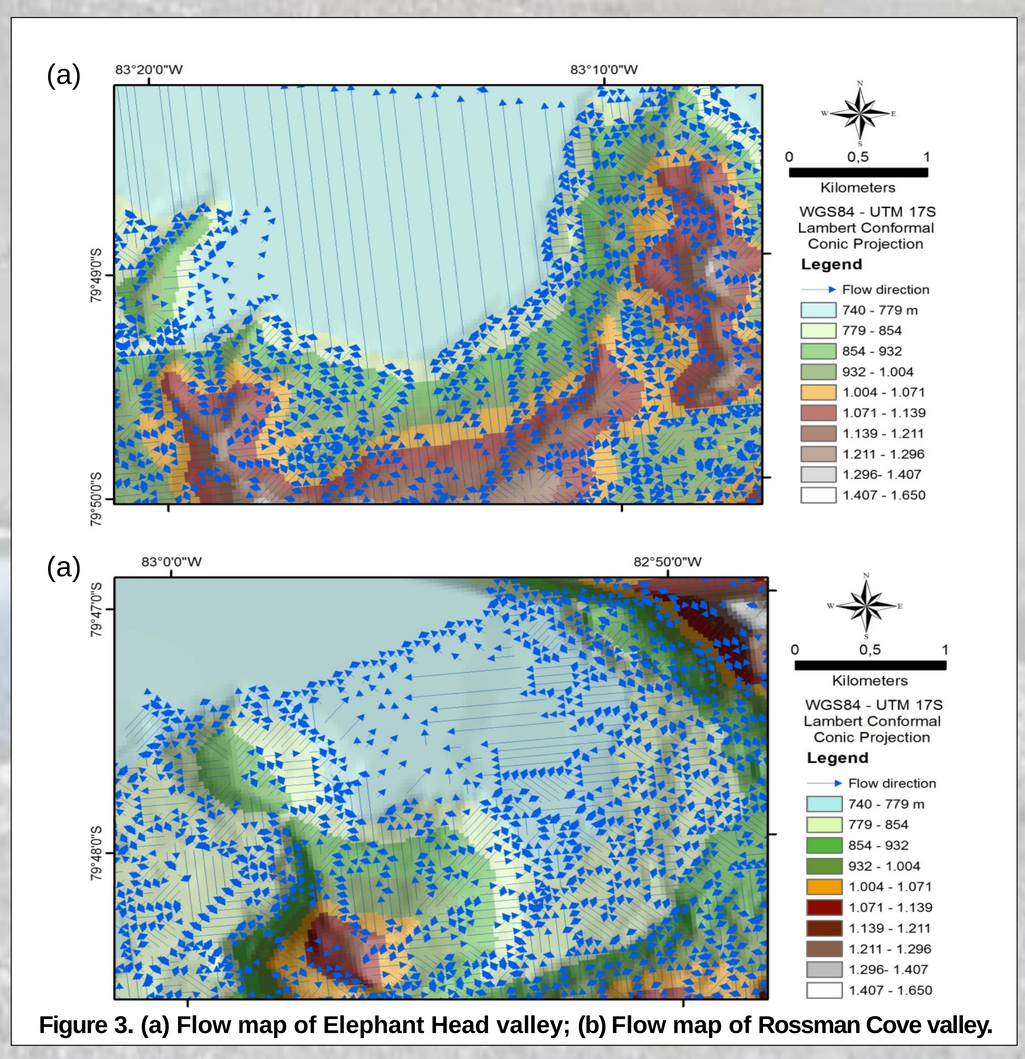


**Figure 3. (a) Flow map of Elephant Head valley; (b) Flow map of Rossman Cove valley.**

## CONCLUSION

It is interpreted that the supraglacial moraines in Union glacier are relict features of a latter period of thickening ice in the region. In Elephant Head area the supraglacial moraine may also have contribution of debris from surrounding slopes. This processes may explain the larger boulders and the thicker debris surface, which reduce ice surface ablations.
Such features can be used in the reconstruction of ancient surface elevations, extensions of ice and age of the blue-ice areas.

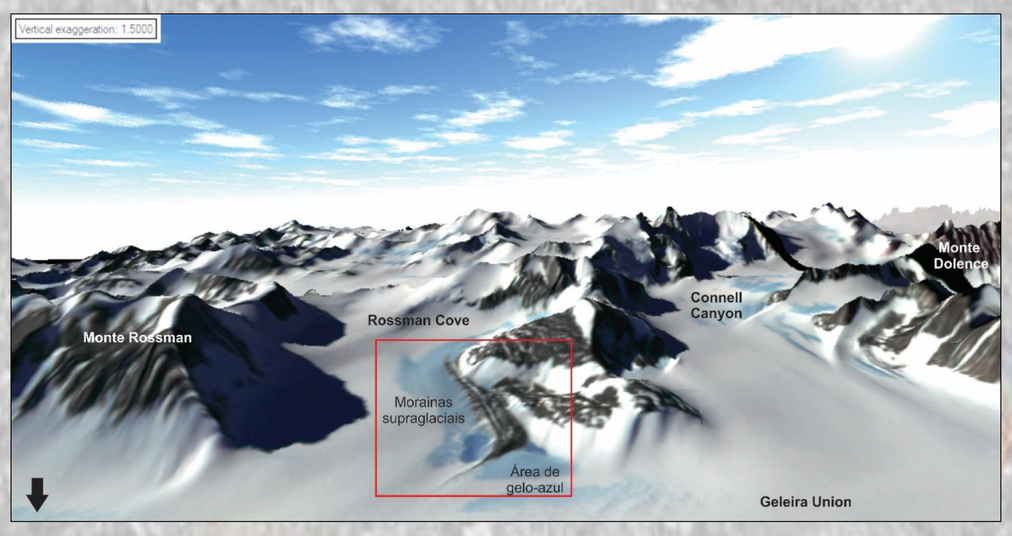


**Figure 4. 3D view of Glacier Union and Rossman Cove. Images of ASTER GDEM, METI and NASA (2011).**