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Subglacial morphology and tectonic framework of the Transantarctic Mountains and the Wilkes and Aurora Basins inferred from RES profiles at Lat 73°-74° S

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During the Antarctic field season 2003, Italian PNRA collected radar data along two flights running roughly parallel to the 73°S and 74°S parallel. The two flights extend about 1400 km inland of the Transarctic Mountains (TAM), to Dome C and into the Aurora Basin. A similar flight was done in 1999 along the 73.5°S parallel and was completed to Dome C in 2003. Other two shorter flights were done in the Dome C area. Reflected echo from the bottom of the ice sheet is present in 90 % of flight lengths. Computed ice thickness in the survey area is variable, ranging from hundreds of meters near the TAM to a maximum of more than 4 k m in correspondence of the Adventure Trench.

The analysis of the three main profiles, nearly parallel and 50 km apart each other, allows to identify the main geological domains in the East Antarctic craton and suggest some clues on the structural setting of investigated area also in the light of earlier works (Ferraccioli, 2001 Studinger et al. 2004).

The same physiographic features where identified in the three analysed Radio Echo Sounding profile revealing their regional extent. The higher horizontal resolution along the radar track with respect to the BEDMAP database allowed to highlight the subglacial morphology of the main, already known physiographic features. From East to West we can recognise: the TAM, the Wilkes Basin, the Resolution HighLands, the Adventure Trench, the Belgica Subglacial HighLands, and the Aurora Basin.

Morphological interpretations based on the tectonic signature on the subglacial land-

scape allow to identify the major tectonic boundaries governing the geodynamic setting of the area. A series of sub-parallel, subglacial troughs separated by ridges characterise the subglacial landscape between the Resolution and the Belgica Highlands. These morphologies where formerly interpreted as compressive tectonic features on the base of aerogeophysical data (Studinger et al., 2004).

The asymmetric transversal profiles of these elongated valleys, namely Adventure, Concordia and Aurora Trenches, strongly resemble the geometry of half graben depressions and suggest the existence of an array of normal faults with listric geometry. Minor antithetic normal faults cut the hangingwall blocks characterised by a rounded surface shape. The abrupt slope break that characterises the easternmost part of the TAM may result from the activity of thrust sheets at the mountain front. A step like valley floor deepening towards the central sector characterises the wide Wilkes Basin. This morphology may easily be the result of a set of normal faults steeply dipping toward the centre of the basin in a domino style fashion.

Glacial erosion played a sub-ordered role in the shape of the subglacial landscape in the investigated area. Observed morphologies do not resemble the typical symmetry resulting from glacial over-excavation. These considerations suggest the existence of a previously undetected extensional tectonics in the central part of the East Antarctic craton. The proposed scenario further complicates the unique geodynamic setting of the Antarctic plate. The identified main tectonic boundaries correlate with the regional scale alignments of published magnetic and gravimetric anomalies. The future integration of the analysis of bedrock morphology from RES profiles with magnetic and gravimetric data will improve the geological understanding of the investigated area.