



Northern Victoria Land (Antarctica) Active tectonics inferred from the integration of GPS data and geologic setting

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A Global Positioning System (GPS) network of 30 semi-permanent vertices known as the Victoria Land Network for Deformation Control (VLNDEF) was set up in the Austral summer of 1998 in Northern Victoria Land (NVL), including the permanent GPS station of Terra Nova Bay (TNB1), Antarctica.

The locations were selected according to the known Cenozoic fault framework, which is characterized by a system of NW-SE regional faults with right lateral, strike slip kinematics.

The TNB1 permanent GPS station is included within the VLNDEF, and was installed on a bedrock monument in October 1998, it has been recording almost continuously up to the present. The GPS network has been surveyed routinely every two summers, using high quality, dual frequency GPS receivers like Trimble 5700, TopCon GB100, and Ashtech Z-XII. In this study we present the results of a distributed session approach based on Gamit/Globk 10.4 software package applied to the processing of the GPS data of the VLNDEF aimed to obtain the preliminary framework of the active tectonics of this region of Antarctica.

An improved reference frame definition was implemented, including a new Euler rotation pole, to compute the Antarctic intra-plate residual velocities.

The projection of the residual velocities on the main faults in NVL show present day activities for some faults, including the Tucker, Leap Year, Lanterman, Aviator, and David faults, with right lateral strike slip kinematics and local extensional and compressional components. This active fault pattern divides NVL into eight rigid blocks, each characterized by its relative movements and rigid rotations. These show velocities of up to several millimeters per year, which are comparable to those predicted by plate tectonic theory at active plate margins.

During the austral summer 2010, in the framework of the Italian Antarctic campaign, field investigations at 25 geodetic stations were performed both for survey of the instruments and measurements as well as for the geological study necessary to evaluate the geological stability of the sites. Preliminary analysis of the collected structural data showed the stability of most of the investigated stations, thus confirming the proposed active tectonic framework of the NVL at the regional scale.