

MONITORING OF SPATIAL MOVEMENTS OF THE MAIN FAULTS IN THE POLISH SUDETES

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ABSTRACT

The results of epoch satellite GPS, gravimetric and other measurements carried out in selected areas of central Europe are presented.

Comparatively short, 10 year period of observations in Sudetes and on the Fore-Sudetic Block, confirm the assumption of continuing tectonic movements in this part of Central Europe.

KEY WORDS: Tectonic movements, faults, Sudetes, 3-D monitoring

* Department of Geodesy and Photogrammetry, Agricultural University of Wrocław, Poland.

E-mail: cacon@kgf.ar.wroc.pl

** Institute of Rock Structure and Mechanics, Czech Academy of Science, Prague, Czech Republic

1. INTRODUCTION

The region of Sudetes, in the NE part of the Bohemian Massif, was subjected in the past to several tens of earthquakes. This together with geological and geodetic investigations carried out during the last century confirms that tectonic movements, which peaked in Neogene, have not yet ceased. Since the beginning of the 90-ties of the 20th century changes happening in the uppermost part of the lithosphere have been monitored here. The measurement techniques include: satellite GPS, geodetic (precise leveling and Total Station) observations, as well as relative observations of the displacements of rock blocks with TM-71 crack gauges.

Selected points in these areas, located on crystalline rock outcrops, formed regional research network "GEO-SUD" (Fig. 1; CACON 2001; CACON *et alii*, 2003).

Locations of the "GEO-SUD" network points were correlated with the main faults to establish geodynamic profiles perpendicular to these structures.

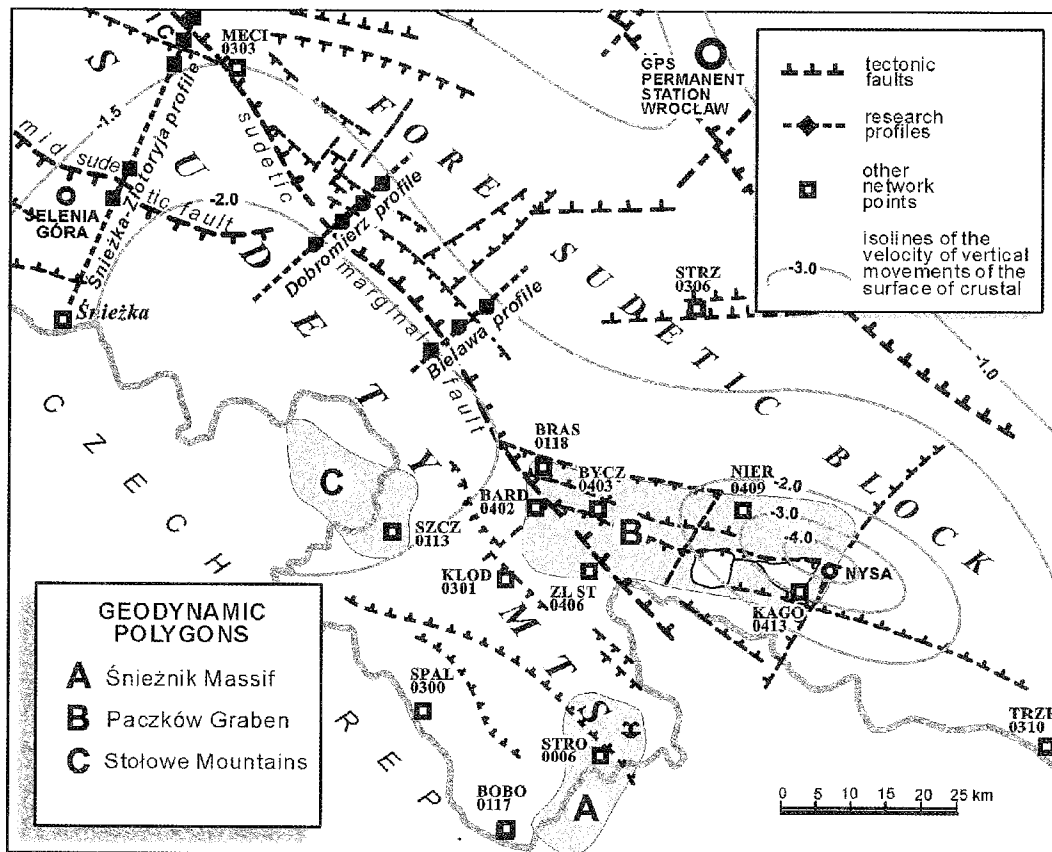


Fig. 1 - "Geosud" geodetic network.

2. RESULTS OF MONITORING

The monitoring and processing methodology are based on self-developed control and measurement systems (CACON & KONTNY, 1994; see: Fig. 2 and Fig. 3) and include:

- (i) satellite GPS and geodetic measurements (KONTNY & BOSY, 2002);
- (ii) gravimetric measurements (BARLIK & CACON, 2001);
- (iii) relative observations with TM-71 crack gauge (KOSTAK & CACON, 1999).

GPS-Velocity vectors of horizontal movements of the research points are shown in figure 4. The greatest velocities registered in the western part of the region

exceed values of 5 mm/y. Changes of the gravitational acceleration measured with precise gravimeters (LaCoste & Romberg and Scintrex CG-3M) reach up to 0.107 mGal with mean error at the $\pm(0.014-0.021)$ mGal levels. Above mentioned facts indicate present-day mobility of tectonic structures near the main faults in the research area. The results of relative observations of rock blocks with TM-71 crack gauges also confirm this activity (Fig 5).

Comparatively short, 10 year period of geodynamic observations in Sudetes and on the Fore-Sudetic Block is not sufficient to give definite conclusions. Nonetheless, results of these investigations confirm the assumption of continuing tectonic movements in this part of Central Europe.

	Characteristics of observation segments				
	Segment I	Segment II	Segment III		Segment IV
			Deep observations	Surface observations	
Observations (instruments)	Satellite (GPS) precise levelling	- satellite (GPS) - total station - precise levelling	- inclinometer	- feeler gauge - clinometer - extensometer	gravimeter
Frequency of observations	1 - 5 years	3 - 12 months	1 - 30 days of permanent		1 - 5 years
Accuracy spatial deformations	$\pm (0,5 - 5)$ mm	$\pm (0,5 - 2)$ mm	$\pm 0,1$ mm/1m	$\pm(0,01-0,1)$ mm	$\pm 0,012$ mGal

Fig. 2 - Characteristics of the monitoring system.

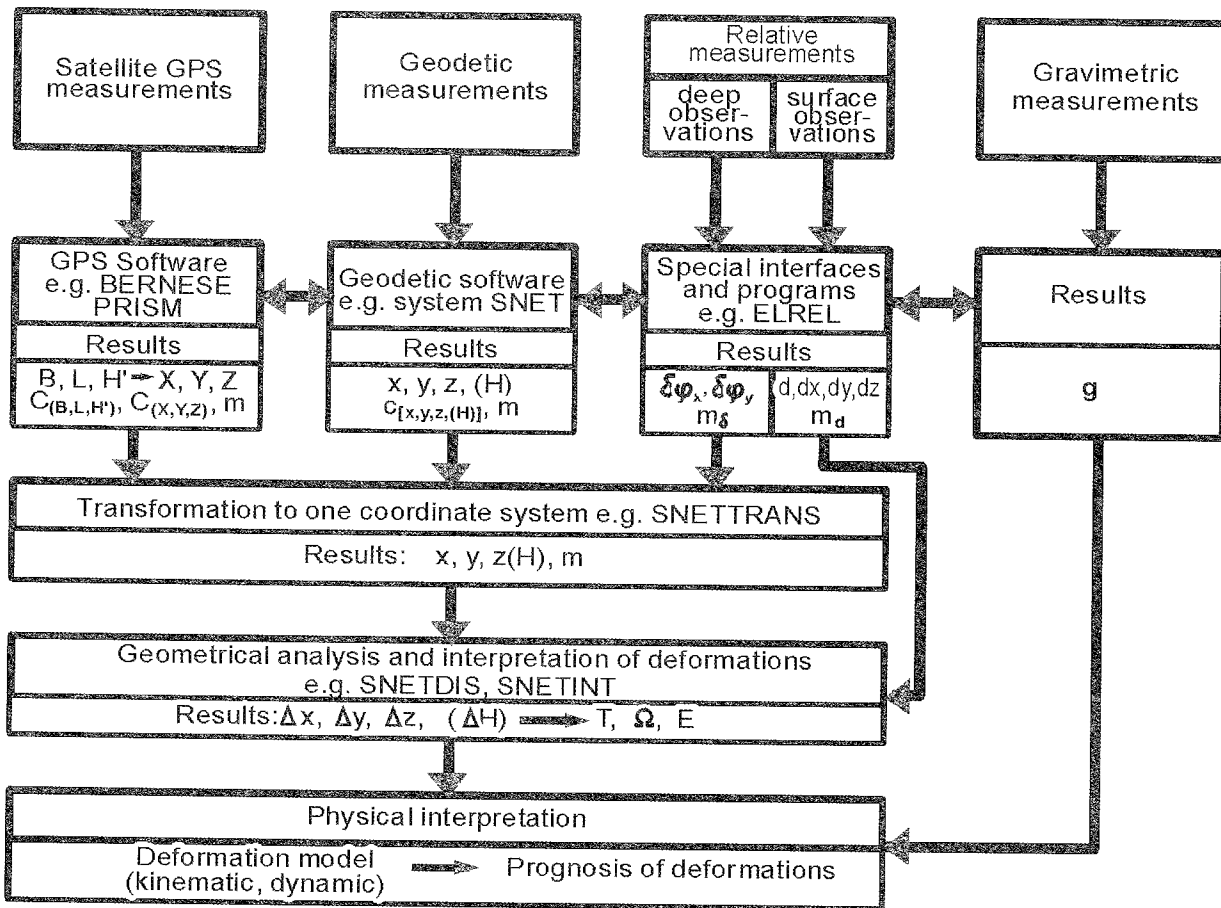


Fig. 3 - Characteristics of the data processing system.

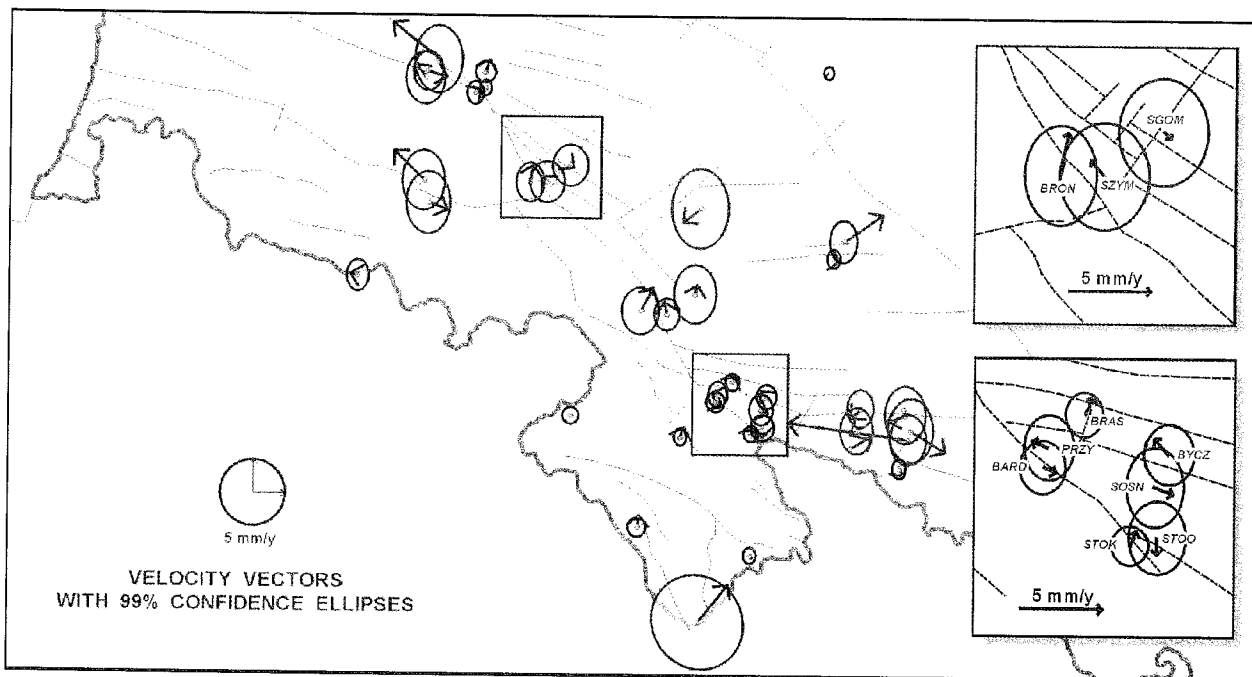


Fig. 4 - GPS-velocity of "GEOSUD" network points (1996-2002).

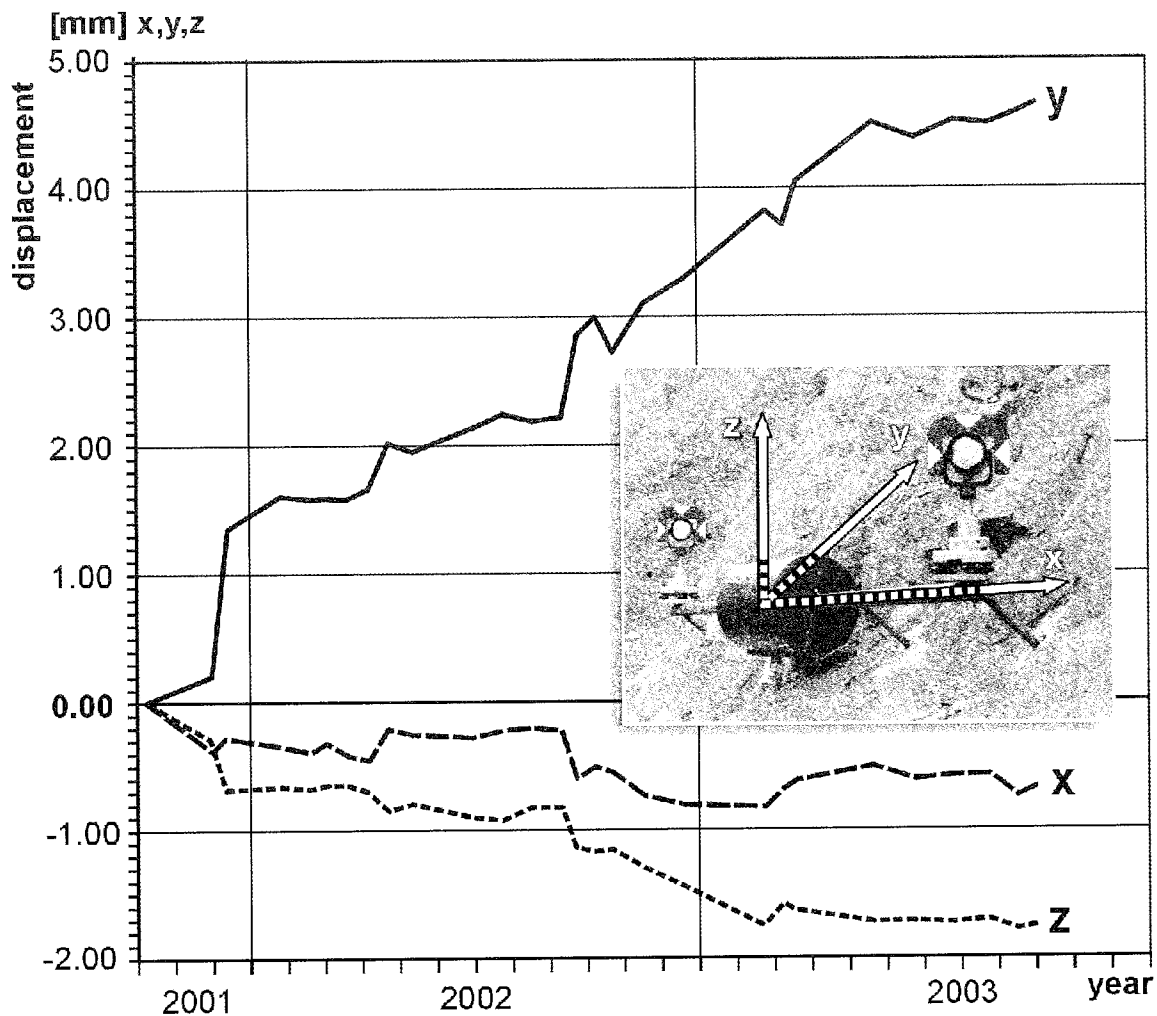


Fig. 5 - TM-71 crack gauges results. The instrument is set up along the Sudetic Marginal Fault zone in the vicinity of Dobromierz dam.

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