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THE RELATIVE VELOCITIES ESTIMATION OF THE TECTONIC MOVEMENTS ON THE AREA OF POLISH SUDETY MTS. AND ITS FORELAND

CONTENTS

ABSTRACT

Since 1996 on the frame of GEOSUD and GEOSUD II projects, the area of Sudety Mts. and Fore-Sudetic Block (GEOSUD network) is investigated by different geodetic techniques. Seven GPS measuring campaigns (1996-2002) of local geodynamic network GEOSUD gave the opportunity to estimate velocities of GPS points. Connection of epoch GESUD network solutions including observations, coordinates and velocities of the EPN permanent stations made possible to determine of absolute ITRF2000 velocities for all pints. The methodology of relative (intraplate) velocities estimation using APKIM2000 and NNR-NUVEL-1A plate kinematic models of GEOSUD network points and preliminary results were presented and discussed.

KEY WORDS: GPS, geodynamics, velocity estimation

1. INTRODUCTION

The Sudety Mts. and Sudety Foreland envelop the area of north-east margin of Bohemia Massif with complicated block-type geological structure. It formed a resisting block for the folding Western Carpathians during Alpine Orogeny. The region owes its present day orographic picture to tectonic movements that culminated in Neogene. Geological studies and repeated measurements of leveling lines during the last century revealed continuing tectonic movements. A lot of earthquakes are registered in historical period (CACOŃ & DYJOR, 2002). These facts and modern quantitative and qualitative data confirm that tectonic activity still is going on. In 1992 an investigation of the recent movement of the upper layer of lithosphere of the areas in Eastern Sudety Mts. and Sudety Foreland was begun. The following areas were investigated: Snieźnik Massif, Paczków Tectonic Trouch and Stowe Mts. In 1996 these separate projects were included into the GEOSUD project (CACOŃ *et alii*, 1998) and extended to GEOSUD II (CACOŃ *et alii*, 2003) and geodynamical GPS network GEOSUD was established (Fig. 1a). Seven GPS measuring campaigns (1996-2002) of local geodynamic network GEOSUD, covering polish part of Sudety Mts. and it's Foreland, were done. The results of GPS data processing (coordinates and its variance-covariance matrix) of these campaigns give the opportunity to estimate velocities of GPS sites.

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2. RELATIVE VELOCITIES DETERMINATION

Site velocity estimation requires the determination of reference frame, the fixed coordinates and velocities of the reference points (BORKOWSKI *et alii*, 2003). The main principles of the movement velocity estimation of individual network sites in the global ITRF2000 and local reference frame and describes the following steps and show figure 1b (SCHENK *et alii*, 2003):

Independent, minimum constrained solution of each session (each year daily observations) using reference-points ITRF coordinates, suitable for the measurement epoch.

Transfer of the reference-points ITRF2000 coordinates from the reference epoch 1997,0 to the each session epoch.

Similarity transformation of each session results (the step #1) to the reference frame created by reference-point coordinates (the step #2) using "free network" constrains.

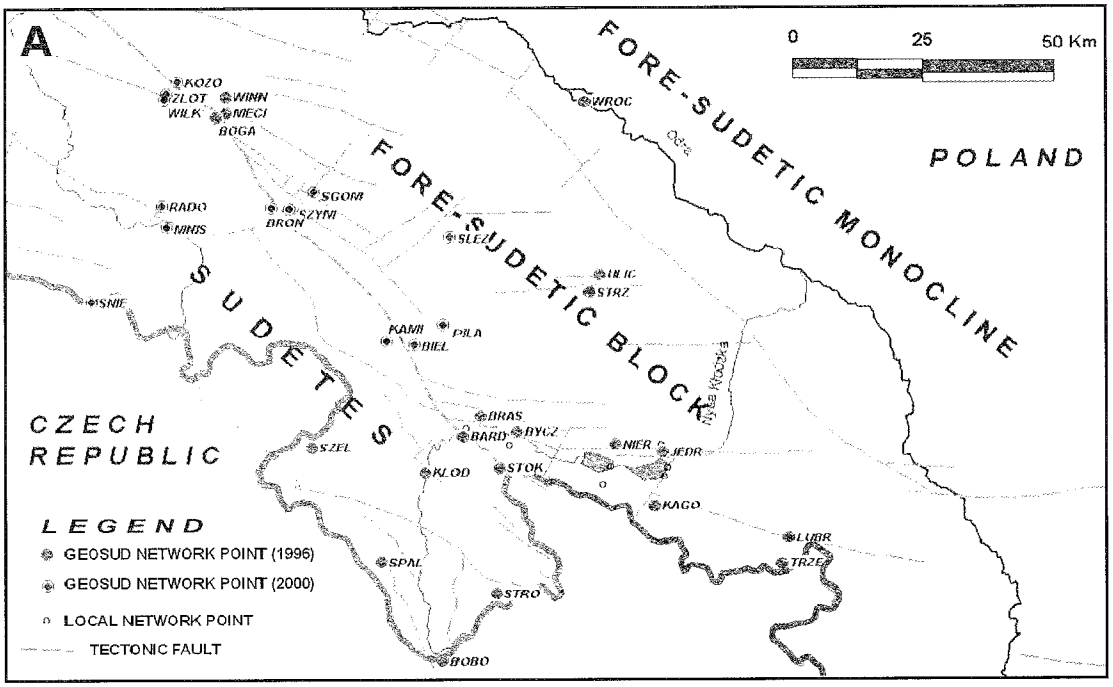
ITRF2000 velocity estimation of the network sites fixing (or weighting) the reference-points velocities.

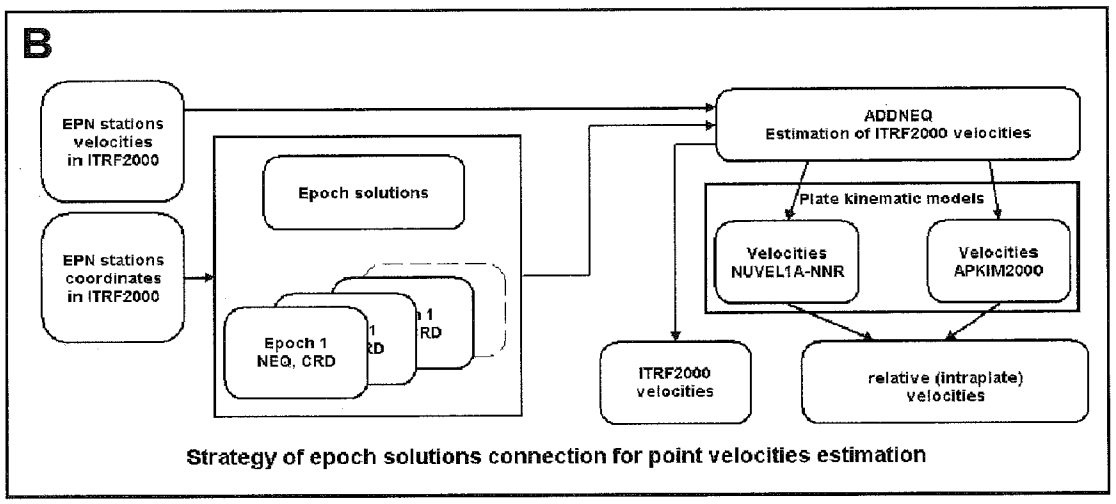
Relative (intraplate) velocities computation by a reduction of the ITRF2000 velocities by plate velocities resulting from plate kinematic models: NUVEL1A-NNR (DEMETS *et alii*, 1994) or APKIM2000 (DREWES & ANGERMANN, 2001).

Preliminary results of determined relative velocities (ITRF2000-APKIM2000) of GEOSUD network points for period 1996-2002 are shown on the figure 1c.

3. CONCLUSIONS

Presented method of local network point velocities estimation gives the possibility to determine the velocity vectors in the global reference frame (ITRF2000). Relative (intraplate) velocities can be computed using plate kinematic models: NUVEL1A-NNR or APKIM2000. The relative velocities of GEOSUD local network points estimated using this approach are the reliable source data for geodynamic interpretations.





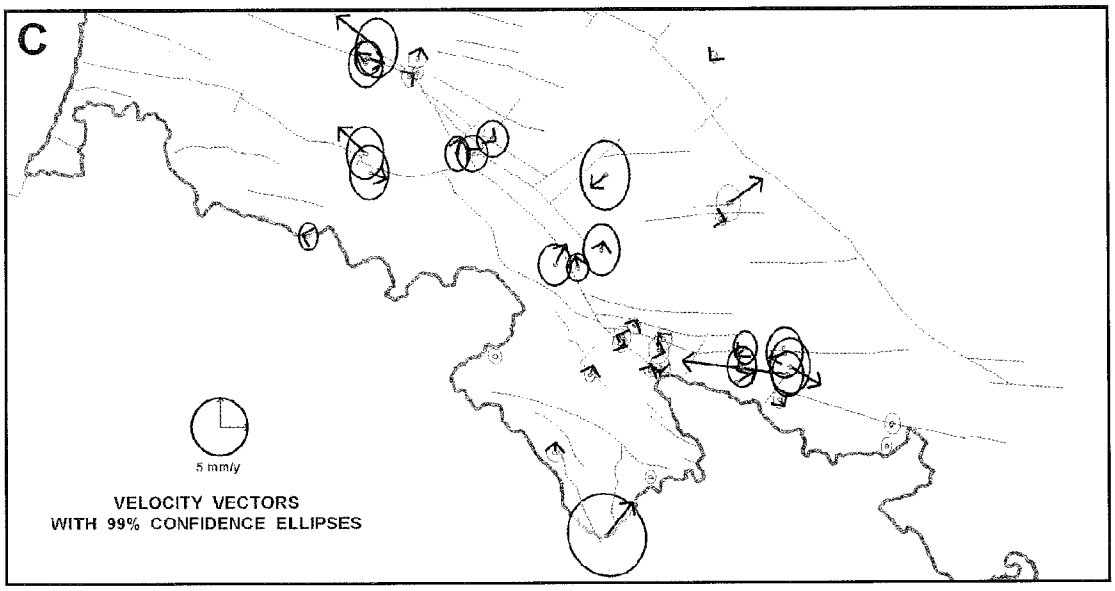


Fig. 1 - A) "Geosud" geodetic network; B) strategy of epoch solutions connection for point velocities estimation; C) GPS-velocity of "GEOSUD" network points (1996-2002).

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