ned. They show the following petro-structural properties: (i) recrystallized (retrogressed) granulites of the Křišťanov massif represent the oldest unit of the area. The phase D_2 recorded in these rocks pre-dates emplacement and deformation of all types of granitoid rocks; (ii) the implacement of fine-grained granitoids is interpreted as polyphase, with a relative younging of intrusions toward the W. The relatively older batches of melt crystallized under conditions of the regional deformation (D_3); (iii) the magmatic fabrics in durbachites are closely tied to the regional deformation D_3; however, structural relations between fine-grained granitoids and durbachites are not safely recognised. Subsolidus fabrics in durbachites are interpreted as resulting in domains of increased deformation coinciding in time with emplacement of new melt batches; (iv) the marginal parts of the Plechý massif were emplaced post-tectonically in relation to deformational evolution of the region. It is thus the youngest granite massif in the area.

Tectonic Control of Glacialy Induced Deformations within Kleczew Graben Zone (Konin Elevation, Great Poland)

Wojciech WŁODARSKI[1]

[1] *Institute of Geology, Adam Mickiewicz University, Maków Polnych 16, 61-686 Poznań, Poland*

The glaciotectonic deformations of the Neogene as well as lower and middle Quaternary sediments are the object of considerations here. These deformations was observed within the Kleczew Graben zone. This graben represents one of many local structures of this type located within the Konin Elevation (Fig. 1a, b). It consists of three segments which trend NW-SE (eastern segment), NNE-SSW (western segment) and WNW-ESE (northern segment). These directions are characteristic for structural plan of the whole Konin Elevation (fig. 1b). The origin of grabens located within the Konin Elevation and thus the Kleczew Graben so far has not been defined in unambiguous way. It is believed that these grabens may have originated in effect of: 1) tangencial extension influenced by bending of the Mesozoic bed-rocks and uplifting of the Konin Elevation, 2) transtension along bounding faults of these grabens due to strike-slip dextral motion of primary dislocations (Gopło-Ponętów and the Poznań – Rzeszów). The main stage of graben formation took place in the Oligocene – Miocene. In this time they performed the role of local sedimentary basins in which the thick series of the Middle Miocene brown coals and the Middle-Upper Miocene Poznań Formation clays were deposited. The high degree of tectonization of these sediments is common within the Kleczew Graben. The faults as well as dense net of fractures of tectonic nature developed here. Their orientation is consistent with orientation of individual segments of the Kleczew Graben as well as bounding faults of this structure. The brown coals and the Poznań Formation clays analysed here were deformed again during the Odranian Glaciation period. Additionally, the South-Polish glacial tills T1 and partially lower beds of the glaciofluvial sands and gravels from anaglacial phase of the Odranian Glaciation were deformed too. In effect of uniaxial subhorizontal compression in front of the advancing Odranian ice-sheet, the folds as well as overthrusts developed. These structures were in detail analysed within zone of bounding fault which encloses the northern segment of the Kleczew Graben from the NNE direction (Fig. 1c). Taking into account the scale, mechanics and kinematics of strains, these structures consitute the proglacial structural domain. The amplitudes of folds achieve on the average 20 metres, maximally 50 metres. The fold axes trend WNW-ESE and ENE-WSW (Fig. 1c). The overthrusts, having the character of macrostructures, achieve the vertical slips about 10–20 metres. They usually form the serial structures of imbrication fan type. The sole thrust is developed within upper part of the brown coal layer. The overthrusts as well as associated with them small faults and cleavage arrange in two systems which trend WNW-ESE and NE – SW (Fig. 1c), respectively. The structures of proglacial structural domain are overlied discordantly by the glacial tills T2 of Odranian age. These tills together with uppermost part of the glaciofluvial sands and gravels from anaglacial phase of the Odranian Glaciation make the subglacial structural domain. The meso- and microstructural studies indicate that these sediments were subjected mainly to (sub)horizontal simple shear induced by ice-sheet motion. On account of strains influenced by pore water migration, deformations observed in subglacial structural domain may have been probably of filter nature. Additionally, the glacial tills T2 were subjected to synsedimentary deformations under conditions of pore-water oversaturation and at porosity ca 40 %. The Riedel shears, observed in mezo- and microscale (deforming bands), are result of such deformations. The mutual intersection between Riedel shears was the basis for recognition of two sets of the B type lineation: WNW-ESE-trending L1 set and NE-SW-trending L2 set (Fig. 1c), respectively.

Summarising, deformation structures induced by the Odranian ice-sheet result from tectonic transport in two principal directions: towards SSW and ESE-SE. The first of them is consistent with orientation of the clast fabric within the glacial tills T2, ribs on the bottom surface of these tills and glacial channel axis of the Struga Kleczewska river. Moreover, the latter runs along NNE-SSW-trending bounding fault which encloses from E western and northern segment of the Kleczew Graben. This direction of tectonic transport may be considered to be glaciotectonic. The other direction of tectonic transport is more problematic. Such complex kinematics of glaciotectonic deformations within the Kleczew graben zone may be interpreted in two ways:

- as an effect of strain partitioning along the older Alpine structures within the Neogene sediments, reactivated glaciotectonicaly during the Odranian glacial period,
- as an effect of coexistence of glacitectonic and neotectonic agents in the same time. It is possible to identify the neotectonic agent with dextral movement of bounding fault enclosing from NNE the northern segment of the Kleczew Graben. Such kinematic pattern has analogy with transpression and related with it strain partitioning. In light of two tectonic transport directions within the Odranian glacial tills T2 induced by synsedimentary (sub)horizontal simple shear, the second interpretation seems to be more possible.

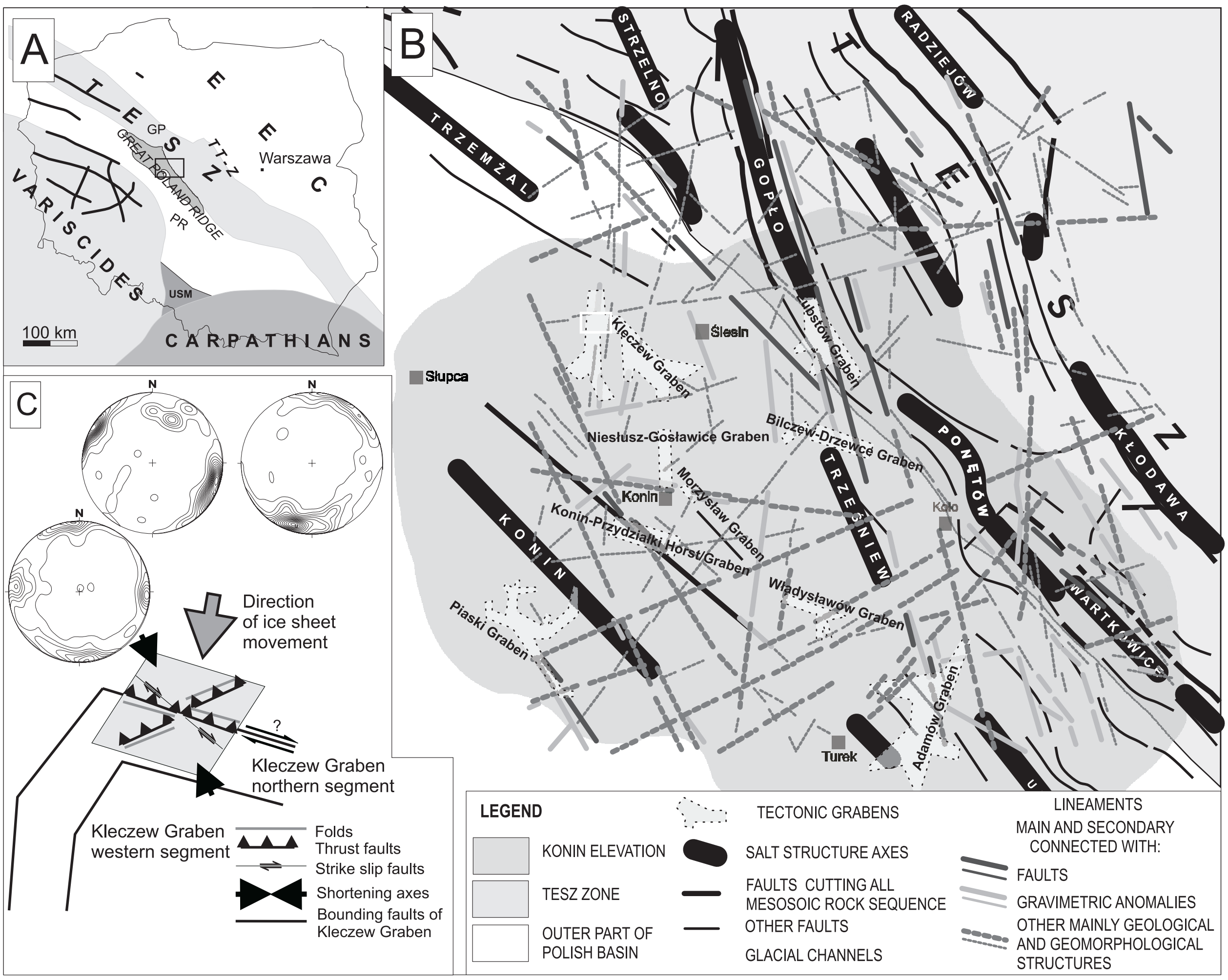

Fig. 1. A: Tectonic sketch of Poland (after Dadlez 1998, modified) showing the Konin Elevation area (black frame). B: Structural sketch of Konin Elevation, compiled after structural maps of Marek (1977), Graniczny (1991), Kasiński et. all (1997) and Widera (1998); white frame shows area of detailed structural and kinematic studies of glacialy induced deformations. C: Orientation of glacialy induced deformation structures (proglacial structural domain) in the vicinity of bounding fault enclosing from NNE the northern segment of the Kleczew Graben. The contour plots show distribution of B-type lineation within Odranian glacial tills T2 (subglacial structural domain).

Influence of Strain on the Chemical Composition of Low-Grade Metamorphic Sandstones: Example from Talass Alatau, Kyrgyzstan

Vyacheslav VOITENKO[1], Andrei KHUDOLEY[1] and Igor GERTNER[2]

[1] *St. Petersburg State University, Geological Department, University nab. 7/9, St. Petersburg, 199034, Russia*
[2] *Tomsk State University, Department of Geology and Geography, Lenin prospect 36, Tomsk, 634050, Russia*

26 oriented samples for strain analysis and chemical study were taken from an overturned regional-scale synclinal fold in low-grade metamorphic Neoproterozoic – early Paleozoic sandstones near the Central Talass Thrust that separates low-greenschist facies rock units from close in age non-metamorphosed succession (Khudoley, 1993). All samples were taken from the same bed and have very similar composition. Typical sandstone specimen is poorly sorted, fine- to medium-grained, matrix- to grain-supported and comprises 60-70% quartz, 10-15% feldspar, 10-15% lithic fragments with some mica and magnetite. Most of lithic fragments as well as matrix are replaced with chlorite and mica and their primary composition is often not identifiable. Evidences for pressure solution are widespread but are best expressed in hinge zone and overturned limb of the fold.