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The damages of Ksiaz Castle architecture in relation to new informations on the structure and indications of recent tectonic activity in Świebodzice Depression

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First informations about the aspects of recent tectonic activity in Książ area (Świebodzice Depression) come from indications of horizontal pendulums (HP), launched in 1974 in Książ. Over 40-years long series of observation have provided informations about the periods when it came to a sudden change of WP's measuring azimuths. This phenomenon has been interpreted as the result of tilting of rock blocks on which HPs are installed. Recent tectonic activity was confirmed by water-tube tiltmeters (WT) which have recorded episodically appeared events of tiltings of foundation and vertical movements. The consequences of strike-slip movements in Książ area are reflected both in the structure of the Świebodzice Basin (e.g. displacements of geological formations, deformations of the geometry of the Pełcznica River valley) as well as damages of architectural elements of the Książ Castle, where the underground Geodynamic Laboratory of Space Research Centre of Polish Academy of Sciences is located (GL SRC PAS).

Tectonic phenomena recorded by both types of tiltmeters (HP and WT) are observed in forms of tilting of foundation and vertical movements. The cause of these effects are horizontal strike-slip movements on the surface of discontinuities (faults) in the Książ massif. From the mechanical point of view faults are the nodes of distribution for these movements. Because of the faults orientation in relation to the main direction of tectonic displacement GL's measuring instruments show transformation of the horizontal component of the movement to vertical movements and tiltings of foundation.

Geological and geodetic works carried out in the Książ area allowed for identification and measurement of faults visible in underground corridors of GL. Analysis of the direction parameters of identified surface of discontinuities allowed to build a model of the structure of Książ massif. Created model contains 12 interpreted main zones of dislocation. Determined routes of fault zones correspond with the general direction of zones of discontinuity in Książ area based on analysis of geological data for the surroundings of Książ Castle.

Research lead to the conclusion that the manifestations of recent tectonic activity are part of the threat to the stability of the architectural elements of the Książ Castle, causing its numerous damages. Based on created model of the structure of castle's hill there were designated approximate routes of faults on the surface. These routes confirm that part of the interpreted major-active nowadays zones of discontinuity is located directly below the castle's architectural elements and corresponds with the observed damage zones. Taking into account the observed value of the vertical component of tectonic deformation during a single event ($\sim$1000 micrometers) likely mechanism explaining the formation of damages is the cumulative effect of vertical deformations formed in the subsequent tectonic events that after many epochs produce deformations of orogen sufficient to generate cracks and damages of architectural elements located in area of zones of discontinuity.