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Six-year cycles of the Earth rotation and gravity

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Recently long-periodical oscillations of the several Earth parameters with periods about six years are discovered. Six-year cycles of the pseudo-periodical oscillations are discovered in the series of the length of day (LOD) changes, the tidal measurements from superconducting gravimeter at observatory Brussels, Belgium and the variations of the vertical at observatory Plana, Bulgaria by filtration of all high-frequency signals, seasonal effects and Chandler oscillations. The LOD changes are obtained from C04 solution of the IERS. The tidal data from observatory Brussels cover 18 year for the period 1982-2000. The variations of the vertical at observatory Plana are obtained from astronomical latitude observations for the period 1987-2004. The amplitudes of the six-year oscillations are within 0.1-0.2 ms for the LOD series, about 50 nm/s**2 for the Brussels tidal series and about 10 mas for the series of the vertical changes at observatory Plana. The six-year oscillations of the Earth rotation and gravity are with close phases for all of the above series. So they are a manifestation of the system of the global oscillations of the planet Earth. In the case of even distribution of the gravity effects of the six-year oscillations of the Earth, the corresponding depth of the resulting central force of the disturbances (pendulum model) will be about 600 km.

These results are obtained in the frame of the following Joint research project between scientific institutions of the Academy of Sciences of the three European countries - Republic Bulgaria, Czech Republic, and Russia:

1. "Variations of some Earth parameters, determined by long series of astrometric observations", 2002-2004, between CLG of BAS and AI of ASCR,

2. "Variations of some Earth parameters determined by long series of astrometric observations and gravity measurements", 2005-2007, between CLG of BAS and AI of ASCR, renewal of the first project, and

3. "Investigation of the long-periodical oscillations of the Earth by astrometric and space observations and tidal measurements", 2005-2007, between CLG of BAS and PO of RAS.

The main goals of the projects are determination of the variations of some Earth parameters - the Chandler and annual component of the Earth rotation pole motion, oscillations of the vertical and the gravity in local and global scale, and study connection between variations of these parameters and some natural phenomena, such as earthquakes and solar activity.