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Dayside off-equatorial magnetic field minima as a trap for energetic ions

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The possibility of quasi-stable trapping of charged particles of hundreds *keV* to *MeV* energy on the dayside Earth magnetosphere is explored by numerical modeling of the single particle orbits in the Tsyganenko modeled geomagnetic field. Due to solar wind pressure the remote magnetic field lines on the frontside Earth's magnetosphere exhibit two minima in the magnetic field strength along the field line in high latitudes on the both sides of the equator. These minima may result in stable confinement structures, a kind of radiation belts, in the northern or/and the southern hemispheres, providing energetic particle trapping for times from several minutes to seasonal scale. Simulation of energetic proton orbits passing through the regions of the magnetic field minima with different Earth's tilt and for different geomagnetic disturbance level reveals conditions in which these trapping zones could appear. The zones are essentially restricted to the sunlit magnetosphere and its existence strongly depends on the seasonal inclination of the Earth's rotation axis: the northern cusp confinement zone appears only in a summer solstice and similarly the southern cusp capture zone appears only in a winter solstice. In equinox time the confinement zones exist in both hemispheres in the disturbed magnetospheric conditions, however, they are less pronounced. The zones have a form of funnel where energetic particle create a kind of cusp radiation belt. Protons drift within this belt with a period of several minutes, conserving its 1^{st} and the 2^{nd} adiabatic invariants. The latitudinal width of the belt is very thin, about 2-5 latitudinal degrees. The proton orbits passing through the off-equatorial field minimum opposite to those cusp belts reveal one more effect: a bound of the geomagnetic equatorial plane on the day sector. This and other features of the confinement zones in the off-equatorial magnetic field minima are discussed.