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# Mechanism of activization of processes at polar regions of the planets and satellites

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One of the fundamental conclusions obtained on the basis of geodynamic model about forced relative displacements of the core and elastic mantle under of gravitational attraction of external celestial bodies is the conclusion about polar drift of the Earth core to the North Pole [1], [2]. This phenomenon has obtained wide confirmations in the data of observations of geocenter motion, in gravimetry measurements, in geodesy determinations of heights variations and in geoid shape variations, in many geophysical and geodynamical phenomena. It has formed a basis for other assumption - about the existence of a forced slow secular redistribution of air (and, in general, oceanic and fluid) masses from southern hemisphere in northern hemisphere of the Earth. This phenomenon is analogue of observable annual redistribution of atmospheric masses between northern and southern hemispheres (the change about 4.5 $\cdot 10^{15}$ kg). The significant contribution in which also brings the mechanism of gravitational influence on the atmosphere of superfluous mass of the core executing annual polar oscillation with amplitude about 30 mm. The maximal displacement of the core to the North takes place in the beginning of year (February-March).

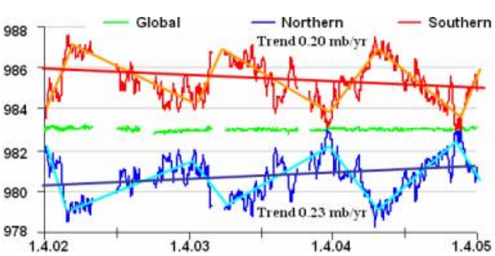


Fig. 1. Phenomenon of inversion of periodic variations of mean atmospheric pressure of dry atmosphere in southern hemisphere (red curve) and in the northern hemisphere (blue curve) in period 1.4. 2002-1.4. 2005 (Burluzskii, 2005). The secular redistribution of dry atmosphere from southern hemisphere (red straight line) to the northern hemisphere (blue straight line) in same period.

As the secular drift of the core takes place (in the direction to North Pole) on a background of described above of annual inversion change of masses between N/S hemispheres of the Earth the slow monotonous tide of atmospheric masses in northern hemisphere should be observed. From comparison of amplitude of annual oscillation of the core and velocity of its secular drift in present period (about 5-6 mm/yr) we obtain an preliminary estimation for velocity of "secular" increasing of atmospheric mass in the northern hemisphere (0.4 - 0.5) $\cdot 10^{15}$ kg/yr.

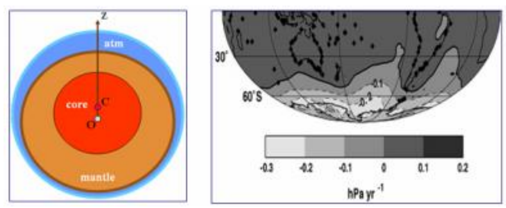


Fig. 2. (Left) The schematically illustration of redistribution of air (fluid) masses from southern hemisphere in northern hemisphere because of gravitational influence of the Earth core is displaced to the North. (Right) Observed trends in the NCEP atmospheric pressure over the period Jan 1950 – Dec 2000. The atmospheric presures for each month are relative to the global ocean integral of the atmospheric pressure for that month. The locations of the tide gauges are also shown. The thick line is the 0 contour, the negative contours are dashed, and the contour interval is 0.1 hPa/yr. (Crush et al., 2005).

As consequence of this fundamental process, the polar moment of inertia of atmosphere of northern hemisphere will be decreased and angular velocity of rotation of this part of atmosphere relatively to

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the Earth surface (as a similar rigid body) in eastern direction increases in present epoch. As a result we in reality observe an increasing of activity of atmosphere processes, number of huriccanes, cyclones and oth. in N hemisphere. In the southern hemisphere the opposite tendencies take place. In opposite southern hemisphere the polar moment of inertia of attmosphere masses will increase and velocity of superrotation of this part of atmosphere will decrease. The similar inversion of relative "twisting" of atmospheres of N/S hemispheres is made also cyclically, for example, with annual or other periods. According to our dynamic constructions in the beginning of year the angular velocity of rotation of atmosphere of northern hemisphere in the eastern direction have the maximal values, and atmosphere of the southern hemisphere - in same direction have the minimal values. Approximately in half-year the situation varies on opposite. These conclusions also prove to be true by the data of modern observations. The similar phenomena in reality are observed in atmospheres of others planets, some satellites and the Sun. Observations with two NASA telescopes show that Jupiter has an arctic polar vortex similar to a vortex over Earth's Antarctica that enables depletion of Earth's stratospheric ozone. On NASA photos on Fig. 3 (1-8) temperature anomalies in the appropriate polar areas on planets and satellites which origin we connect to action of the mechanism of forced relative polar displacement of shells of these celestial bodies are illustrated. This mechanism makes active processes of decontamination in corresponding polar regions of celestial bodies (for example geysers on Enceladus, and active zones of decontamination in the Earth southern hemisphere and oth.). (1, 2) Temperature regime of Enceladus is demonstrated on Fig. 3 (1, 2). Hot region at South pole of this satellite has general nature with high activity of its hysers. (3, 4) Neptune's south pole is "hotter" than anywhere else on the planet by about 10 degrees Celsius (50 degrees Fahrenheit). The average temperature on Neptune is about minus 200 degrees Celsius. The quasi-hexagonal structure at North Pole of Jupiter rotates slowly eastward at 1.2 degrees of longitude per day (5, 6). The images (7, 8) shows the unexpected "hot spot" at Saturn's North Pole. It was shown that the North Pole, despite being in winter darkness for more than a decade, is home to a hot, cyclonic vortex very similar to that found on Saturn's much sunnier south pole. The Cassini data confirm a region of warm atmospheric descent into the eye of a hurricane-like storm locked to Saturn's South Pole (7, 8). Here a swirling cloud mass centered on the south pole, around which winds blow at 550 kilometers per hour.

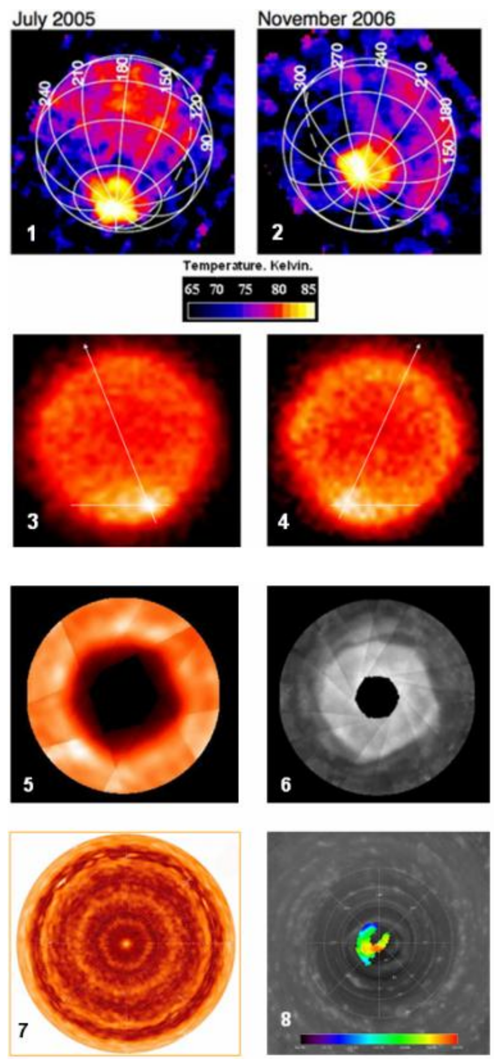


Fig. 3: (1, 2) Enceladus hot southern pole; (3, 4) Neptune's hot South Pole; (5,6) cold hole over Jupiter's Pole (PIA03864); (7, 8) active Saturn's northern pole.

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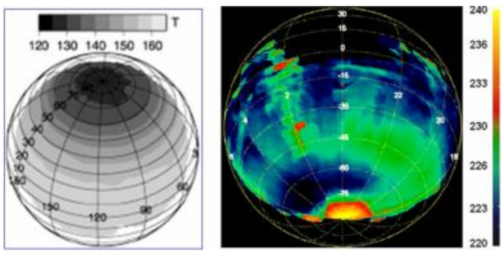


Fig. 4. (Left) Map of temperature for Titan (at 3 mbar) and composition obtained using evenly spaced sub-divided icosahedra bins for the T23 flyby. Temperatures are colder towards the north pole, whereas abundances of trace species increase due to subsidence. The variations are dominated by a zonally symmetric structure, which validates the use of simple latitude bins (Teanby et al., 2008). (Right) The temperature of an atmosphere of Venus in area of South Pole approximately on 10 degrees is higher than average (at a level of pressure of 90 mb) (Migliorini, et al., 2009).

The phenomenal laboratory for demonstration of similar atmospheric processes in own N/S hemispheres is the Sun. On the Sun we observe inversion processes in activity N/S hemispheres, in their rotation and others. The Sun north polar region was cooler than average on 19 K and south polar region was hotter on 19 K than average (Wittmann, 1978). The big variety of objects confidently rather allows us to speak about universality of the mechanism managing polar areas of atmospheres of celestial bodies. On this role I suggest the mechanism of the forced relative translational oscillations of the shells of these bodies [1], [2]. Certainly, the similar processes everyone will be discovered again not only in atmospheres, but also in oceanic shells, in redistribution of all fluid masses and in tectonic structures of polar regions of celestial bodies. The mentioned mechanism has universal nature and actively works on all celestial bodies, including planets and satellites in exoplanet systems, on the stars multiple or with planet systems.

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