ON RANDOM EXCITATION AND DAMPING OF THE POLAR MOTION

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The paper deals with the behavior of the Earth's pole when exclusively random excitations are at work (e.g. internal displacements of matter, treated as a process of stochastic character). The title of the paper is similar to that of a paper of N. Sekiguchi whose probabilistic final deductions are very ingenious. However they have been applied to a wrong solution of the basic differential equation system. The correct solution is more complicated and does not afford such an advantageous practical possibility of applying the probabilistic treatment with success.

In this paper all the assumptions of Sekiguchi are preserved:

1. excitation functions X(t), Y(t) are Heaviside step functions;
2. probability distribution of excitation poles (X_i, Y_i) is of the "pan cake" type;
3. excitations occur at epochs t_i separated by equal intervals Δt_i = const. = Δt, i = 1, 2, 3, ...

The correct solution of the Liouville system with damping terms is found. After a thorough discussion the author contrived to find an analytical form of the "probability function" Π expressing the probability of increase of the radius vector r_i of the rotation pole during the interval Δt_i. Π turned out to be a function of r_i itself and of constant parameters: κ, k, Δt, C. $\Pi(r)$ is a monotonic function, decreasing from 1, at r = 0, to zero at a finite value of r. Thus there does exist a finite value r_o such that $\Pi(r_o) = 1/2$. The main conclusion is:

> The value r_o equals the radius of the circle of statistical equilibrium for the pole of rotation, with the center at the mean pole of figure.

Hence, if r_o can be deduced from observation, as a mean value of the Chandlerian amplitude, the equation $\Pi(r_o, \kappa, k, \Delta t, C) = 1/2$ offers a relation linking the constants: κ (damping coefficient), k (radius of the "excitation circle"), Δt (mean interval between excitations), and C (the Chandler frequency).

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