Abstract

A geomagnetic nonlinear dynamic system (GNLDS) was proposed in the literature. It was shown that GNLDS is chaotically produced by reverse- intermittency. Many works were carried out and revealed different chaotic trends. In the area of studying chaotic systems, all the works were carried out via numerical techniques. Our objective, here, is to propose an iteration scheme for approximate analytical solutions to the GNLDS. The convergence theorem is established and proved. The solutions obtained are evaluated numerically by considering the dimension of the parameters space is infinite, bearing in mind that an infinite linear dynamical system is chaotic. The three and two-dimensional (3D) and (2D) phase portraits are displayed. The 3D portrait shows spiral chaos, while the 2D portrait shows swing chaos, which exhibits limit cycle solutions. The Global bifurcation is demonstrated by representing the components of GNLDS against the relevant parameters. It is also tested against sensitive dependence on the initial conditions. Furthermore, the extended center manifold is constructed.