Intermittent chaos in Hamiltonian dynamical systems

S. A. Chygryn, *postgraduate student*

The statistical characterization of chaotic trajectories in Hamiltonian dynamical systems attract special interest. Such systems usually show coexistence of regions of chaotic and regular motion in the phase space. When chaotic trajectories approach the regular regions, they stick to their border inducing long periods of almost regular motion. This intermittent behavior determines the main dynamical properties of the system. The fundamental problem is how to quantitatively relate the intermittency of the chaotic dynamics to the distribution and stability properties of the regular regions of the phase space.

There are good reasons to ask about the relevance of studying classical Hamiltonian systems. From a dynamical-systems perspective Hamiltonian systems are very particular. From the perspective of physical models Hamiltonian systems are also exceptional. The reason is that natural systems are never completely isolated and/or include inherent sources of dissipation/creation of energy. Considering additionally that the dynamics in Hamiltonian systems is fundamentally different from the one in dissipative systems, one sees that a justification in general terms for a theoretical study in this field is necessary.

From the previous considerations it should be no surprise that important questions of physics rely on properties of Hamiltonian dynamics. The most prominent ones are those related to the foundations of statistical mechanics. Other important basic issues which are presently under investigation refer to wave and quantum mechanical systems that are classically chaotic. In such cases semi-classical methods based on the classical properties of Hamiltonian systems have shown to be extremely powerful.

Altogether, the different results lead to a new unified interpretation of the chaotic dynamics in Hamiltonian systems and raise the phenomenon of stickiness to a fundamental status.

A. M. Diadechko, *ELA*

Соціально-гуманітарні аспекти розвитку сучасного суспільства : матеріали Всеукраїнської наукової конференції викладачів, аспірантів, співробітників та студентів, м. Суми, 21-22 квітня 2014 р. / Відп. за вип. О.М. Сушкова. — Суми : СумДУ, 2014. — С. 440.