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NO-LINEAR DYNAMICS AND PHASE TRANSITIONS IN THE POPULATION OF COSMIC
 CIVILIZATIONS

Abstract

One of the main assumption of the Drake equation is a supposition that the mean duration of communication phase (life time) of cosmic civilizations L is a kind of constant of nature and, particularly, does not depend on the total number of civilizations in the Galaxy and the prehistory of the population of the civilizations. We consider a model of communication between civilizations by information bearer channels in which L is not a constant. Quite general supposition is that there are three main kinds of civilizations in the relation to communications between them that we call 1) unsociable, 2) neutral, 3) sociable. Communications are harmful for unsociable civilizations in a sense that they shrink their expected communication life time L ; for neutral civilizations L is not changed; communications are useful for sociable civilizations in a sense that L increases. With a simple mathematical model of contacts in a large homogeneous galaxy we show, that the subpopulation of sociable civilizations (if not empty) can demonstrate interesting no-linear dynamics in the time. There are two quite different quasi steady states of the sociable subpopulation with low and high mean number of contact partners per civilization and mean number of civilizations per unit volume. These states are called 'silence phase' and 'saturation of contacts phase' respectively. Phase transitions between these two phases and a phenomenon of bistability in the population of cosmic civilizations are described and studied. The subpopulation of sociable civilizations of the Galaxy in the phase of saturation of contacts may support a self-developing overcivilization system called galaxy cultural field. Possible features of such system are discussed. It is shown that existing of such cultural field in our Galaxy does not contradict the observed phenomenon of silence of the Universe (Fermi paradox, astrosociological paradox). The perspectives of observing of the galaxy cultural field are discussed.