



On deterministic nature of intermittent geodesic acoustic mode observed in tokamaks

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Through a carefully designed numerical experiment, we demonstrate that a transition between two distinct phases of energy concentration in a zonal flow-drift wave system (caviton and instanton) may play a key role in the intermittent excitation of geodesic acoustic mode (GAM) that are observed in tokamaks. The two energy structures - the caviton, a slowly breathing spatial local structure of 'negative' energy, and the instanton, a fine radial structure of short lifetime in rapid propagation, were recently identified in [Zhang Y. Z., Liu Z. Y., Xie T., Mahajan S. M., and Liu J. 2017 *Physics of Plasmas* **24**, 122304] (now extended to include GAM in this paper). The transition (decay) from the former to the latter is triggered by a rapid zero-crossing of radial group velocity of drift wave and is found to be strongly correlated with the GAM onset. Many features peculiar to intermittent GAMs, observed in real machines, are identified in the numerical experiment; the results will be displayed in figures and in a movie.