

MATHEMATICS DEPARTMENT
North Carolina State University

DIFFERENTIAL EQUATIONS SEMINAR

Wednesday, December 4, 2002
2:35 p.m. 330 Harrelson Hall

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“Ergodic theory of systems with symmetry”

In the last few years there has been substantial progress in understanding the ergodic and mixing properties of Lie group extensions of dynamical systems. A group extension of a base dynamical system is a dynamical system whose phase space is $X \times G$, where X is a manifold and G is a Lie group, such that the base dynamics on X decouples from and forces the dynamics on $X \times G$. Such models occur frequently in applications because the equations modelling a system often commute with a group action on phase space. For example the partial differential equations modelling the dynamics of spiral waves in reactive media such as cardiac tissue and Belousov-Zhabotinsky chemical reactions have noncompact (Euclidean group) symmetry. The models adopted to study these systems are Euclidean group extensions of certain base dynamical systems.

We present results on the topological and statistical properties of Lie group extensions of periodic, quasiperiodic and chaotic base dynamics. The techniques used are a mixture of ergodic theory, analysis and Lie group theory. We will also detail applications of these results to the study of spiral waves in reactive media and the statistical behaviour of random compositions of Euclidean isometries.

Graduate students are invited to attend.