Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

A dynamical systems approach to modeling the rapid pressure strain correlation ANANDA MISHRA, SHARATH GIRIMAJI, Texas A&M University — Models for the rapid pressure strain correlation, under the auspices of the classical Reynolds stress closure schemes, represent dynamical systems in the state space composed of the Reynolds stress tensor components. For 2 dimensional mean flows, these are single parameter systems, dependent on the mean flow gradient. A classification of the topology and behavior of the same would provide invaluable guidelines for developing improved models. In line with the maxim of understanding before prediction, the authors aim to classify the dynamical behavior of this hypothetical system. With the objective of isolating the effects of pressure strain correlation, the behavior of the Navier Stokes equations is contrasted against its pressure released analogue, the Burgers equations, in the rapid distortion limit. The authors carry out numerical simulations, in addition to the analytical modeling, for both the systems. The corresponding invariant set topologies are classified and a concomitant bifurcation analysis is conducted. Some salient issues addressed in this study include the requisite nature of the model, viz. a linear or nonlinear structure; and the inability of models to capture elliptic flows.

Sharath Girimaji
Texas A&M University

Date submitted: 02 Aug 2008 Electronic form version 1.4