1125-37-2000 **Matthew A Morena*** (mamorena@yhc.edu) and **Kevin M Short**. *Fundamental Cupolets of Chaotic Systems.*

Cupolets represent highly accurate approximations to the unstable periodic orbits of chaotic systems and large numbers can be efficiently generated via a particular control method. Cupolets exhibit the interesting property that a given set of controls will uniquely identify a cupolet regardless of the initial state of the parent chaotic system. Recently, we demonstrated that this property allows for controlled transitions between nearly any two cupolets. Now, we discuss how this result can be used to classify cupolets according to their reducibility: a cupolet is classified as fundamental if its orbit cannot be decomposed into the orbits of simpler cupolets and is called composite when a decomposition is possible. Our work introduces a new way to generate higher order cupolets simply by amalgamating fundamental cupolets via sequences of controlled transitions. This allows for large collections of cupolets to be collapsed onto smaller subsets of fundamental cupolets without losing any dynamical information. We also discuss the potential for analyzing a chaotic system through its set of cupolets according to the framework that has been established through unstable periodic orbits. (Received September 19, 2016)