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Mark Colarusso* (colamark@isu.edu), Department of Mathematics, Physical Sciences 318,
P.O. Box 8085, Idaho State University, Pocatello, ID 83209, and **Sam Evens**. *K-orbits on the flag
variety and the geometry of Gelfand-Zeitlin fibers.*

In two 2006 papers, Kostant and Wallach constructed a complexified Gelfand-Zeitlin integrable system for the Lie algebra $\mathfrak{gl}(n, \mathbb{C})$. In this talk, we discuss joint work with Sam Evens in which we use the theory of $K = GL(n - 1, \mathbb{C}) \times GL(1, \mathbb{C})$ -orbits on the flag variety of $\mathfrak{gl}(n, \mathbb{C})$ to study the Gelfand-Zeitlin system. In particular, we show that the irreducible components of the regular nilfiber of the moment map of the system correspond to certain Borel subalgebras constructed using the K -orbits related to the holomorphic and anti-holomorphic discrete series representations for the real group $U(n - 1, 1)$. We also describe our current work in using K -orbits and the Grothendieck resolution to study arbitrary Lagrangian moment map fibers. Along these lines, we prove that every Borel subalgebra contains points where the Gelfand-Zeitlin flow is Lagrangian and develop a condition that relates the length of a K -orbit through a Borel subalgebra containing elements of a given regular fiber to spectral data of elements in the fiber. (Received August 28, 2011)