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**Megumi Harada\*** (Megumi.Harada@math.mcmaster.ca), Department of Mathematics and Statistics, 1280 Main Street West, McMaster University, Hamilton, Ontario L8S4K1, Canada, and **Graeme Wilkin**. *Hyperkahler Kirwan surjectivity for quiver varieties: Morse theory and examples*. Preliminary report.

This is a preliminary report on work in progress with Graeme Wilkin.

Let  $G$  be a compact Lie group. The well-known Kirwan surjectivity theorem in equivariant symplectic geometry states that the  $G$ -equivariant rational cohomology of a Hamiltonian  $G$ -space  $(M, \omega)$  surjects onto the ordinary rational cohomology of the symplectic quotient of  $M$  by  $G$ . This surjective ring homomorphism (“the Kirwan map”) has been a key tool in computations of the topology of symplectic quotients.

I will discuss our recent progress on the analogous hyperkähler question, namely: if  $(M, \omega_1, \omega_2, \omega_3)$  is a hyperkähler hyperhamiltonian  $G$ -space, then does the  $G$ -equivariant cohomology of  $M$  surject onto the ordinary rational cohomology of the hyperkähler quotient of  $M$  by  $G$ ? We restrict to the case of Nakajima quiver varieties and develop a Morse theory for the hyperkähler moment map analogous to the case of the moduli space of Higgs bundles. I will explain how, using this Morse theory, we can conjecturally derive new formulae for the Poincaré polynomials of specific examples of small-rank quiver varieties, including hyperpolygon spaces and some ADHM quivers. (Received January 12, 2008)