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Dueling Dynamical Backaction in a Cryogenic Optomechanical Cavity[1] BRADLEY D HAUER, THOMAS J CLARK, PAUL H KIM, CALLUM DOOLIN, JOHN P DAVIS, University of Alberta — Dynamical backaction has proven to be a versatile tool in cavity optomechanics, allowing for precise manipulation of a mechanical resonator's motion using confined optical photons. In my talk, I will present measurements of a silicon whispering-gallery-mode optomechanical cavity where backaction originates from opposing radiation-pressure and photothermal forces, with the former dictating the optomechanical spring effect and the latter governing the optomechanical damping. At high enough optical input powers, we show that the photothermal force drives the mechanical resonator into self-oscillations for a pump beam detuned to the low frequency (red) side of the optical resonance, contrary to what one would expect for a conventional radiation-pressure-dominated optomechanical device. Using a fully nonlinear model, we fit the hysteretic response of the optomechanical cavity to extract its properties, demonstrating that this non-sideband-resolved device exists in a regime where photothermal damping could be used to cool its motion to the quantum ground state.

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