

Abstract Submitted  
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**Nonequilibrium life-cycles in Ocean Heat Content**<sup>1</sup> JEFFREY B. WEISS, Department of Atmospheric and Oceanic Sciences, University of Colorado, Boulder, BAYLOR FOX-KEMPER, Department of Geological Sciences, Brown University, Providence, DIBYENDU MANDAL, Department of Atmospheric and Oceanic Sciences, University of Colorado, Boulder, ROYCE K.P. ZIA, Department of Physics and Astronomy, Iowa State University, Ames and Department of Physics, Virginia Tech, Blacksburg — Natural climate variability can be considered as fluctuations in a nonequilibrium steady state. A fundamental property of nonequilibrium steady states is the phase space current which provides a preferred direction for fluctuations, and is manifested as preferred life-cycles for climate fluctuations. We propose a new quantity, the phase space angular momentum, to quantify the phase space rotation. In analogy with traditional angular momentum, which quantifies the rotation of mass in physical space, the phase space angular momentum quantifies the rotation of probability in phase space. It has the additional advantage that it is straightforward to calculate from a time series. We investigate the phase space angular momentum for fluctuations in ocean heat content in both observations and ocean general circulation models.

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