

Abstract Submitted  
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**Emergence of Onsager vortices via evaporative heating mechanism in two-dimensional superfluid turbulence**<sup>1</sup> TAPIO SIMULA, Monash University, MATTHEW DAVIS, University of Queensland, KRISTIAN HELMERSON, Monash University — We have studied computationally turbulent non-equilibrium dynamics of quasi-two-dimensional superfluid Bose-Einstein condensates. Beginning with a random out-of-equilibrium distribution of vortices and antivortices in the condensate, we have observed emergence of ordered vortex structures corresponding to absolute negative temperature states in this conservative Hamiltonian system. We explain the spontaneous self-organization of the singly quantized vortices into two “Onsager vortex” clusters of like-signed vortices in terms of an “evaporative heating” mechanism of the vortex gas. These results provide a clear pathway to observing Onsager vortex structures and their unusual thermodynamics in a superfluid Bose gas.

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