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Fire Whirls, Vortex Breakdown(?), and Blue Whirls[1] ELAINE ORAN, HUAHUA XIAO, MICHAEL GOLLNER, University of Maryland — As we were investigating the efficiency of fire-whirl burning on water, we observed the usual transformation of a pool fire to a fire whirl, and then suddenly, we saw the fire undergo a third transition. A blue cup appeared around the base of the fire whirl, surrounding the yellow flame, the yellow flame receded into the cup and finally disappeared. What remained was a small, rapidly spinning blue flame that burned until the fuel on the water was consumed. The blue whirl was shaped like a spinning cup, closed at the bottom near the water surface, and spreading in radius moving upwards towards the rim. Above the blue cup lip, there was a purple cone-shaped mist. The fuel was usually n-heptane, but at one point it was crude oil, and still the blue whirl formed naturally. The height of the fire whirl on the laboratory pan was larger than a half meter, and this evolved into a blue whirl about 48 cm high. Occasionally the blue whirl would become "unstable and revert to a transitional state of blue cup holding a yellow flame. When the blue whirl formed, turbulence seemed to disappear, and the flame became quiet. We will show videos of how this happened and discuss the evolution of the fire whirl to the blue whirl in vortex-breakdown concepts.

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Elaine Oran
University of Maryland

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