Imploding Water Wave: a Poppy Blossom

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Implosion of surface waves is ubiquitous in nature, and provides an important analogy for many physical phenomena. For example, when a heavy solid object (such as a meteoroid) impacts a fluid surface (such as the planet's ocean), a crater is created and subsequently begins to pinch radially inward, resulting in the formation of a vertical water jet.[1] In the shallow water limit, surface wave implosion also has an analogue in nuclear energy fusion, where gasdynamic shock waves are imploded to generate dense plasmas of extremely high temperature at the center.[2] In this study, the dynamics of an imploding circular water wave are simulated experimentally using a simple gate-type water table (90 x 105 x 20 cm) and high-speed video imaging.[3, 4] A circular, converging water wave is created by rapidly retracting a gate separating a region of high water level from a region with lower water level. Four cylindrical obstacles are placed in the path of the collapsing wave to test the stability of the imploding wave.

Figure 1 shows a sample snapshot of this implosion process just before the wave breaks at the center, visualized from the bottom of the water table. For a better quality of representation, the raw image is enhanced by the *ImageJ* software.[5] From the picture, the center of convergence of the water wave coincides with the center of symmetry of the implosion. The transient, inward-sweeping turbulent flow created by the retracting gate, as well as the outward-sweeping trajectory of the disturbances on the water wave caused by the four cylindrical obstacles, can be seen and traced. A sequence of images of this implosion process until the water wave breaks at the center, visualized from the bottom of the water table, is also given in Fig. 2.

Artistically, the implosion core resembles the shape of a remembrance poppy. In Canada, as in many other countries, the red poppy flower is the symbol of remembrance worn on the left lapel during the two weeks before the Remembrance Day on November 11 to commemorate members of the armed forces who died during war in the service of their country.[6]

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Figure Caption

FIG. 1. Snapshot of an imploding circular water wave with four cylindrical obstacles in its path.

FIG. 2. A sequence of images showing the implosion of the surface water wave.