fluted films

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Falling water takes on a shape similar to a fluted glass in the image on the left. When a mass of water held in a 50 mm polycarbonate tube is suddenly released, the acceleration of the fluid is opposed by shear stresses at the wall. The largest portion of the water mass exits the tube in the first of seven high-speed images shown below (25 ms between each). The no-slip condition forms a Poiseuille-like flow, exhibited by the concave shape of the trailing free-surface. As a result of the velocity profile, a thin tubular film connects the water mass to the tube exit (images 1-4). Surface tension and a pressure differential from internal air flow force the tubular film to collapse radially inward, zipping the film into a thin water column downstream (images 5-7). Meanwhile, the top of the tubular bubble thins, ruptures and detaches from the tube beginning in the fifth image. An upside down "water bell" forms a structure reminiscent of a champagne flute when the film fully detaches from the tube. The accumulation of water at the retreating film's border decorates the rim of the glass with satellite droplets, resembling a champagne splash from a joyful clink.

Cheers!