**Cavitation by low-speed water impact**

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**Abstract**

When a solid object impacts the surface of a liquid, extremely high pressure develops at the site of contact. Von Karman’s study of this classical physics problem showed that the pressure on the bottom surface of the impacting body approaches infinity for flat impacts. Yet, in contrast to the high pressures found from experience and in previous studies, we show that a flat-bottomed cylinder impacting a pool of liquid can decrease the local pressure sufficiently to cavitate the liquid. Cavitation occurs because the liquid is slightly compressible and impact creates large pressure waves that reflect from the free surface to form negative pressure regions. We find that an impact velocity as low as ~3 m/s suffices to cavitate the liquid and propose a new cavitation number to predict cavitation onset in low-speed solid-liquid impact scenarios. These findings imply that localized cavitation could occur in impacts such as boat slamming, cliff jumping, and ocean landing of spacecraft.