

Colloquium

Modeling, Computation and Simulation for the Submarine Implosion Problem

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摘 要：

In this talk, we will first describe the interesting and important phenomenon of implosion. The examples and videos from material science, civil engineering, and astronomy will be given. Then we show the bifurcation patterns and then how to use the powerful software LS-DYNA to model the implosion phenomenon. We show how the submarine is crushed by the water pressure in deep ocean. We will use the incident of the Argentinian Submarine ARA San Juan (S-42) as a case study. This submarine was a TR-1700-class diesel-electric submarine in service with the Submarine Force of the Argentine Navy from 1986 to 2017. It was built in West Germany and entered service on 19 November 1985. But on 15 November 2017, San Juan went missing during a routine patrol in the South Atlantic off the coast of Argentina, believed to have suffered an electrical malfunction. It was recently discovered in November 2018 that the submarine has imploded and its wreckage is located in a depth of 907 meter in the Atlantic Ocean.

Our work is capable of capturing certain important patterns of implosion by comparisons with benchmarks. The work is currently ongoing. This work should help the design of submersibles working in deep ocean and improve their crashworthiness and survivability of the craft.

