A NON-LINEAR MODEL FOR LOW VELOCITY UNDERWATER EXPLOSIONS

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The theory and computed results of an explosion model based upon a perturbation technique are presented. The perturbation parameter was selected to be the ratio of the initial particle velocity to the liquid sound speed. The explosion model is studied in conjunction with the air-gun source of seismic marine exploration. The distinction between this model and past models is the preservation of wave propagation interior to the sphere. Although the effects of these interior waves seem to be negligible for explosion sources with high initial velocities, their interaction with the gas-liquid boundary seem to significantly affect the expansion of bubbles from the low velocity air-gun source. The theory indicates that during bubble growth the bubble surface expands toward its equilibrium radius while oscillating about intermediate points during the whole course of its motion. Although direct and clear observational data seem to be lacking, the data which are available lend support to this idea.