The 8th European Congress on Computational Methods in Applied Sciences and Engineering
ECCOMAS Congress 2022
5 – 9 June 2022, Oslo, Norway

APPLICATION OF INTERFACE CAPTURING SCHEMES ON MULTIPHASE/MULTICOMPONENT COMPRESSIBLE FLOW OF UNDERWATER EXPLOSION

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Key Words: *Underwater explosion, Cavitation, CWENO Diffuse-interface method.*

We present in this work a finite-volume central-weighted essentially non-oscillatory (CWENO) reconstruction scheme on an unstructured grid, to solve the five-equation interface-capturing models for interfacial compressible multicomponent/multiphase flows problems of underwater explosions near structures or a free surface. A robust non-oscillatory numerical framework is needed due to the presence of strong gradients of the flow variables found in underwater explosion. The hull/bulk cavitation in an underwater explosion unlike attached or incipient cavitation is very fast, unsteady and evolves into various dimensions before collapsing violently due to the surge in pressure. Although shock loading is often regarded as the primary source of structural loading, studies have shown that hull/bulk cavitation collapse reloading also has a comparable damaging effect on the structure as that of the shock loading. Using the five equation diffuse interface models of Allaire's et al. **[1]**and that of Kapila's et al. **[2]**five-equation in the high-order finite-volume method based on the CWENO scheme implemented in the open source UCSN3D CFD code **[3]**, we will investigate the effect of cavitation as a source of secondary reloading to nearby objects during underwater explosions and quantitatively compared our results of the pressure impact with existing numerical and experimental results for validation. To also demonstrate the capabilities and advantages of the CWENO in capturing and resolving the material interface between the two-phase medium of the underwater explosion, several numerical results from our study would be compared with existing high order methods where "anti-diffusion" or "artificial compression" or interface sharpening are being introduced into the models to reduce numerical smearing at the interface. Schlieren visualizations will be used to quantitatively show how the CWENO captures the material interface of the two-phase medium in the underwater explosion and it's perfomance against existing numerical results available in the literature. An effort will also be made to make a perfomance comparison between five-equations interface-capturing models of Kapila's et al. **[1]**and that of Allaire's et al **[2]**on several test cases.

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