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Computational and experimental studies of shock waves reflection over concave double wedges reflectors

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The study aims at understanding the phenomenon of shock reflection over different geometries of concave surfaces. The double concave wedge is generated computationally by changing different geometrical parameters like radius and initial wedge angle of the two concave surfaces. The study focuses on the effects of the change of the geometry of the concave surfaces and the incident shock wave Mach numbers on the overall behavior of shock wave reflections. The simulations are done for four different incident shock wave Mach numbers. The investigation of the effect of different geometrical and flow parameters reveals a number of interesting wave features starting from the early stage of the shock interaction and transition from Mach reflection (MR) to transitioned regular reflection (TRR) over the first concave surface followed by complex shock reflections over the second concave surface. Two new behaviors of the shock reflections are found over the second concave surface, which appear to depend on the initial wedge angle of the concave surfaces. In the first behavior, an additional shock wave appeared when the TRR over the first concave surface meets the incident shock wave on the second concave surface and eventually merges with the reflected wave as shown in figure 1(a). In the second behavior, the additional shock wave falls behind the incident shock wave and penetrates the reflected wave over the second concave surface as shown in figure 1(b). Also, it was found that the difference between the transition wedge angles over the two concave surfaces increased as the incident shock wave Mach number increased. These findings indicate that the shock wave does have a characteristic to retain its memory.

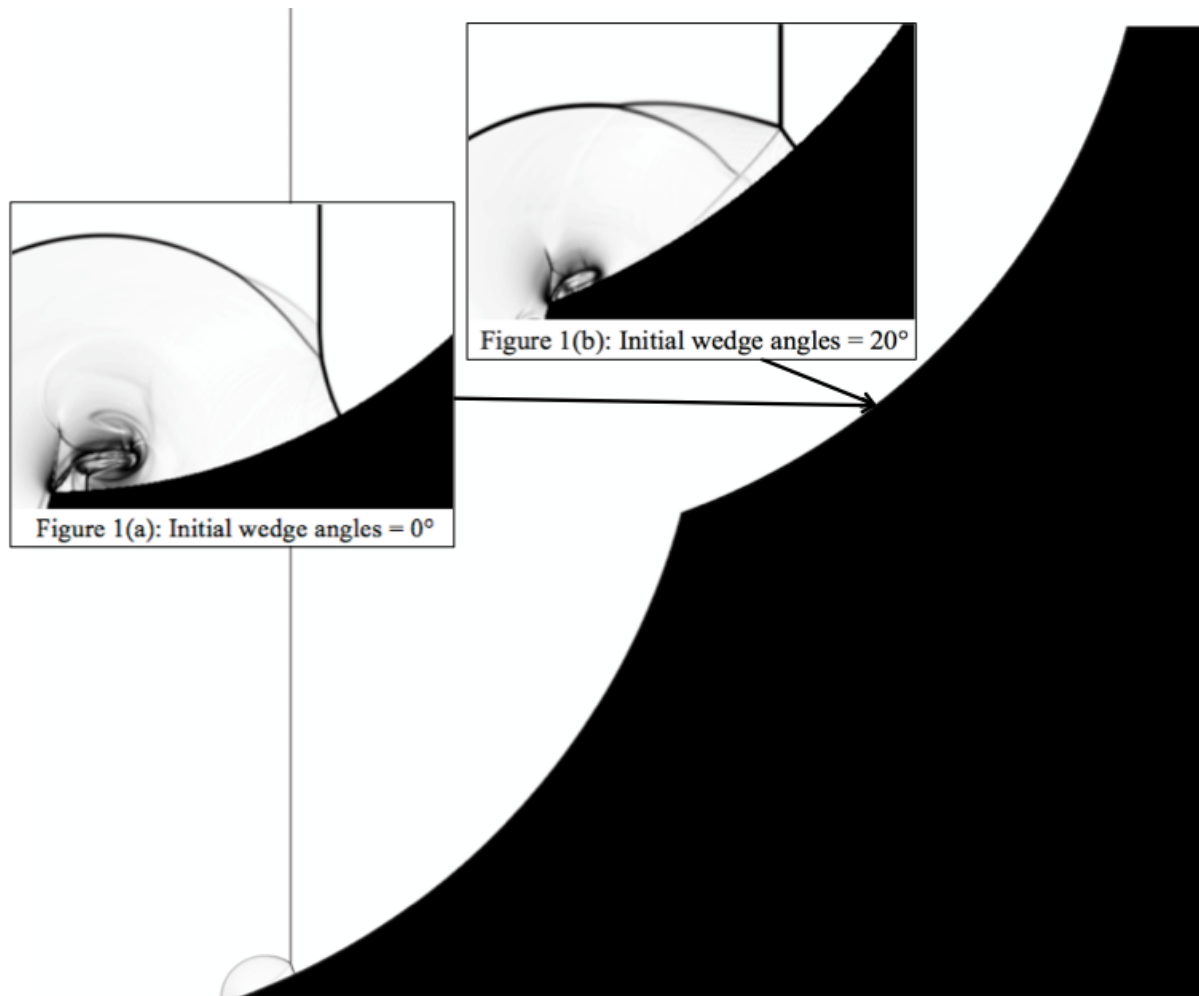


Figure 1: Shock waves reflection: the radius of the concave surfaces is 50mm; the incident shock wave Mach number is 1.6

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