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Investigation of wall temperature and angle of attack effects on boundary layer stability over a blunt cone[1] LIANG XIAN, School of Mathematics and Information Science, Beifang University for Nationalities, LI XINLIANG, LHD, Institute of Mechanics, Chinese Academy of Sciences — A new PSE (parabolized stability equations) method based on the general orthogonal curvilinear system of coordinates is developed. Combined with DNS data, the PSE method is used to investigate the effects of wall temperature and angle of attack (AOA) on stability of the boundary layer over a blunt cone. Results indicate that cooling the surface leads to higher wave number appearing in streamwise for a given frequency disturbance wave. Cooling the surface induces stronger harmonic and 3D disturbances comparing to the adiabatic wall case, which further accelerates the growth of multi disturbance modes in blunt cone boundary layer. Thus finally decreases the transition Reynolds number. Although the non-parallelism is markedly in conical flow, the non-parallel effects on the evolution characteristic of disturbance is not so obviously. So the PSE approach is a useful method in analysis of the hypersonic boundary layer stability over a blunt cone. The combined effects of the wall temperature and the AOA on the transition over the blunt cone are further to be studied in our present work. Many new nonmonotonic changes of transition position versus above variables have been found.

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