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超声叶栅前缘处的脱体激波预测

Prediction of detached shockwaves from leading edge of supersonic cascade

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中文关键词： 超声叶栅 钝前缘叶栅 脱体激波模型 激波位置 激波形状

英文关键词:supersonic cascade blunt leading edge cascade detached shockwaves model shockwaves location shockwaves shape

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中文摘要:

为了准确预测超声叶栅前缘处的脱体激波，以Moeckel法为基础，通过分析和公式推导，构造叶栅前缘处的脱体激波模型.首先对Moeckel法进行改进，提高均匀来流条件下的对称脱体激波逼近精度；然后再将Moeckel法推广到均匀来流条件下的非对称脱体激波逼近；最后结合超声叶栅流动特征，给出叶栅前缘处的脱体激波模型.将所得模型用于3个超声叶栅，预测叶栅前缘处的脱体激波形状和位置，并将预测结果与CFD软件求解结果进行比较.结果表明：在均匀来流条件下，改进后的Moeckel法能更准确地逼近对称脱体激波，并可用于逼近非对称脱体激波；由超声叶栅脱体激波模型确定的脱体激波形状和位置与CFD求解结果一致性很好.

英文摘要:

In order to accurately predict detached shockwaves from the supersonic cascade leading edge,the supersonic cascade detached shockwaves model based on Moeckel method was built by analysis and formula derivation.Firstly,Moeckel method was improved to increase symmetrical detached shockwaves approximation accuracy on the uniform flow condition.And then,Moeckel method was extended to approximate the asymmetric detached shockwaves on the uniform flow condition.Finally,the detached shockwaves model was constructed according to supersonic cascade flow characteristics.The resulting model was used for three supersonic cascades to predict the shape and position of detached shockwaves from leading edge of cascades.And the predicted results were compared with the CFD solved results.The results show that improved Moeckel method can more accurately approximate symmetrical detached shockwaves and also can be used for predicting asymmetric detached shockwaves,while the shape and location of detached shockwaves obtained by the model is consistent with those obtained by CFD software.

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