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### 基于面元-黏性涡粒子混合法的风力机风轮气动计算

## Aerodynamic calculation of wind turbine wheel based on hybrid panel viscous-vortex particle method

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中文关键词: 风力机风轮 气动计算 面元法 涡粒子 面元-黏性涡粒子混合法

英文关键词: wind turbine wheel aerodynamic calculation panel method vortex particle hybrid panel viscous-vortex particle method

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#### 中文摘要:

为了快速准确地预估大型风力机风轮的气动性能,建立了一种基于面元-黏性涡粒子混合(HPVP)法的风力机风轮气动性能计算方法,自主编制了相应的计算程序,以model experiments in controlled conditions(MEXICO)风轮为算例,将计算结果与实验数据、CFD方法进行了比较.结果表明:HPVP法可准确计算主要工作区的叶片压力分布.相比于CFD方法,在流动分离较小时,HPVP法可以快速获得与CFD方法精度相当的结果,但计算时间仅需要CFD方法的千分之一.除能够给出叶片压力分布外,HPVP法还能给出风力机风轮流场的其他流动细节.

#### 英文摘要:

To accurately and rapidly predict the aerodynamic performance of large wind turbine wheel, a hybrid panel viscous-vortex particle (HPVP) method was established to calculate the wind turbine aerodynamic performance, and corresponding calculational program was developed, the model experiments in controlled conditions (MEXICO) wheel was chosen to validate the accuracy and reliability of HPVP method by comparison of calculational result, test data and CFD method. The results show that the pressure distribution of the main working zone of blade is predicted accurately in HPVP method. Compared with CFD method, when the flow separation is small, the aerodynamic calculation in HPVP method is faster than that of CFD method, and the calculational time by HPVP method is one thousandth of CFD method. Additionally, some other flow details of flow field of the wind turbine wheel can be also showed by HPVP method including the pressure distribution of blade.

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