# Yingyun Zhang

**2017 Yingyun Zhang --The variation in frequency locations in Doppler ultrasound spectra for maximum blood flow velocities in narrowed vessels**

**Purpose:** This study assessed the variation in the frequency locations in the Doppler ultrasound spectra for the maximum blood flow velocities of in vessels with different degrees of bilaterally axisymmetric stenosis(双边轴对称器官狭窄).

**Methods:** This was done by comparing the relationship between the velocity distributions and corresponding Doppler power spectra. First, a geometric vessel model with axisymmetric stenosis was established. This made it possible to obtain the blood flow velocity distributions for different degrees of stenosis from the solutions of the Navier–Stokes equations（纳维-斯托方程）. Then, the Doppler spectra（多普勒）were calculated for the entire segment of the vessel that was covered by the sound field. Finally, the maximum frequency locations for the spectra were determined based on the intersections of the maximum values chosen from the calculated blood flow velocity distributions and their corresponding spectra.

**Conclusion:**The computational analysis showed that the maximum frequencies, which corresponded to the maximum blood flow velocities for different degrees of stenosis, were located at different positions along the spectral falling edges. The location for a normal (stenosis free) vessel was in the middle of the falling edge. For vessels with increasing degrees of stenosis, this location shifted approximately linearly downward along the falling edge. For 40% stenosis,the location reached a position at the falling edge of 0.32. Results obtained using the Field II simulation tool demonstrated the validity of the theoretical analysis and calculations, and may help to improve the maximum velocity estimation accuracy for Doppler blood flow spectra in stenosed vessels.