



An Introduction to Alfvén Waves, (Series on Plasma Physics)

By Rodney Cross

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Alfvén waves permeate the universe. They have been observed in the Sun, in the magnetosphere, as low frequency fluctuations in the Earth's magnetic field, and they are easily generated in laboratory plasmas. Alfvén waves serve as a useful diagnostic tool to probe plasma conditions in both space and laboratory plasmas. In the quest for nuclear fusion they have been used with spectacular success to heat tokamak plasmas to temperatures exceeding 50 million Kelvin. This book aims to provide an introduction to the physics of Alfvén wave propagation for postgraduate physicists and astrophysicists who are entering research on laboratory or space plasmas. In the early chapters the basic properties of Alfvén waves are derived for homogeneous plasmas, using the ideal magnetohydrodynamic fluid equations. The essential differences between torsional and compressional wave types are highlighted by an examination of phase and group velocity surfaces, and by a discussion of recent experimental results obtained with small, 'point-source', antennae. Later chapters deal with cylindrical plasmas, Alfvén waves in a plasma with two or more ion species, effects of plasma current, resistive damping and inhomogeneous plasmas. There are also two chapters about numerical and experimental techniques, topics which are often neglected in other books.

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