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Loops; 2.8 Magnetic Loops above Spots; References; 3 Resonators for MHD Oscillations in Stellar Coronae; 3.1 Eigenmodes of Coronal Loops: The Plasma Cylinder Approach and the Dispersion Equation; 3.1.1 Trapped Modes; 3.1.1.1 Global Sausage Mode; 3.1.1.2 Global Kink Mode; 3.1.2 Leaky Modes; 3.1.2.1 Sausage Mode; 3.1.2.2 Kink Modes; 3.1.3 Ballooning Modes; 3.2 MHD Resonator at ~ 1 RO in the Solar Corona; 3.3 Excitation Mechanisms for Loop Oscillations 3.3.1 External Triggers 3.3.2 Parametric Excitation of Loop Oscillations by p-Modes; 3.3.3 Internal Excitation; 3.3.3.1 The Excitation of the Sausage Mode by Instantaneous Energy Release; 3.3.3.2 The Excitation of the Global Kink Mode by Chromosphere Evaporation; 3.3.3.3 The Excitation of the Sausage Mode by High-Energy Protons under the Bounce-Resonance Condition; References; Further Reading; 4 Propagating MHD Waves in Coronal Plasma Waveguides; 4.1 MHD Waves in Vertical Coronal Magnetic Flux Tubes; 4.1.1 Effects of Stratification; 4.2 Propagating Waves in Coronal Loops 4.2.1 Propagating Compressible Waves in Coronal Loops 4.2.2 Transverse Waves in Coronal Loops; 4.3 Waves in Coronal Jets; 4.4 Evolution of Short-Wavelength, Fast Magnetoacoustic Waves; 4.5 Alfvén Wave Phase Mixing; 4.5.1 Damping of Alfvén Waves because of Phase Mixing; 4.5.2 Enhanced Nonlinear Generation of Oblique Fast Waves by Phase-Mixed Alfvén Waves; References; 5 Prominence Seismology; 5.1 Prominence Models; 5.2 Prominence Oscillations; 5.3 The Heating Effect; 5.4 Nonlinear Oscillations: Dynamical Modes; 5.5 Flare Processes in Prominences; 5.6 Stellar and Interstellar Prominences References 6 The Coronal Loop as a Magnetic Mirror Trap; 6.1 Particle Distribution in a Coronal Loop; 6.1.1 Gyrosynchrotron Emission from a Flaring Loop; 6.2 Kinetic Instabilities in a Loop; 6.2.1 A Loop as an Electron Cyclotron Maser; 6.2.2 The Plasma Mechanism of the Radio Emission from Coronal Loops; 6.2.3 Instabilities of Whistlers and Small-Scale Alfvén Waves; 6.3 The Fine Structure of Radio Emission from Coronal Loops; 6.3.1 Sudden Reductions; 6.3.2 Zebra Pattern; 6.3.3 Diagnostics of Coronal Plasma Using the Fine Structure of Radio Emission; References 7 Flaring Events in Stellar Coronal Loops

Sommario/riassunto

This concise and systematic account of the current state of this new branch of astrophysics presents the theoretical foundations of plasma astrophysics, magneto-hydrodynamics and coronal magnetic structures, taking into account the full range of available observation techniques -- from radio to gamma. The book discusses stellar loops during flare energy releases, MHD waves and oscillations, plasma instabilities and heating and charged particle acceleration. Current trends and developments in MHD seismology of solar and stellar coronal plasma systems are also covered, while recent p