Overview about Jupiter's magnetosphere

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Abstract: Jupiter's magnetosphere is the largest and most powerful planetary magnetosphere in our solar system, driven by its rapid rotation and internal magnetic dynamo within its metallic hydrogen layer. This presentation provides a comprehensive overview of Jupiter's inner structure, atmospheric composition, and magnetic field configuration in comparison with Earth. Emphasis is placed on the formation and dynamics of Jupiter's vast magnetosphere, including its key regions such as the bow shock, magnetosheath, magnetotail, and radiation belts. The role of plasma sources like Io's plasma torus, as well as the generation and propagation of various plasma wave modes—such as whistler-mode waves, electromagnetic ion cyclotron (EMIC) waves, and electron cyclotron waves—is discussed in detail. Particular attention is given to whistler-mode emissions like chorus and hiss waves, highlighting their generation mechanisms through wave-particle interactions and lightning-driven processes. The study enhances our understanding of planetary magnetospheres and wave-particle dynamics in space plasma environments.