Ring Current Dynamics and MLT Asymmetry During Geomagnetic Storms

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The interaction of the solar wind with Earth's magnetosphere drives a complex system of currents in the magnetosphere–ionosphere system. During active space-weather conditions, these currents are enhanced significantly. Among these currents, the ring current is a dominant contributor to geomagnetic disturbances at low and mid latitudes, especially during geomagnetic storms. These disturbances can affect ground and space-based technologies, navigation, communication, and power systems. In this presentation, an overview of ring-current formation and evolution will be given, followed by a discussion of the associated magnetic local time (MLT) asymmetry that develops significantly during storm time. A quantitative approach for modelling this asymmetry empirically will be discussed, along with its relevance for interpreting storm-time MLT variations in the low-latitude ΔH disturbances. Understanding the MLT asymmetry is crucial and has significant applications in space weather studies.