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原始数据压缩对星载SAR/GMTI系统测速影响研究

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Study of Effect of Raw Data Compression on Space-borne SAR/GMTI Velocity Measurement

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摘要 星载SAR原始数据压缩是目前解决星载SAR实时获取的海量数据与星上有限数传带宽的有效手段。压缩比越大，数据率越低，但较大的量化误差将影响SAR-GMTI的测速精度；压缩比越低，数据压缩对测速精度影响越小，但数据率越高。因此，数据压缩比的选择需要在数据率与测速精度之间取得折中。该文建立了星载SAR/GMTI系统回波信号仿真模型，仿真了星载SAR-GMTI原始数据，针对相位中心偏置天线(DPCA)与沿迹干涉(ATI) 两种有重要工程应用潜力的方法，详细分析了分块自适应量化 (BAQ) 算法对测速精度的影响。该文的研究结果将为星载SAR/GMTI系统的压缩比选择提供重要的理论依据。

关键词： 合成孔径雷达 原始数据 压缩 地面动目标显示 速度测量

Abstract： At present, the effective way to resolve the contradiction between huge space-borne SAR raw data rate and limited on-board data-transmission bandwidth is space-borne SAR raw data compression. The higher compression ratio is, the lower data rate will be, but larger quantization error will affect the velocity measurement accuracy of SAR-GMTI. The lower compression ratio is, the less effect of data compression on velocity measurement accuracy is, but the higher data rate will be. Therefore, the choice of data compression ratio needs achieve a compromise between data rate and velocity measurement accuracy. This paper establishes the echo simulation model of space-borne SAR/GMTI system and simulates the raw data of space-borne SAR-GMTI. For Displaced Phase Center Antenna (DPCA) and Along-Track Interferometry (ATI) methods which have significant application potentialities in practice, this paper analyzes the effect of Block Adaptive Quantization (BAQ) algorithm on velocity measurement accuracy in detail. The results of this paper provides important theory basis for the choice of compression ratio of the space-borne SAR/GMTI system.

Keywords： Synthetic Aperture Radar (SAR) Raw data Compression Ground Moving Target Indication (GMTI) Velocity measurement

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