

利用MERIS水汽数据改正ASAR干涉图中的大气影响

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Correcting atmospheric effects in ASAR interferogram with MERIS vapor data

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摘要

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摘要

大气对流层对雷达信号的传播延迟是制约重复轨道InSAR高精度测量应用的重要因素之一. 本文描述了MERIS水汽数据用于大气改正的方法; 并以美国南加州地区为例, 选取4对ENVISAT ASAR数据进行了大气改正的研究. 结果显示对这4幅干MERIS水汽数据改正后InSAR与GPS差异的RMS分别【JP2】降低了41.7%, 65.2%, 19.3%和39.4%. 平均改善程度达41.4%. 重要的是, 经过MERIS水汽改正后, 从2005~2007年【JP】干涉图和2004~2007年干涉图中, 能清楚地识别出三处形变区域: Long Beach-Santa Ana盆地、Pomona-Ontario和San Bernardino, 其形变速率从-8 mm/a到-28 mm/a, 20 mm/a左右, 与这些地区2003年以前的历史形变速率基本一致. 因此, 采用无云条件下的MERIS水蒸气数据改正同步干涉图, 可以显著地降低大气水汽对干涉图相位的影响, 从而更真实地反映地表形变等地球物理信号.

关键词: 合成孔径雷达干涉 MERIS ASAR GPS 大气改正 地表形变

Abstract:

The troposphere delay of radar signals has been one of the major limitations for the application of high repeat pass InSAR. In this paper, we present the atmospheric correction methods for ASAR interferogram with MERIS integrated water vapor (IWV) data. Then, using four ASAR interferometric pairs over Southern California examples, this paper conducts the atmospheric corrections with MERIS IWV data. The results show that after the correction the RMS differences between InSAR and GPS were reduced by 41.7%, 65.2%, 19.3%, and 39.4% respectively for the four selected interferograms, with an average improvement of 41.4%. Most importantly, after the correction, three distinct deformation areas have been identified, i.e., Long Beach-Santa Ana Basin, Ontario and San Bernardino, with the deformation velocities ranging from -8 mm/a to -28 mm/a and around -20 mm/a. The deformation is quite consistent with the historical deformation derived from GPS measurements by other researchers. Thus, using the cloudless MERIS IWV data for correcting the synchronized ASAR interferogram can significantly reduce the atmospheric effects in the interferograms and further better capture the ground deformation and other geophysical signals.

Keywords: InSAR MERIS ASAR GPS Atmospheric correction Ground deformation

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