CRInSAR与PSInSAR联合探测区域线性沉降研究

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Detecting the regional linear subsidence based on CRInSAR and PSInSAR integration

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摘要 本文提出一种CRInSAR与PSInSAR联合解算算法,并将该算法应用于区域线性沉降探测中.该算法将CR点上计算得出的形变速率值及高程改正值作为研究区域PS基线网络的约束,进而通过间接观测平差法估计出PS网沉降速率和高程改正值的全局最优解.算法实现了人工角反射器雷达干涉测量技术(CRInSAR)与永久散射体雷达干涉测量技术 (PSInSAR) 的有效结合.实验利用河南地区PALSAR影像对联合解算算法进行验证分析,成功提取出研究区域的线性形变速率场和高程改正场.实验结果表明,该算法可避免人为选取参考点的不确定性,增加了PS基线网络空间维解缠时的多余观测,获取的研究区域形变速率相对于传统算法在精度上有明显改善,与已有地面水准实测形变结果吻合程度明显提高,探测得出沉降区域与研究区域的矿区位置实际分布较为吻合,因而可更广泛有效地应用于区域线性沉降探测乃至矿区地质环境监测中.

关键词: CRInSAR　 PSInSAR　 沉降探测　 矿区

Abstract： The paper presents a CRInSAR and PSInSAR federative calculation algorithm, and applies it to the monitoring of regional linear subsidence. With use of the subsidence rates and elevation corrections calculated on the CR points as constraint for the PS network over the study area, the algorithm estimates the global optimum solutions of subsidence rates and elevation corrections in the PS network using the parametric adjustment method. The algorithm achieves the integration of CRInSAR and PSInSAR effectively. The author uses the PALSAR data over Henan province to validate the algorithm and extract the subsidence rates and elevation corrections successfully. The results show that the algorithm can avoid the trouble of choosing reference point, add the redundant observations in the step of spatial unwrapping through PS baselines. The precision of the velocities on the PS points is improved a lot compared to that of traditional algorithm. The displacement is accordant better with that of leveling. The distribution of mine in the area also agrees well with the subsidence area detected, thus the algorithm can be more widely and effectively applied in detecting regional ground subsidence and even the monitoring of mining area.

Keywords： CRInSAR　 PSInSAR　 Subsidence Detecting　 Mine

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