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Argo浮标温盐剖面观测资料的质量控制技术

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Quality control of Argo temperature and salinity observation profiles

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摘要 Argo浮标可用来监测全球大洋从海表到2000 m深层的变化,鉴于Argo浮标的剖面观测数据存在位置错误、可疑剖面、异常数据以及盐度漂移等诸多问题,必须对Argo浮标资料进行有效的质量控制.本文基于Argo观测剖面资料与法国海洋开发研究院(IFREMER)提供的可靠历史观测数据集,提出了一种Argo资料质量控制的新途径.该方法通过寻找Argo浮标不同剖面位置与其"最佳匹配"历史剖面资料对比判别的途径,可以有效地识别Argo观测误差,特别是能够将由于Argo位置环境变化引起和由Argo浮标自身漂移引起的两类Argo浮标盐度偏移现象进行有效甄别,减少了对Argo浮标盐度剖面偏移的误判,有效节约了Argo浮标质量控制时间.本文还提出基于"三倍标准差"的异常数据检测方法,并将其与传统异常数据检测法相结合进行剖面异常数据剔除,有效实现了对异常数据的剔除.基于本文提出的Argo资料质量控制方法,对中国Argo实时资料中心网站提供的全球Argo浮标剖面进行了质量控制再分析,进一步剔除和订正了其中的一些数据误差,生成了经新的质量再控制后的全球Argo浮标剖面资料集.通过将质量再控制处理前后的数据与Ishii资料进行比较发现,处理后的数据比处理前的数据误差减小,表明本文提出的方法合理有效.

关键词 Argo剖面,　质量控制,　盐度漂移,　盐度偏移,　异常数据

Abstract：Argo profiling floats can be used to monitor the variability of upper ocean from surface to about 2000 meter. However,there are several wrong position profiles, abnormal data, suspicious profiles and salinity drift profiles in Argo observations, Argo quality control is very important. In this paper, we proposed a method to find the corresponding "optimal matching" historical profiling data from the reliable historical data set of France IFREMER for different Argo profiles. By comparing the Argo float data with their corresponding "optimal matching" historical profiling data, we can identify the Argo observation error effectively. Especially, we can distinguish between salinity offsets caused by the environmental changes of Argo profiling positions and caused by the Argo sensor drift efficiently, thereby reducing the misjudgment of the Argo salinity offset causes and saving computational time. This paper also proposed a synthetical method of abnormal data test by combining the traditional abnormal data test with the abnormal data method based on "three times the standard deviation" proposed in this paper to eliminate the abnormal observations. With the proposed method of Argo data quality control, a new global Argo profiling floats data set are produced from the global real-time Argo float data provided by the website of "China Argo Real-time Data Center" by removing and calibrating some wrong profiling observations. In comparison with Ishii data, the root mean square error of the objectively analyzed data from Argo calibrated data after quality control is smaller than that from the uncalibrated data, which shows that the method proposed is reasonable and effective.

Keywords Argo profile,　Quality control,　Salinity drift,　Salinity offset,　Abnormal data

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