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英文题目: Quality Control and Evaluation of the Observed Daily Data in North American Soil Moisture Database

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英文摘要: The North American Soil Moisture Database (NASMD) was initiated in 2011 to assemble and homogenize in situ soil moisture measurements from 32 observational networks in the United States and Canada encompassing more than 1,800 stations. Although statistical quality control (QC) procedures have been applied in the NASMD, soil moisture content tends to be systematically underestimated by in-situ sensors in frozen soils, and using a single maximum threshold (i.e., $0.6 \text{ m}^3 \text{ m}^{-3}$) may not be sufficient for robust QC because of the diverse soil textures in North America. In this study, based on the in situ soil porosity and the North American Land Data Assimilation System phase 2 (NLDAS-2) Noah soil temperature, the simple automated QC method published in Xia et al. (2015) is revised to supplement the existing QC approach. This revised QC method is first validated based on the assessment at 78 of the Soil Climate Analysis Network (SCAN) stations where the manually checked data are available, and is then applied to all stations in the NASMD to produce a more strictly quality-controlled dataset. The results show that the revised automated QC procedure can flag the spurious and erroneous soil moisture measurements for the SCAN stations, especially for those located in high altitudes and high latitudes. Relative to station measurements in the original NASMD, the quality-controlled data shows a slightly better agreement with the manually checked soil moisture content. It should be noted that this quality-controlled dataset may be over-flagged for some valid soil moisture measurements due to potential errors of the soil temperature and soil porosity data, and validation in this study is limited by the availability of bench mark soil moisture data. Updated QC and additional validation will be desirable to boost the confidence in the product when high quality data becomes available in the future.

中文题目: 北美土壤含水量观测数据集的质量控制与评估

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北美土壤含水量数据集收集了美国和加拿大地区 32 个观测站网 (共计超过 1800 个站点) 的土壤含水量数据。虽然该数据集在制作过程中已对观测数据做了初步的质量控制, 即剔除大于 $0.6 \text{ m}^3 \text{ m}^{-3}$ 的值, 但由于传感器在冻土条件下会低估土壤含水量测量值的问题并没有被考虑。因此, 本研究对已有的质量控制方法进行改进, 首先基于观测站网 SCAN 中的 78 个站点进行测试并验证该方法的可靠性, 最后把该质量控制方法应用于整个北美土壤含水量数据集。结果表明, 经过质量控制后, 特别是对位于高纬度和高海拔地区的站点, 观测数据的质量获得了较为显著的提升。

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