

基于 Sentinel-1 SAR 的全球 1 公里分辨率土壤水分数据产品：算法 和初步评估

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摘要：高空间分辨率土壤水分数据对于区域和全球尺度水分、能量和碳循环及其相互作用具有重要作用，全球 1 公里分辨率土壤水分数据产品对于农业、水文等领域研究具有重要意义。为此，本研究提出了一种基于 C 波段双极化合成孔径雷达土壤水分反演算法（DPA），并基于此算法利用哨兵 1 号数据生产了全球尺度 1 公里分辨土壤水分数据产品（S1-DPA）。具体地，本研究构建了一个适用于不同土壤和植被状态的“土壤水分-后向散射”正向模型，并根据 SMAP 土壤水分数据产品对模型参数进行标定。基于定标好的模型，利用 2016 至 2020 年的哨兵 1 号 C 波段 VV 和 VH 极化 SAR 数据生产了空间分辨率为 1 公里的全球每日升轨、降轨土壤水分数据产品。最后，利来自全球土壤水分观测网络（ISMN）的同期地面实测数据对 S1-DPA 产品的精度进行了验证。结果表明，S1-DAP 与地面实测数据相关系数中位数为 0.372，偏差中位数为-0.003 m^3/m^3 ，均方根误差中位数为 0.105 m^3/m^3 ，无偏均方根误差中位数为 0.076 m^3/m^3 。总体上，本数据产品在促进高分辨率土壤水分数据在水文、生态、气象等领域的应用具有巨大潜力。