VALIDATION AND COMPARISON OF AATSR AOD L2 PRODUCTS OVER CHINA

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ABSTRACT

The Advanced Along-Track Scanning Radiometer (AATSR) aboard on ENVISAT has been used to observe the Earth for more than 10 years since than 2002. One of main applications of AATSR instrument is to observe atmospheric aerosol, especially in retrieval of aerosol optical depth (AOD), taking advantage of its dual-view that helps to separate the contribution of aerosol from top of atmosphere reflectance. The project of Aerosol_CCI, as part of European Space Agency's Climate Change Initiative (CCI), has released new AATSR aerosol AOD products by the of 2015, including the SU v4.21 product from Swansea algorithm, ADV v2.3 product from the ATSR-2/AATSR dual view aerosol retrieval algorithm (ADV) and ORAC v03.04 product from the Oxford-RAL Retrieval of Aerosol and Cloud algorithm. In this paper, we validated these AATSR AOD products with latest versions in mainland China in 2007, 2008 and 2010 by the means of comparison with the AErosol RObotic NETwork (AERONET) and the China Aerosol Remote Sensing Network (CARSNET). The combination of AERONET and CARSNET helps to make up for the disadvantages of small number and uneven distribution of AEROENT cites. The validation results show different performance of these AOD products over China. The performances of SU and ADV products seem to be the same with close correlation coefficient (CC) about 08~0.9 and root mean square (RMS) within 0.15 in all three years, and sensitive to high AOD values (AOD >1): more AODs and more underestimated. However, these two products do exist difference, which is that the SU algorithm retrieves more high AODs, leading to more space-time validation matches with ground-based data. The ORAC algorithm

is different from the others, it can be not only used to retrieve low AODs but also high AODs over different land cover types. Even though ORAC algorithm has ability in retrieving AODs in different values, it shows largest uncertainty in retrieving different AODs.

中国陆地地区 AATSR AOD 产品的验证和比较研究

自2002年，搭载在ENVISAT卫星上的先进的沿轨迹扫描辐射计（AATSR）被广泛应用于地球观测。AATSR的双视角观测有助于消除天顶反射率中的地表反射部分，故AATSR的主要用途之一是对大气气溶胶进行观测，特别是反演气溶胶光学厚度（AOD）。2015年11月， aerosol_CCI（欧空局CCI项目的一部分）公布了最新的AATSR AOD产品，包括Swansea大学算法的SU v4.21产品、ATSR-2/AATSR双视反演算法的ADV v2.3产品以及Oxford-RAL 云、气溶胶反演算法的ORAC v03.04。本文通过与AErosol RObotic NETwork（AERONET）、China Aerosol Remote Sensing Network（CARSNET）对比，验证了三种产品2007、2008以及2010在中国区的精度。AERONET与CARSNET的结合弥补了中国区AERONET站点不足且分布不均匀的缺陷。结果表明，三种产品在中国区的表现存在差异。从相关性角度看，SU、ADV产品在三年的精度相当，相关系数与RMS都处于同一水平（CC：0.8-0.9，RMS：小于0.15），同时精度会随着AOD的增高而降低，低估现象也会更加严重。但两种产品之间是存在差异的，SU产品的适用性更强，反演AOD值域范围更大，产品覆盖度也就更大。ORAC算法的精度不如前两者算法且反演精度不稳定，但适用性最强，可反演不同地表上空气溶胶参数。