Comparing SeaWiFS and MERIS Products off the Northeast U.S. Coast

Introduction

The objective of this study is to compare SeaWiFS and MERIS (MEdium Resolution Imaging Spectrometer) products for a region off the Northeast U.S. coast using coincident images acquired on 13 April 2003. SeaWiFS standard products are normalized water leaving radiances (nLw), while MERIS are normalized surface reflectances (πnLw/F0). For this study, both data sets were converted to remote sensing reflectance (RRS= nLw/F0). F0 is the nominal band extraterrestrial solar irradiance.

Chlorophyll

The relative frequency distributions of chlorophyll concentration for SeaWiFS (red) and MERIS (blue) show good agreement for the 16 boxed regions. The SeaWiFS OC4v4 algorithm uses the maximum band ratio (443/555, 490/555 or 510/555) to calculate Chl concentration. MERIS’s algorithm uses the 443, 490, 510 and 560 nm wavebands to calculate Chl.

Remote Sensing Reflectance

Spectral Differences. Comparison of reflectance ratio [RRS(λ)/RRS(490)] spectra for coastal (left, box 9) and offshore (middle, box 12; right, box 15) areas. In the left and middle frames, note the 620, 681 and 708 nm bands in MERIS (blue) which are not present for SeaWiFS (red). Reflectance spectra based on the Morel Case 1 model (using mean Chl) are shown for the two offshore areas (black). In situ data (green) acquired October 1999 at 36.4° N, 71.98° W are from the SeaBASS archive. The short wavelength component of the SeaWiFS spectra differs significantly from MERIS, in situ and Morel Case 1 calculations.

Conclusions

• MERIS and SeaWiFS chlorophyll agreement is good, probably because the SeaWiFS OC4 algorithm is using primarily 490 or 510 nm in the Chl calculation, rather than 443 nm.
• MERIS and SeaWiFS differ significantly at 412 and 443 nm, particularly in “blue” offshore waters, with MERIS more similar to model calculations and in situ data.
• The results imply that SeaWiFS is not providing accurate reflectances (water-leaving radiance) at 412 and 443 nm.
• If the above is true, then inversion algorithms applied to SeaWiFS data are SIGNIFICANTLY overestimating the amount of CDOM, even in open ocean waters.

• GIVEN THE INCREASING USE OF INVERSION ALGORITHMS, WE NEED TO DETERMINE WHY THE SEAWiFS BLUE BANDS ARE APPARENTLY INACCURATE AND FIX THE PROBLEM!!

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