Retrieval of in-water attenuation to absorption ratios from PACE mission measurements using neural networks

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The feasibility of a neural network (NN)-based approach is explored for the conversion of measurements of the degree of linear polarization at the top of the atmosphere as carried out by the HARP2 instrument in the PACE mission into estimations of the ratio of water attenuation to absorption in the surface layer of the ocean. Polarization has been shown to contain information on the in-water inherent optical properties like attenuation coefficient, which are not retrievable from standard remote sensing reflectance spectra of the Ocean Color satellite sensors. These properties may be further combined with inversion algorithms to retrieve projected values for the properties of marine particulates. Using bio-optical models to produce synthetic data in quantities sufficient for network training purposes, and with associated polarization values derived from vector radiative transfer modeling, a two-step algorithm was developed that retrieves surface-level polarization first and attenuation-to-absorption ratios second, with each step handled by a separate neural network. The networks use multispectral inputs that were anticipated to be available within the PACE data environment and produce results suggesting that a neural network-mediated conversion of remotely sensed polarization into in-water IOPs is viable. Using actual data from the PACE mission and in-situ data from the ocean cruises, performance of algorithms will be tested for various ocean environments.

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