Classification of Aerosol Properties Retrieved From Spaceborne Polarimetry Using a Multivariate Algorithm

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Abstract

Since the development of global aerosol measurements by satellites and AERONET, classification of observed aerosols into several types has become important. This is due to the complex nature of aerosol types, resulting from differences in composition, origin, and behavior in the atmosphere that influence remote sensing measurements. Traditionally, aerosol retrieval algorithms have been limited to the retrieval of a few key parameters which may not reflect the true nature of the aerosol due to their simplicity and computational efficiency. This paper presents a new approach to the classification of aerosols using a multivariate algorithm. The algorithm is based on the retrieval of aerosol properties from various remote sensors, including POLDER-PARASOL and POLDER-3. This approach allows for a more comprehensive understanding of the aerosol types present in the atmosphere.

1. Background and goal

In some cases, aerosol-type classification can be identified from imagery by tracing the narrative clues shown in Fig. 1(a). In other cases (Fig. 1(b)), it is not possible to derive aerosol-type classification based on aerosol properties alone. For example, if the aerosol signature is dominated by smoke, carried down the Mississippi Valley, along the Gulf Coast, or by a large-scale dust and wildfire event, it can be difficult to classify the aerosol type accurately.

2. Aerosol classification method

The paper describes a new approach to aerosol classification using a multivariate algorithm. The algorithm is based on the retrieval of aerosol properties from various remote sensors, including POLDER-PARASOL and POLDER-3. This approach allows for a more comprehensive understanding of the aerosol types present in the atmosphere. The classification method is based on the retrieval of aerosol parameters (Table 1) from the POLDER-PARASOL data set, and it is applied to the classification of aerosols observed by the POLDER-PARASOL instrument.

3. Application to POLDER-PARASOL Retrieved Aerosol Parameters

Hasekamp et al. (2011) describe retrievals of aerosol properties from pixels viewed by the POLDER-3 polarimeter on the PARASOL spacecraft. Table 1 lists the properties retrieved by the POLDER-3 polarimeter, which includes more wavelengths and includes particle non-sphericity (though in a different way than the AERONET algorithm). Our POLDER classification uses a parameter, RRI, to define aerosol classes. Retrieved aerosol parameters are used to assign to the retrieved aerosol class, and to derive a modified Mahalanobis distance, dSSA, that takes into account the non-dimensional SSA (SSA ≤ 0) of each aerosol type. We use this Mahalanobis distance to define a modified Mahalanobis distance, dSSA, that takes into account the non-dimensional SSA (SSA ≤ 0) of each aerosol type. We use this Mahalanobis distance to define a modified Mahalanobis distance, dSSA, that takes into account the non-dimensional SSA (SSA ≤ 0) of each aerosol type. We use this Mahalanobis distance to define a modified Mahalanobis distance, dSSA, that takes into account the non-dimensional SSA (SSA ≤ 0) of each aerosol type.

4. Summary and conclusions

This paper presents a new approach to the classification of aerosols using a multivariate algorithm. The algorithm is based on the retrieval of aerosol properties from various remote sensors, including POLDER-PARASOL and POLDER-3. This approach allows for a more comprehensive understanding of the aerosol types present in the atmosphere. The classification method is based on the retrieval of aerosol parameters from the POLDER-PARASOL data set, and it is applied to the classification of aerosols observed by the POLDER-PARASOL instrument.

Our method, Mahalanobis classification using predefined clusters (5), defines several predefined clusters (2) using parameters retrieved from Aerosol Retrieval Data (ARD) using the AERONET algorithm. The ARD contains a single aerosol type that is defined in terms of the ARD parameters and is known to be typical of the aerosol type. We apply the algorithm to the classification of aerosols observed by the POLDER-PARASOL instrument. The algorithm is based on the retrieval of aerosol parameters from the POLDER-PARASOL data set, and it is applied to the classification of aerosols observed by the POLDER-PARASOL instrument.

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