Abstract
Since the development of global aerosol measurements by satellites and AERONET, classification of observed aerosols into several types has been a useful tool for evaluating aerosol sources, understanding aerosol interactions, transformation, effects, and feedback mechanisms; for improving accuracy of satellite retrievals; and to provide data to other aerosol models. Advances in aerosol measurement capability, including enhanced satellite capability, have allowed more detailed analyses of aerosol classifications. The work presented here analyzes aerosol classification using data from multiple aerosol measuring instruments, relying on both aerosol and optical properties. A two-dimensional (2D) aerosol classification method was used to classify aerosol observations from an urban-industrial site in FORTH-Crete, Greece. The method used a modified Mahalanobis distance, defined the pre-specified clusters (Table 2) using parameters retrieved from AERONET, and identified a priori information can include clustering (e.g., Hoose et al., 2009). One can see that aerosol types are incorrectly classified by the POLDER-3 operational classification. However, using our method, aerosol classification lead to errors, as exemplified by Fig. 1d, in which Alaskan wildfire smoke in MODIS, POLDER, and POLDER-3, and dust in POLDER-3, and MODIS. Our method can help to reveal the relative strengths of each method.

2. Aerosol classification method
This poster uses AERONET data in two ways: (1) To illustrate how Mahalanobis classification works with a variable number of parameters and (2) to determine how changing aerosols observed by the POLDER-3 aerosol products on the PARASOL spacecraft.

1. Aerosol optical parameters in relation to aerosol types
In Russell et al. (2015), we showed that correlations between aerosol properties (e.g., extinction, backscatter) and aerosol classification can be found by using remote radiometric measurements of aerosol layers (e.g., AERONET, POLDER, POLDER-3). We used the POLDER-3 aerosol indices to classify aerosols into several types (based on aerosol properties), and found that the aerosol classification lead to errors, as exemplified by Fig. 1d, in which Alaskan wildfire smoke in MODIS, POLDER, and POLDER-3, and dust in POLDER-3, and MODIS. Our method can help to reveal the relative strengths of each method.

1. Background and goal
In some condition, aerosol type can be identified in imagery from a single wavelength (e.g., POLDER-3, Fig. 1a) in other cases (e.g., Fig. 1b) in a number of aerosol type based on several wavelengths. However, for global aerosol measurement, many measurements are used to classify aerosol types. The work presented here analyzes aerosol classification using data from multiple aerosol measuring instruments, relying on both aerosol and optical properties. A two-dimensional (2D) aerosol classification method was used to classify aerosol observations from an urban-industrial site in FORTH-Crete, Greece. The method used a modified Mahalanobis distance, defined the pre-specified clusters (Table 2) using parameters retrieved from AERONET, and identified a priori information can include clustering (e.g., Hoose et al., 2009). One can see that aerosol types are incorrectly classified by the POLDER-3 operational classification. However, using our method, aerosol classification lead to errors, as exemplified by Fig. 1d, in which Alaskan wildfire smoke in MODIS, POLDER, and POLDER-3, and dust in POLDER-3, and MODIS. Our method can help to reveal the relative strengths of each method.

4. Application to POLDER-PARASOL Retrieved Aerosol Parameters
Hasekamp et al. (2011) describe retrievals of aerosol properties from pixels viewed by the POLDER-3 polarization on the PARASOL spacecraft. Table 1 lists the properties retrieved, their spatial resolution, and the aerosol classification algorithm. We applied our classification method to aerosol parameters retrieved from observations of Hasekamp et al. (2011) algorithm, which uses more wavebands and includes particle non-sphericity (though in a different way than the AERONET algorithm). Our aerosol classification uses a parameter, the IRI (Imaginary Refractive Index) values of the aerosol layers, and Polder-retrieved uncertainties are used in the analysis. For this analysis, we use the POLDER-3 aerosol classification results as a pseudo-classifier. We find that the aerosol classification results can be improved by using the POLDER-3 aerosol classification results as a pseudo-classifier. We find that the aerosol classification results can be improved by using the POLDER-3 aerosol classification results as a pseudo-classifier.