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Trend Analysis of the Aerosol Optical Thickness and Ångström Exponent Derived from the Global AERONET Spectral Observations

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The routine aerosol monitoring using ground-based observations is important not only to control the air quality for human health, but also to assess the aerosol radiative budget on Earth. In particular, the large increase of anthropogenic aerosols in recent years has become one of the biggest uncertainties in the climate forcing assessment. In this study, linear trends of Aerosol Optical Thickness at 440, 675, 870, and 1020 nm as well as Ångström exponent determined in the spectral range 440-870 nm have been derived using AERONET spectral observations, having a long observation history with more than five years. Additionally, temporal AOT trends of coarse- and fine-mode dominated aerosols have been estimated by applying aerosol classification with an accurate Ångström exponent and its spectral curvature. In order to take into account the main effect of cloud disturbance in the observation, the weighted trends by monthly standard deviation and observation number are introduced in this study. Temporal increase of fine-mode dominated aerosol prevails at the stations in or near the emerging economics or burning agriculture regions over East Asia and South Africa. At the typical desert and oceanic stations, an increase or decrease of coarse-mode dominated aerosol with respect to the meteorological conditions is observed. On the other hand, insignificant or negative trends in the fine-mode dominated aerosol are detected over West Europe and North America.