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Linear Long-term Trend of Aerosol Optical Thickness derived from SeaWiFS and MERIS using BAER over Several Regions

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Global aerosol monitoring using satellite observations has been performed over past decades to investigate aerosol's role on the air quality for human health and the radiative forcing for the Earth climate system. Using BAER (Bremen AErosol Retrieval), this study has derived linear long-term trends of AOT (Aerosol Optical Thickness) (at 443 and 555 nm) with SeaWiFS (Sea-viewing Wide Field-of-view Sensor) and MERIS (MEdium Resolution Imaging Spectrometer) data. The AOT trends have been analyzed in specific regions (BeNeLux, Po Valley, Eastern Europe, Eastern Mediterranean in Europe, and Pearl River Delta in South China), which are densely populated and mainly influenced by anthropogenic aerosol sources (urban and industrial pollutants). In order to validate the retrieved AOTs and their trends, AERONET level 2.0 data have been used. The comparison results at AERONET sites Lille, Ispra, Venice, and Crete located within the selected regions, showed good correlations. Furthermore, BAER AOT trends were similar to AERONET after recovering non-representative monthly AOTs in cloudy seasons (winter for European regions and summer for Pearl River Delta). In general, negative trends were observed during most of the seasons in all European regions (BeNeLux, Po Valley, Eastern Mediterranean, and Eastern Europe). Meanwhile, the trend in Pearl River Delta was positive caused by a rapid economical development. The derived long-term trends might be influenced, however, by aerosol retrieval accuracy in BAER as well as cloud uncertainties, which are thin cloud contamination, misclassification of heavy aerosol loading as clouds, and bias in aerosol sampling due to non-retrieval for cloudy pixels.