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Global dimming or regional dimming - anthropogenic effects on solar insolation

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Anthropogenic aerosol emissions could contribute significantly to the decrease of surface solar radiation from the 1950s to the 1980s, widely termed solar dimming. The global-scale analysis of year-to-year variations of solar radiation fluxes showed that solar dimming is dominated by the large urban sites (Alpert et al, GRL, 2005). On a global scale, we can now quantify this effect: dimming becomes totally significant (from -0.16 to -0.27 W/m^2/year) when maximum population density is higher than 50 person/km^2. Furthermore, at middle latitudes higher than 40^{o}N, dimming formation is more pronounced as compared with that at low latitudes. At middle latitudes, dimming becomes totally significant when maximum population density is higher than 10 person/km^2. In contrast, at low latitudes (40^{o}S – 40^{o}N), increasing tendencies (brightening) are the essential feature in solar radiation trends, over the areas where population density is lower than 20 person/km^2. These increasing tendencies change to declining ones, when maximum population density is almost 30 times higher (300 person/km^2) than that at middle latitudes.