



## **Variability and trends of the frequency of “very good” visibility days (higher than 10km) in Italy (1951-2017)**

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Passing through the atmosphere, the sunlight is reduced by the interaction with atmospheric gases and aerosol particles, which can absorb or scatter the light. Therefore, a change in visibility, defined as the maximum distance at which the outlines of a target can be recognized against the horizon, is connected to a variation in the optical properties of the atmosphere and aerosol load. For these reasons, visibility can be considered as an indicator of air quality over an area, with the advantage to have data since mid 20th century when no aerosol data series are available. For the Italian territory, a huge amount of visibility series is available even if they are not analyzed yet. They can be recovered from the National Air Force Meteorological and Climatological service (Servizio Meteorologico dell'Aeronautica Militare) since the beginning of 1950s with sub-daily resolution (8 values per day).

During this work, a strong effort has been done to check the quality of the data in order to obtain reliable climate time series. The analysis of frequency of days with visibility higher or lower than a certain threshold (e.g., 1; 2; 5; 10; 20km) and the identification of the underlying causes is in progress. Here, the frequency of days with visibility higher than 10 and 20km at 12UTC (time of the day during which the visibility is maximum and the effect of factors like humidity is minimum) is analyzed to study the variability and trends under “very good” conditions and to investigate how visibility can be used as proxy variable for atmospheric transparency. The frequency of days with visibility higher than 10km over the 1951-2017 period depends on the considered region reflecting the atmospheric composition of each area. The mean visibility is higher at high elevation and increases from north to south. Moreover, the mean series, over the whole considered period, show a decreasing tendency (“global dimming”) until the mid of 1980s and an opposite trend (“brightening period”) in the subsequent period in agreement with the increase and the following decrease in aerosols concentrations observed in many areas of Europe. In particular, the trends are stronger for low than for high elevations (where almost no signal is observed) and in the north (where the Po Valley, one of the most polluted areas in Europe, is located) with respect to the south.