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A survey of total gaseous mercury and ozone during spring and summer 2018 after characterization of air masses at the Col Margherita Atmospheric Observatory (2543 m a.s.l.) in the Italian Dolomites

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Mercury (Hg) and its compounds have long been known to be toxic to human health and the environment[1], whilst ozone (O_3) is highly relevant to the Earth's climate, ecosystems and human health[2]. Measurements of Hg and O_3 in alpine environments are pivotal when evaluating air quality in natural ecosystems as well as when trying to understand regional and synoptic atmospheric transport regimes and advection of air pollutant to the Alps[3]. This study is crucial for the evaluation of the Hg exchange processes between soil and atmosphere in a high altitude alpine environment, where increasing Hg snowpack concentrations occur during winter time, followed by Hg release to the overlying atmosphere during spring and summer[4] time snowmelt events. In this context, evaluating the gas phase reaction between elemental mercury and ozone[5] is essential. All the experimental activities were performed at the CNR-IDPA atmospheric observatory at Col Margherita (CMA) that is located in the Italian southeastern Alps, a UNESCO protected region far from anthropogenic and natural sources of air pollutants (altitude 2543 m a.s.l., 46°22'0.6" N, 11°47'30.9" E). The observatory is equipped with a complete weather station. Total Gaseous Mercury (TGM) was measured from March to August 2018 using a Tekran 2537B (Tekran Inc.), a mercury analyzer that alternately samples TGM on two gold traps and determines it using cold vapor atomic fluorescence spectrometry (CVAFS). During the same period, near-surface O_3 measurements were performed with a Thermo 49c UV photometric analyzer (Thermo Corp.), according to WMO/GAW guidelines. For the purpose of the present study, daily and monthly levels of hourly Hg and O_3 concentrations were assessed. Relationships with meteorological parameters (T, RH, P, WS, WD, solar radiation, snow) were investigated by performing a back trajectory atmospheric reanalysis using HYSPLIT for the duration of the measurement campaign. The results showed that Hg concentrations increase, on average, from spring to summer, with some episodes of rapid daytime increase or decrease of atmospheric Hg that could be related to both the O_3 variability and specific weather conditions.

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