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Aerosols and gases concentrations observed at Stelvio National Park (Italian Alps) during summer conditions

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Three summer fields campaigns were carried out during 2009, 2010 and 2011 in two sites in the area of Stelvio National Park (SNP), Central Italian Alps. Those activities were performed in the frame of the SHARE – Stelvio project (Station at High Altitude for Research on the Environment). SNP includes an extensive impervious territory of valleys and high mountains, up to 3900 m asl. Two high altitude sampling sites, Rifugio Guasti (3285 m asl) and Forni glacier (2700 m asl), have been picked out for collecting the main atmospheric parameters: the first site hosted the field campaign in 2009 and 2010 and was located at Cevedale pass, at the border between Lombardia and Trentino-Alto Adige regions, while in 2011 the measurements were carried out on Forni glacier surface, in a N-S oriented valley, through SHARE-box, a portable and autonomous unit for atmospheric measurements developed in the framework of SHARE project.
Because of different location Rifugio Guasti is an ideal site to monitor long range transport on Southern slope of Alpine range, while Forni glacier is more affected by local influence of valley and glacier breezes. Monitored parameters concerned (i) meteorology, such as air temperature, relative humidity, wind speed and direction, air pressure, (ii) chemical and physical properties of the aerosols (number concentrations, size distribution and chemical composition) and (iii) , gases concentration (CO_2, O_3).
This work is aimed at describing the behaviour of these compounds, in terms of concentration observed over different time scales, such hourly and daily, in order to investigate the impact of transport processes (i.e. air masses transports arisen from both "thermal" breezes or synoptic circulation) on aerosols and gases variability at SNP.
The Alps face the Po Valley, one of the more populated and industrialized region in Europe. This is one of the most probable source of polluted air masses which spread towards high altitude sites, such as Alps and Apennines, according to the dominant wind direction and the planetary boundary layer depth. In fact during summer-time, when the convective boundary layer is well developed, the measurement could be affected by air masses travelling along Tellina Valley and from the urbanized Po Valley and vegetated belt, spreading towards the high elevation of Alpine Southern slope, strongly affecting the tropospheric conditions and resulting in a typical diurnal cycle.
On the other hand, as will be shown in this work, the long-range transport related with synoptic circulation may affect air-mass composition at the SNP. In fact several episodes of mineral dust transport coming from Northern Africa and air-masses descending from the upper troposphere or the low stratosphere has been observed. Long range transport of polluted air masses from continental Europe may also affect the pristine air conditions at SNP.