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SIMULTANEOUS MEASUREMENT OF NITRIC AND NITROUS ACIDS BY MEANS OF A NOVEL MULTIPOLLUTANT DIFFUSIVE SAMPLER

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The study of the "family" of nitrogen containing compounds, including nitrogen oxides, nitrous and nitric acid, PAN, is important to clear the relative abundance, role, of possible harmful potential and impact on indoor and outdoor air quality.
The importance of indoor monitoring in environments devoted to conservation of artifacts, in particular books and manuscripts, such as libraries and archives was emphasized in previous works [1]. Damage to paper due to the presence of acidic species was studied both in artificial [2] and in real conditions.
A well established and known technique to collect these atmospheric trace gases is represented by denuder sequence based systems employed to sample the species separately and to avoid mutual interferences, but this technique is time consuming and labor intensive. Diffusive sampling can overcome these problems since it represents an easy to use technique which exploits the spontaneous diffusion of species collected by specific absorbing media.
Recently a novel "multipollutant" diffusive sampler was designed for simultaneous sampling of three different pollutants (nitric acid, nitrous acid and nitrogen dioxide) collected at separate sampling stages.The sampler has been employed to perform measurements at two locations in the Czech Republic, National Archives in Prague and Regional Library at Teplice. Both locations represent a different outdoor environment with high traffic load in Prague and high load of industrial emissions at Teplice. The outdoor measurements in Prague have been performed on balcony of building oriented to busy street (OUT), indoor measurements have been done in room of the "Bohemian tables (BT)" and in room of "Archives of the Czech Kingdom (ACK)". The first room contains "Bohemian tables" date since 1541 (the oldest part since 1278 was burnt during the great burning in Prague in 1541), the second room collects manuscripts of the Czech Kingdom since the twelve century. Both rooms have its own HVAC system. The Regional Library at Teplice is located in chateau in the center of city and contain Cistercian monastery library in Osek, former chateau library of Clary-Aldringens, and the collection "Goethe-Schiller". Monitoring scheme is in Table 1.

Table 1. Monitoring Scheme.

Location	Sites	Season	Dates	Pollutants investigated
Prague	IN 1 (BT)	Spring	04/08-05/10/2013	SO_2, O_3, NH_3, NO_2, HNO_3, HONO HCOOH, CH_3COOH PM
			05/10-06/11/2013	
	IN2 (ACK)	Winter	ongoing	
	OUT			
Teplice	IN	Spring	04/09-05/09/2013	
			05/09-06/10/2013	
	OUT	Winter	ongoing	

The measurements have been carried out using diffusive samplers Analyst for SO_2, O_3, NH_3, NO_2, HNO_3 and IVL samplers for formic and acetic acids. Additional measurement has been provided through the parallel exposure of the multipollutant sampler in the case of NO_2 and HNO_3.
Preliminary results collected at present indicate that NO_2 concentration values were higher, as expected, in Prague, the I/O ratios calculated both for NO_2 and HNO_3 showed a greater penetration of pollutants indoors at Teplice and can possibly indicate the effectiveness of the indoor air treatment unit installed in Prague's archive. HONO concentration values were, as expected, lower outside at both of the sites.

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