

The Implementation and adaptation of an (DENuder for Long-Term Atmospheric sampling (DELTA) for a Brazilian network.

Stéphane P. Crispim¹(TM), **Roberta L. M. Alcaide**¹(PG), **Maria C. Forti**¹ (PQ)*, **Carlos D. Meneghetti**¹(TM), **Stefânia Marques**¹(IC). **José R. Chagas**¹(TM). (¹Instituto Nacional de Pesquisa Espaciais/ Centro de Ciência do Sistema Terrestre – INPE/CCST).

stephane.crispim@inpe.br; roberta_alcaide@yahoo.com.br; *cristina.forti@inpe.br; daniel.meneghetti@inpe.br; stefania_tec@hotmail.com; jrchagas05@gmail.com.

Keywords: DELTA, denuder, gaseous and particulate.

Introduction

The atmospheric sampling system described in this study is an adaptation of the DELTA system (DENuder for Long-Term Atmospheric sampling) developed by Sutton et al.¹ which is based on diffusion tubes. The system is constituted by a train of denuders and filters designed for sampling the gaseous phase of NH_4^+ , NH_3^- (HNO_3 , HONO, NO_2), SO_2 (as SO_4^{2-}), and HCl (as Cl^-) and particulate phase of Na^+ , K^+ , Mg^{2+} , Ca^{2+} , NH_4^+ , NO_3^- , SO_4^{2-} and Cl^- . In portuguese we named it as “Sistema de Amostragem de Aerossóis por Denuder – SAAD²”.

The sampling system is based on the concept that says: “when a laminar flow of gas pass through a diffusion tube (denuder) coated with an acid, alkaline species (gas) is captured by the internal walls”, and subsequently they can be extracted in the laboratory for its quantification. In the case of a denuder coated with and alkali, a gas phase of an acid will be captured. The particulate in the air stream by its turn will be captured on a cellulose filter placed downstream of the denuder. The separation between the gas and particulate phase occurs because the gases diffuse faster in the denuder walls than the particles. For this system, the field-sampling period can be extended up until to three weeks, depending on the concentration species in the atmosphere.

Results and Discussion

The DELTA system consists in a train of denuders for gas sampling and a two-stage filter holder for particle sampling. This train is coupled to a flowmeter (with a capacity of $1.5 \text{ L}\cdot\text{min}^{-1}$), a vacuum pump (with flow between 0.3 and $0.4 \text{ L}\cdot\text{min}^{-1}$) and a high sensitivity gasmeter. The low sampling rate allows the use of small glass denuders, ca $10 - 15 \text{ cm}$ in length, which is the optimal length to reach up to 99% efficiency in capturing the gases of interest.

The equipment installation in the field requires a shelter set on the floor, while the train of denuders and filters must be placed inside a PVC case, which is coupled in a fixed pole near the shelter (the air intake level should preferably be about 1.50 m from

the ground level). In our adapted system, the pump is powered with batteries coupled to a solar panel. This setting allows the field operator not come in direct contact with the sampling system, thus minimizing contamination also this design allow the case to be safely transported by post office or courier.

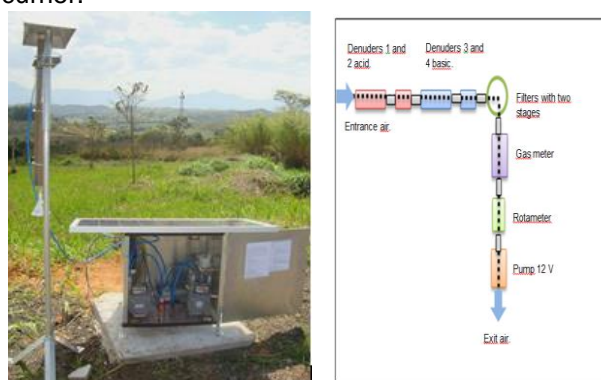


Figura 1. DELTA/SAAD System in the field.

Conclusion

The configuration presented here and the equipment used for its assembly met the expectations of its operation, providing satisfactory results for all sites where the sampling procedure is in progress except in São Paulo city where some discrepancies were found and we understand that are due to high concentrations of the species of interest. Thus, a larger number of sampling tests is planned to ensure the proper functioning of the system in this site.

Acknowledgement

Fapesp Proc. 2012 / 06416-1 for financial support, MCTI through the PCI program, and E.Honda, M.Ranzini, J.C.dos Santos, R.Ribeiro, S.R.de Souza, G.Pedrosa, A.P. Barbassa, J.B. Rosa, A.F. de Souza for field support.

¹ Sutton M.A., Tang Y.S., Miners B. e D. Fowler, Water, Air and Soil Pollution. Focus, 2001, 1(5/6), 1456.

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