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Atmos. Chem. Phys., 5, 583-595, 2005  
www.atmos-chem-phys.net/5/583/2005/  
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## Measurements of total odd nitrogen ( $\text{NO}_y$ ) aboard MOZAIC in-service aircraft: instrument design, operation and performance

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**Abstract.** A small system for the unattended measurement of total odd nitrogen ( $\text{NO}_y$ , i.e., the sum of NO and its atmospheric oxidation products) aboard civil in-service aircraft in the framework of MOZAIC is described. The instrument employs the detection of NO by its chemiluminescence with  $\text{O}_3$  in combination with catalytic conversion of the other  $\text{NO}_y$  compounds to NO at 300°C on a gold surface in the presence of  $\text{H}_2$ . The instrument has a sensitivity of 0.4-0.7cps/ppt and is designed for unattended operation during 1-2 service cycles of the aircraft (400-800 flight hours). The total weight is 50kg, including calibration system, compressed gases, mounting, and safety measures. The layout and inlet configuration are governed by requirements due to the certification for passenger aircraft. Laboratory tests are described regarding the conversion efficiency for  $\text{NO}_2$  and  $\text{HNO}_3$  (both >98%). Interference by non- $\text{NO}_y$  species is <1% for  $\text{CH}_3\text{CN}$  and  $\text{NH}_3$ , <5x10<sup>-5</sup>% for  $\text{N}_2\text{O}$  (corresponding to <0.2ppt fake  $\text{NO}_y$  from ambient  $\text{N}_2\text{O}$ ) and 100% for HCN. The time response of the instrument is <1s (90% change) for  $\text{NO}_2$ . The response for  $\text{HNO}_3$  is nonlinear: 20s for 67%, 60s for 80%, and 150s for 90% response, respectively.

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Citation: Volz-Thomas, A., Berg, M., Heil, T., Houben, N., Lerner, A., Petrick, W., Raak, D., and Pätz, H.-W.: Measurements of total odd nitrogen ( $\text{NO}_y$ ) aboard MOZAIC in-service aircraft: instrument design, operation and performance, Atmos. Chem. Phys., 5, 583-595, 2005. [Bibtex](#) [EndNote](#) [Reference Manager](#)

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