Atmospheric moisture collection from a continuous air flow through a refrigerated coil tube

L. Cáceres\textsuperscript{a,*}, J. Delatorre\textsuperscript{b,1}, B. Gómez-Silva\textsuperscript{a},
V. Rodríguez\textsuperscript{a}, C.P. McKay\textsuperscript{c,2}

\textsuperscript{a}Universidad de Antofagasta, Avenida Angamos 601, Antofagasta, Chile
\textsuperscript{b}Universidad Arturo Prat, CHDE Avenida Arturo Prat 2120, Iquique, Chile
\textsuperscript{c}Space Science Division, NASA Ames Research Centre, Mail Stop 245-3 Moffett Field, CA 94035, USA

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Abstract

A controlled airflow circulating through a coil tube maintained at sub-ambient temperatures allows moisture to condense as water droplets with subsequent adhesion onto the internal tube walls. At the same time, water droplets scavenge fine particulate matter and dissolve a fraction of the gaseous pollutants. The accumulated water in the coil is amenable for collection and chemical inspection to yield information about the presence of pollutants in the air. Based on this principle, an experimental apparatus was developed to collect and analyze ambient humidity at different sites of the Atacama Desert in Northern Chile. Moisture collection experiments lasting from 3 to 24 h were carried out with condensing temperatures ranging from $-20$ to $0 \degree C$. Under all experimental conditions, the amount of collected water was between 60\% and 90\% of the total removable water. Sodium was present in all collected water samples and reached values up to 4 g l$^{-1}$. Practical details, theoretical considerations and the potential use of the proposed method in characterizing specific air pollutants are discussed.

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* Corresponding author. Fax: +56-55-24-0152.
$E$-mail addresses: lcaceres@uantof.cl (L. Cáceres), jose.delatorre@unap.cl (J. Delatorre), cmckay@arc.nasa.gov (C.P. McKay).
\textsuperscript{1} Fax: +56-55-49-5190.
\textsuperscript{2} Fax: +1-650-604-6779.