Application of a microscopic chemical imaging system to characterize ambient particulate matter

ESMAEEL MASADEH AND ALAN W. GERTLER*

Desert Research Institute, 2215 Raggio Parkway, Reno, NV 89512 (*correspondence: alang@dri.edu)

Many urban and industrial areas suffer from high levels of ambient PM_{10} and $PM_{2.5}$. In order to evaluate the health impacts of the particulate matter and develop effective pollutant abatement strategies, one needs to know the source contributions to the observed concentrations. The most common approach involves the collection of ambient air samples on filters followed by laboratory analysis (IC, AA, XRF, automated colorimetry, thermal/optical reflectance for OC/EC, and GC/MS for PAHs) and application of receptor modeling methods such as the chemical mass balance receptor model (CMB). This process is expensive and time consuming. One possible method for physically characterizing and apportioning the sources of ambient PM is the application of microscopic chemical imaging (MCI) to identify and apportion the sources of ambient particulates.

The MCI method involves measuring individual particle fluorescence coupled with morphological data to develop unique source profiles that form the basis of a source identification library. Ambient filter samples can then be analyzed using the MCI method and source attribution based on individual particle analysis followed by identification using the source library. Using this approach, the apportionment of ambient PM to specific sources can be performed in near real time. In this paper we describe the MCI technique and present the results of efforts to apply the technique for aerosol characterization and source apportionment.

Calculation of cosmogenic nuclide production rates in the Earth atmosphere and in terrestrial surface

JOZEF MASARIK

Komensky University, Mlynska dolina F1, SK - 842 48 Bratislava, Slovakia (masarik@fmph.uniba.sk)

Introduction

Considerable progress has been achieved in calculations of GCR particles production and transport in the atmosphere and in the Earth surface by Monte Carlo approaches [1-3]. Results of such simulations are presented here.

Calculational Methods

Production rates were calculated using depth dependent proton and neutron differential spectra within the atmosphere [2] calculated by the GEANT and MCNP codes. Cross sections used were the same as used in recent calculations for stony meteorites [3]. Production rates were calculated for present geomagnetic field intensity and solar GCR modulation parameter of 550 MeV that was proposed as long-term averages of solar GCR modulation [3].

Results

Calculated globally averaged production rates are compared with values obtained by different calculations In Table 1. Significant differences in obtained results are obvious from the table. One reason of the differences can be attributed to the cross sections, mainly for neutron induced reac-tions. This underscores the importance of their further investigations.

GCR modulation parameter	Globally averaged production rate		Ref
	^{10}Be	^{7}Be	
$\Phi = 630$ MeV	0.045	0.081	[4]
$\Phi = 550$ MeV	0.0201	0.0129	[1]
$\Phi = 550$ MeV	0.0184	0.0354	[2]
$\Phi = 550$ MeV	0.0209	0.0402	this

Table 1: Calculated globally averaged production rates [atoms cm^{-2} s^{-1}] of atmospheric ^{10}Be and ^{7}Be.

[1] Reedy & Masarik (1995) *EPSL* **136,** 381–395. [2] Masarik & Beer (1999) *JGR* **D104**(10) 12099–13012. [3] Leya *et al.* (2000) *Meteoritics & Planet. Sci.* **35,** 259–286. [8] Lal & Peters (1967) *Handbuch der Physik* **XLVI/2**, Springer, Berlin, 551–612.