Ethanol Variability in Rainwater and its Impact on the Chemistry of the Troposphere

R.J. KIEBER[1], J.D. WILLEY[1], G.B. AVERY[1], R.N. MEAD[1], F.F. GIUBBINA[2] AND M.L. CAMPOS[2]

[1]University of North Carolina Wilmington, Department of Chemistry and Biochemistry, Wilmington, NC USA 28403 (*correspondence: kieberr@uncw.edu)

[2]Departamento de Química, Faculdade de Filosofia, Ciências e Letras de Ribeirão Preto, Universidade de São Paulo, Av Bandeirantes, 3900, 14040-901 Ribeirão Preto, SP, Brazil

We present the first detailed analysis of the occurrence and variability of ethanol in precipitation collected in coastal North Carolina (NC) USA and at the Universidade de São Paulo, Brazil. Concentrations ranged from 23 nM to 908 nM with a volume weighted average (VWA) concentration of 193 nM at the NC collection site (n=52). The VWA concentration of ethanol is more than an order of magnitude higher (2.7 μM) in Brazilian rain (n=40) relative to the NC site with the highest concentrations exceeding 10 μM. There was a great deal of variability in the abundance of ethanol between rain events at both sites driven primarily by temporal and air mass back trajectory influences.

The presence of significant quantities of ethanol in precipitation has important implications for fundamental properties of atmospheric waters including the oxidizing and acid generating capacity of the troposphere, photochemical smog formation, as well as indirect effects on solar radiative transfer and light attenuation. Also, because rainwater is an important mechanism by which CH_3CH_2OH is transported from the atmosphere to surface waters, greater wet deposition of ethanol from increasing biofuel usage could dramatically influence the biogeochemistry of receiving watersheds which typically have concentrations one to two orders of magnitude lower than rainwater.

Factors affecting fractionation of Ni and Cr in ultrabasic soils from southwestern Poland

J. KIERCZAK[1], A. PĘDZIWIATR[1], J. WAROSZEWSKI[2], AND R. TYSZKA[2]

[1]University of Wrocław, Institute of Geological Sciences, Cybulskiego 30, 50-205 Wrocław, Poland; jakub.kierczak@ing.uni.wroc.pl, artur_pedziwiatr@op.pl

[2]Wrocław University of Environmental and Life Sciences, Department of Soil Sciences and Environmental Protection, CK Norwida 25/27, 50-375 Wrocław; jaroslaw.waroszewski@gmail.com, tyszkarafal@gmail.com

Weathering of ultrabasic rocks, naturally enriched in some trace elements (e.g., Ni and Cr) leads to the formation of soils having distinctive properties caused primarily by a specific chemical composition of parent rocks. The parent ultrabasic rocks commonly cause infertility of serpentine soils, which results from the low ratio of calcium to magnesium, and the high content of Ni and Cr in the parent rock and the soil.

We have analysed shallow and well drained soils (Leptosols) developed on a variety of ultrabasic rocks, from hornblende peridotite through partially serpentinized peridotite to proper serpentinite. The Ni and Cr concentrations in soils decrease upwards in analysed pedons and range from 72 to 2350 ppm for Ni and 160 to 3500 ppm for Cr. Studied ultrabasic soils have similar physicochemical charcteristics (e.g., slightly acidic to neutral pH, clay content approximately 10% etc.) however mineralogical composition seems to be strongly influenced by different types of ultrabasic roks. Soils developed on peridotites have more complex mineralogy and contain important proportions of swelling phases (smectite, vermicullite, interstratified chlorite/smectite) whereas only traces of swelling phases were detected in soil derived from serpentinite. Fractionation of Ni and Cr, estimated using the 0.05 M EDTA, aimed to determine the easily mobilizable proportions of these elements. In all studied soils proportions of Ni-EDTA extractable (5-42% of total Ni) are larger than proportions of Cr-EDTA extractable (1-7% of total Cr). The highest proportions of EDTA extractable fractions of both Ni and Cr were noted in topsoil horizons of all studied soils. Soils developed on peridotites have hihger proportions of Ni-EDTA extractable than soils derived from serpentinite.

Our study shows that type of parent rock strongly influence fractionaction of Ni and Cr in ultrabasic soils, however other factors (e.g., organic matter content, local climatic conditions etc.) should also be taken into account.

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