Non-stoichiometric dissolution of biotite: A preliminary RBS-study

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Non-stoichiometric release of elements is commonly observed during laboratory weathering of aluminosilicates and constitutes one of the difficulties in extrapolating laboratory weathering rates to natural conditions and long time-scales. We compare the surface composition of weathered and unweathered biotite using Rutherford Backscattering Spectrometry (RBS). The biotite was weathered in batch reactors for 1-20 days at room temperature in an ionic medium with specified pH.

Figure 1 shows typical RBS spectra for weathered and unweathered samples with the analyzing beam normal to basal planes. Steps in the spectra correspond to elements on the biotite surface, as annotated. After weathering, the potassium step has disappeared, indicating almost complete depletion of potassium from upper surface region (~0.5 µm). Iron is also depleted (but not completely), consistent with preferential leaching of iron from the surface.

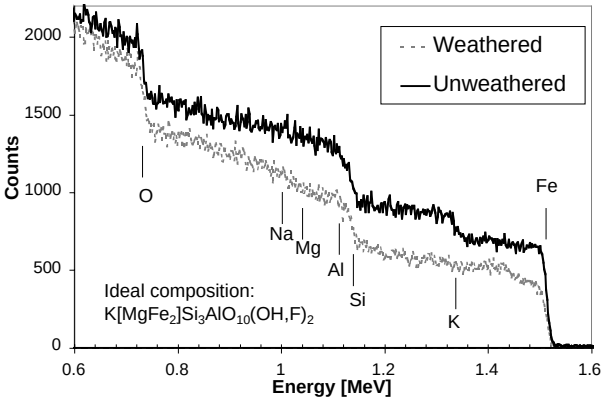

Figure 1: RBS spectra of basal planes of unweathered biotite and biotite reacted for 20 days in 0.5 M $NaNO_3$ at pH 2.

The depletion of potassium and iron increases with time. It is enhanced in Na^+-medium but suppressed in K^+-medium. This indicates a coupling between ion-exchange and dissolution stoichiometry. We conclude that RBS has the potential to provide important information for assessing the biotite weathering mechanism and for evaluating conceptual models for progression to congruent dissolution.

Carbon isotopes in detecting urban pollution in Rome

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To test the reliability of ^{14}C as a biomarker of atmospheric pollution, we carried out measurements on leaves of evergreen species (*Quercus ilex* L., *Pinus pinea* L.) sampled in an urban park of Rome (Villa Ada) and in three reference localities outside of the city in a three-year period (1995-97). $r^{14}C$, $\delta^{13}C$, Pb concentration, net photosynthesis and leaf fluorescence of chlorophyll-*a* are analysed.

In the figures are shown results obtained for Villa Ada holm-oaks sampled along a transect from an intense vehicular traffic road to the inner park.

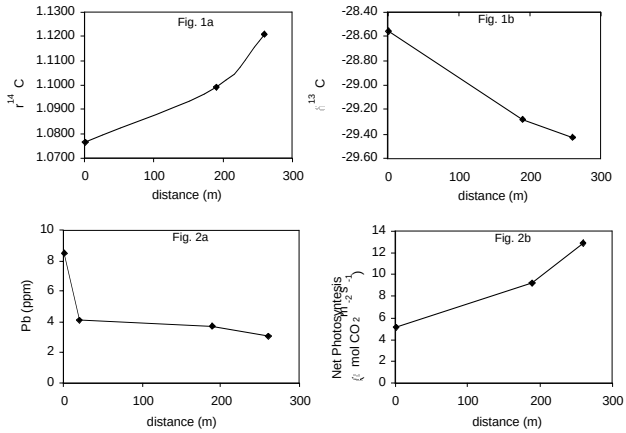

Fig. 1a, b: mean $r^{14}C$ and $\delta^{13}C$ values in Villa Ada holm-oaks leaves vs distance from road; Fig. 2a, b: Pb concentration and net photosynthesis trends vs distance from road.

Our data show that $r^{14}C$ is in close relationship with CO_2 of anthropic origin, while $\delta^{13}C$ shows a similar pattern in Villa Ada park, but different features in reference localities, suggesting that it is conditioned by many other environmental factors**.** Pb and ecophysiological para-meters are strictly influenced by environmental pollution.

Conclusions

Results show that Radiocarbon is an useful tool in environmental studies, allowing to quantify the contributions of CO_2 of anthropic origin. This parameter, together with appropriate chemical and ecophysiological analyses, could be able to provide a good indication of the «air quality» in urban and rural contexts.

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