Mineral and chemical composition of aeolian material from the Tatra Mts. (S Poland)

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Studies of aeolian dust are important in interpretation of airborne dust source, transport, concentration, formation of aerosols, climatic effects of aerosols, and their contribution in soil formation.

Aeolian material deposited with snowfall during the night 23/24 March 2007 was collected on 25th March 2007 at the Hala Gąsienicowa meadow (1510 m a.s.l.) in the Tatra Mts. (S. Poland). Dust is composed mainly of quartz with subordinate amount of feldspars (both plagioclases and K-feldspar), micas, I/S minerals and traces of kaolinite. Grain size varies from below 1 µm to 25 µm. Aggregates composed of mica and quartz grains, often containing organic matter and iron oxides, are common. Determination of the source area of the dust is impossible based on mineral and chemical composition

Pollen of trees and shrubs (Alnus, Pinus, Betula, Corylus, Carpinus, Acer, Ulmus, Picea, Fagus, Salix) and herbs (Compositae, Cyperaceae, Chenopodiaceae, Caryophyllaceae) determined in the dust represent local vegetation from the Carpathian Mts.

Several dust falls were noted in S Poland in XIX and XX centuries. Source area was localized usually in the area between Black Sea, Sea of Azov and Caspian Sea. Dust material deposited in 2007, derived from local source area in Carpathians, is very similar in mineral composition and grain size to the material from other dustfalls noted in S Poland. Lack of calcite in the local material is the only one significant difference.

Evaluating the structure of poorly-crystalline iron oxyhydroxides

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Poorly crystalline iron phases commonly form in contaminated aqueous geochemical systems such as acid mine drainage environments. In particular, the ferric iron oxyhydroxide known as ferrihydrite is an important component in both the soils and waters of these systems due to its tendency to scavenge potential environmental contaminants. With individual particle sizes typically less than 10 nm, ferrihydrite exhibits a large amount of reactive surface area and is known to associate with metal and metalloids via processes of coprecipitation and adsorption. The reactivity of this phase is therefore important in controlling the fate and transport of contaminants in the environment. The increased reactivity of ferrihyrite and other nanosized phases is inextricably related to atomic structure. Conventional methods of structure determination are generally inadequate for quantitatively evaluating the 3-dimensional arrangement of atoms in nanosized solids. However, the recent application of high energy X-ray total scattering for pair distribution function analysis has led to considerable advancements in our understanding of the structures of both synthetic and natural samples of ferrihydrite. In the case of naturally occurring samples, this phase often precipitates under complex conditions and in aqueous systems containing a variety of species including organics, metals, and metalloids. The effects of these species on the resulting poorly crystalline precipitates are only partly understood. New results on samples collected from acid mine drainage sites build on recent work conducted on fully synthetic ferrihydrite and provide new insight into the structure of this important phase.