Geophysical Research Abstracts,
Vol. 10, EGU2008-A-09632, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-09632
EGU General Assembly 2008

An Oligocene regolith preserved on top of the Sesia Zone, Western Italian Alps

N. Kapferer (1), A. Berger (1), I. Mercolli (1)
(1) Institute of Geological Sciences, University of Berne, Switzerland

A regolith occurs in the internal part of the Sesia Zone in the region of Biella (Piemonte, NW Italy). It is exposed in several outcrops between the underlying Alpine metamorphic rocks of the Sesia Zone and Oligocene lavas on top. In the literature, these rocks were interpreted as ìbasal-conglomerateî of the volcanic rocks, but different observations indicate, that these rocks represent a regolith preserved below the aforementioned volcanic sequence.

The regolith shows the typical transition to the underlying metamorphic rocks of the Sesia Zone. The detritic part of the matrix and the angular components reveal weathering structure and only local transport of fragments on inclined slopes. The fragments often indicate that a former compact rock fractionalized and its single components are slightly shifted against each other. The preserved transition between the regolith and the metamorphic bedrocks emphasizes that no tectonic contact occurs between the basement and the regolith. Due to later tilting of the whole area, we can conveniently investigate the regolith and its substratum in three dimensions.

The petrography of the regolith is inhomogeneous and consists mainly of fractured Sesia components. It contains angular sub-mm to several dm sized constituents incorporated into a fine-grained matrix. The regolith shows a variable size of clasts, different amount and types of matrix in lateral directions as well as in depth. Most of the fragments are characterized by dynamically recrystallized quartz, ductile deformed phengite and garnet, which are typical for the underlying Sesia metamorphic rocks. Also some local enrichment of garnet grains occurs in a matrix of secondary minerals. Other particles include rounded organic rubbles and basic volcanic rocks of

the overlying volcano-sedimentary series. The matrix consists predominantly of detritic quartz, feldspar and mica and different amount of new developed phases. These are mainly Fe-oxides, Fe-hydroxides, carbonates, clay minerals and chlorite. In addition, the regolith is locally crosscut by a network of veins and cracks filled with alteration minerals. The lifetime of the regolith has to be short, because only a small amount of new secondary phases developed. This can be well documented by rock density measurements in a profile perpendicular to the paleo-surface.

Scanning electron microscope observations show that some cavities in the regolith are filled with chlorite and illite. The crystal structures of the alteration minerals were identified by using X-ray diffraction (XRD), which indicates that the mineralogical composition of illite minerals consists of ordered illite/smectite mixed layers (I/S (R 1) with an illite content greater than 70%. Next to chlorite and illite vermiculite, montmorillonite, K-Na-sulfates and stilbite occur within the samples. These phases indicate temperatures higher as any normal surface temperature. The chlorite and illite formation are either related to a high temperature volcanic hydrothermal circulation close to the surface or a very low-grade metamorphic overprint after the development of the regolith. Fission track-dating on zircon and apatite and U-Pb dating on zircons of the overlying volcanic rocks will give a more precise minimum age of the regolith.

The lifetime of the regolith and its petrography give first order information about the environmental conditions of the Alps surface in Oligocene times.