Irregular retreat of tropical glaciers during the Holocene

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Causes and timing of tropical glacier fluctuations during the Holocene are poorly understood. We present a chronology for the past 11, 000 years of the Bolivian Telata glacier. We show that Telata glacier retreated irregularly. A rapid and strong melting from the maximum extent, at 10.8 ka ± 0.9, to 8.5 ka ± 0.4 ^{10}Be years was followed by a slower retreat until the Little Ice Age (LIA) while a dramatic acceleration occurred over the 20th century. A glacier-climate model and additional climate constraints indicate that annual temperatures for this region were -3.3±0.8 °C cooler at 11 ka BP and were -2.1±0.8 °C below the present value until the end of the LIA. We suggest that low-frequency warming of the eastern tropical Pacific and increased atmospheric temperature in response to enhanced austral summer insolation were the main drivers for the long-term Holocene retreat of the glacier. Future temperature projections estimate a 4°-5°C warming in the tropical Andes by 2100, a warming close to our estimate for the whole Holocene.

Mineral composition of the metallurgical slag after steel production

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Introduction

Metallurgical slags are increasingly often used as material in production of aggregates, but there are also attempts made to recover metals from them. That is why it is important to carry out research on their mineral and chemical composition, which may deliver much valuable information during an economic exploitation of slags, e.g. connected with new phases forming in a metallurgical furnace, forms of metal occurrence in slag components and possibilities of their release from slag components and migration to the environment [1, 2].

Research results

The conducted mineralogical research of slags after steel production proves that among their phase components, apart from metal concentrations (including up to 98% Fe) and glaze, oxide and silicate phases are especially interesting because of their heterogeneous chemical composition.

Oxide phases are represented by iron oxides (magnetite, hematite, wustite), chromite, ilmenite and phases with compound chemical composition. We can recognize among them oxides Ca-Mg or Ca-Ti with elements of: Cr, Mn, Fe, Zn. A common component is also a solid solution od compounds: FeO, MgO, MnO occuring in variable quantity relations, with admixtures: V, Zn, Cr, Ti and Ca.

Among silicate phases there are distinguished, among others, pyroxenes from a series of augite, monticellites, wollastonite, dicalcium silicates (larnite). Their chemical composition is considerably diversified, and often differs from the chemical composition of the same phases forming in natural conditions. Silicate phases are also carriers of heavy metals, which may be included in their internal structures or form micro-inclusions. For instance, a considerable group consists of calcium silicates with admixtures of Ti, Cr, Mn, V, Mg and P, as well as calcium silicates and aluminosilicates Ca-Fe.

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