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THE ROLE OF BASALT WEATHERING ON CLIMATE : THE SIBERIAN TRAPS

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The Siberian traps represent one of the most important flood basalt provinces on Earth. Their onset coincides with a profound faunal mass extinction at the Permo-Trias boundary (250 my ago). The volcanic eruption has also environmental and climatic effects through aerosols and gases injection into the atmosphere. Chemical weathering processes play a major role in biogeochemical cycles and climate evolution. In particular, the weathering of silicate rocks represents an important sink of atmospheric CO_2. At the million-year timescale, the volcanic release of CO_2 into the atmosphere-ocean system is balanced by its consumption during silicate weathering followed by carbonate deposition on the seafloor. Recent data have shown that chemical weathering of basalt is five to ten times more efficient than weathering of acidic silicate rocks such as granite or gneiss (Dessert et al., EPSL, 188 : 459-474, 2001). Thus the weathering of basaltic rocks consumes more atmospheric CO_2 than other silicate rocks. In the case of subaerial basaltic volcanism, an eruption not only releases CO_2 to the atmosphere, but also produces basaltic rocks which weather rapidly, enhancing CO_2 consumption rates. Currently, the Siberian basaltic traps are located in a cold and dry region. The weathering rates of this province are low, and the climatic impact is thus currently low. But in the past, the latitudinal temperature gradient was smaller. During the Permian, the climate was significantly warmer than today. Thus the chemical weathering of the Siberian traps was enhanced at that time, and this process led to a long-term impact on the Triassic climate and on the carbon cycle. The used model calculates the traps impact on the long-term carbon cycle and climate evolution. This model has been refined and adapted to high latitudes environments. We quantify the cooling caused by traps weathering.