15 Continental Weathering and River Flux of Materials

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Weathering of the continents by rivers and the consequent transport of materials to the World's oceans is one of the important processes in global biogeochemical cycles of elements. The two fundamental processes of weathering, physical and chemical act complementarily, and are controlled by tectonics, climatic change and human interferences. The dominant control of tectonics or climate on erosion are widely debated. The total river flux of sediments to global oceans is estimated to be a staggering 16-18 billion tons per year. The tectonic processes involving sea-level fluctuations, chemical weathering, volcanism, earthquakes and change in vegetation can influence global climate significantly. During the entire geological timescales, natural processes have always played a significant role in controlling the Earth's climate. The interplay between tectonic deformation, climate, continental weathering and enhanced physical erosion processes change the global atmospheric CO2. Increased atmospheric Carbon-gases are also caused due to human interferences by rapid burning of fossil fuels. The rates of chemical weathering, especially silicate rock weathering have regulated the CO2 concentration in the atmosphere by increased CO2 consumption during weathering. The process relating chemical weathering to the global cooling operates through a negative feedback mechanism; the rise of Himalayas are a good example of Cenozoic climate cooling. It has been estimated that rivers originating and draining through the Himalayas transport approximately 30% of global sediment flux. The combined mechanical weathering from the vast river systems of the Himalayan-Tibetan orogeny result in the burial of large masses of carbon and sequestering it; thus creating a situation of forced cooling trend on global climate. The present talk deals with continental weathering by rivers, controlling factors of physical and chemical weathering, laboratory experiments on mineral dissolutions and the implications on global geodynamics.