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Potassium in global river: a new perspective on the source characterization

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Until now all previous models have claimed that K in global river is primarily from leaching of silicate minerals and in small amounts from other sources that often include one or more among evaporite minerals, fertilizers, and rain waters. The model presented here gives a vastly different perspective about the sources of K in global river, pointing out the role of decay of land plants, which was never previously considered, as a very major source of K in global river. Our model emphasizes that terrestrial plant decay as a distinct geochemical entity is the single largest source of K in global river and presents a quantitative line of argument to support this claim. The premise on which the model has been constructed includes both K and Rb data on silicate minerals, evaporite minerals, rain waters, fertilizers, and plant materials. Some of the data that have been used to construct this model are already available in the literature, but some additional data we have gathered by analyzing ourselves both field samples (stream waters from a highly vegetated terrain and rain waters) and laboratory controlled substances (rocks artificially weathered and plant materials). Taking clues from ranges of K/Rb ratios of various different sources that could directly contribute K to global river and following a mass balance approach, the quantitative aspect of our model demonstrates that between 46 and 68% of K in global river comes from decay and leaching of plant materials, as opposed to about 19 to 43% that could come by way of water leaching following weathering of silicate materials. By demonstrating that decay of plants annually is the leading source of K in the global river, and not leaching of silicate minerals by ground water and surface waters to be the major source of K as all have previously claimed, we have been able to estimate that nearly 97-98% of K released from decay of plants is recycled each year into newly grown plants. The small amount of K that is transferred annually from the biosphere to the

hydrosphere is sufficient enough to make the process itself as the largest contributor of K to global river.