



The Birougou Mountains: Forested throughout the Holocene

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The Congo basin with an area of ~ 400 million ha harbours the second largest tropical forest complex of the world which covers $\sim 60\%$ of the area. Besides tropical rain forest the savannah biome comprises the second naturally abundant ecosystem type. During the Holocene (20.000 yrs. BP – Modern Times) the distribution of forest and savannas changed with changing climate and during the last glacial maximum (~ 20.000 yrs. BP) most of the Congo basin was covered by savannas and the Congolian rain forests were confined to refuge areas. Later the distribution between savannas and rainforest changed with changing climate, whereby in some regions rainforest and savannas replaced each other while on some sites one vegetation type persisted. During drier periods of the Holocene the rain forest biome was confined to refuge areas, which formed a conservation reservoir for forest re-extension during more humid, i.e. forest favourable, climatic periods. In order to understand the dynamics of the forest/savannah replacement process reference states of patches of stable savannah or stable rain forest are needed. Within this paper we will describe a patch of stable rain forest vegetation located at the Birougou Mountains in Gabon, and demonstrate that rain forest vegetation has continuously persisted since the Holocene climate optimum dated at around ~ 6.000 yrs. B.P. by using the signature of stable Carbon isotope discrimination of photosynthesis. Savannah grasses follow the C4-type of photosynthesis while forest vegetation exhibits C3 photosynthesis. Accordingly they differ in the $\delta^{13}C$ ratios of carbon incorporated into biomass. Soil organic Carbon originates from decomposition of litter inputs. $\delta^{13}C$ values along a vertical soil profile thus indicate persistence or past changes in vegetation cover. ^{14}C age of soil humic acids, indicate the mean residence time of soil organic carbon. Results indicate that at the Birougou mountains (in contrast to other parts of the Congo basin) litter input into the soil solely comprised of rain forest vegetation at least throughout the last ~ 5000 years. This indicates that the region was continuously covered by rain forest since the Holocene climate optimum and explains the high ecosystem Carbon storage within the rain forest of the Mts. Birougou of ~ 550 t/ha.