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A study of the vegetation change and climate memory in Africa using a dynamic global vegetation model

Ishii Shouta^{1*}, Sato Hisasi², Takeshi Yamazaki¹

¹Tohoku University, ²Nagoya University

Various vegetation types are distributed in African continent, and those are results of interaction between land surface and the atmosphere. In particular, precipitation change strongly affects vegetation. Vegetation has a system, 'climate memory', that holds effect of precipitation anomaly even after it has been occurred. Vulnerability is also important concept for prediction of vegetation change because it is used for indicator of ecosystem stability. In this study, we applied a dynamic global vegetation model, SEIB-DGVM, to African continent and examined the effect of precipitation change on vegetation structure (e.g., LAI and tree height) and carbon / water balance. Then, we examined the vulnerability of vegetation among seven sites using the Sensitivity Index and Resilience Index. In the model, spatially explicit virtual forest is placed; growth, competition and decay of individual trees can be calculated. Input data is daily climatic data from 1979 to 2004 obtained from NCEP/NCAR reanalysis data. The spatial resolution of this data was coarse (192*94 global points); thus, the data was linearly interpolated for targeted site. However, NCEP/NCAR precipitation was corrected by monthly precipitation data by GPCP. The atmospheric CO₂ concentration was set to 358.6 ppm, which is the global mean from 1979 to 2004. We selected the seven sites in African continent from CarboAfrica. Climate memory and vulnerability for precipitation change was differed among the seven sites and it was thought as characteristics for each site. It caused by differences of climate zones, biome and plants characteristics (such as the root depth) in each site.

Keywords: Vegetation, Africa, Climate Memory, Vulnerability, Numerical Model