Land-atmosphere interaction over Sahel region, Africa revealed by several satellites data

Yuki Murayama[1]; Atsushi Higuchi[2]; Munehisa Yamamoto[3]; Masamitsu Hayasaki[3]

[1] Earth & Planetary Sci., Tokyo Univ.; [2] CEReS, Chiba University, Japan; [3] CEReS, Chiba Univ.

http://higu.cr.chiba-u.jp/~higu/

Sahel region is recognized as one of regions, where the surface processes deeply coupled with the atmospheric phenomena particularly in convective activity. One of key issues in diurnal cycle in precipitation / convective activity is addressed that dynamical changes in vegetation (so-called phenology, land cover changes) are how to influenced on the diurnal cycle of convection. Thus we analyzed several satellites dataset to diagnose the response in convection with vegetation status changes over Sahel region.

We used MODIS level2 products (vegetation indices, surface temperature and emissivity in thermal wavelength), TRMM combined 3-hourly product (3B42), and Meteosat geostationary hourly data. A two years window (2004-2005) is set as the analysis period. In addition, IGBP.Ecomap and Gtopo30 were used for identify the land cover and topography in the study region, respectively. To divided into land cover effect on convective activity, we selected three land cover categories: forest, savanna and grassland. Then both the surface-related information (Normalized Difference Vegetation Index; NDVI, surface temperature derived from MODIS products) and the atmosphere-related information (precipitation phenomena in TRMM 3B42; delta Tbb, which defined as difference between Tbb in thermal-Infrared [IR] and Tbb in water vapor channel [cf. Ohsawa et al., 2001]derived from Meteosat) were compositely collected with daily basis. In addition, the peak time analysis in delta Tbb was performed as similar as Ohsawa et al. (2001) but for daily basis. Moreover, time - longitude section of peak time in deltal Tbb with migration and withdrawal in NDVI ware made for the inter-comparison between vegetation status changes and amplitude and phase changes in convective activity.

Results could be summarized as follows: 1. Relationship between seasonal march in vegetation and rainfall amount, frequency of rain areas are well in savanna and grassland. 2. Diurnal amplitude and phase in convection is relatively constant with seasonal march in all land cover. 3. However, to pay attention the direction of sea - inland (longitude), it seems that the amplitude of diurnal cycle enhanced / decreased with seasonal migration / withdrawal African monsoon. In particular orographic convection s are relatively seems to enhance in the mature season. Such fact implies that orographic and atmospheric environment changes are relatively dominant factors for the seasonal march in diurnal cycles in convection, rather than vegetation activity changing.