

## Formation of the global monsoon - A comparison between the past and future -

Hiroaki Ueda<sup>1\*</sup>

<sup>1</sup>Faculty of Life and Environmental Science

In this presentation, the comparison will be made between past warm climate such as mid-Pliocene (3Ma) /mid-Holocene (6k) and projected CO<sub>2</sub> rich climate. The past cold climate so-called last glacial maxima (21k; LGM) or last millennium (LM) historical archive are also important topics in the monsoon studies which are expected to provide another insight for the climate dynamics. Keeping these in mind, the speaker seeks a conjunction point between the climate modeling groups and paleo-proxy investigator.

The Asian monsoon is a planetary-scale phenomenon driven by differential response to seasonal variations of solar radiation between the Asian Continent and surrounding oceans due to their difference in heat and moisture capacity (Halley 1686). This concept, so-called macro land-sea breeze, is elegant in its simplicity and has been accepted in the monsoon community. In addition to the conventional idea, recent progress of the climate dynamics enable us to discuss heat by integrating temperature with time, which opened new door for interpretation of the monsoon in terms of various time-scales including future projection and paleoclimate. The heat in the monsoon system can be decomposed by diabatic heating over and around the elevated Tibetan Plateau and adiabatic heating anchored with the enhanced rainfall in the tropics.

Trenberth et al. (2000) proposed a concept of global monsoon (GM), in which the seasonally varying overturning circulation in the tropics plays a crucial role for the connections among various kinds of regionally different monsoons. Recently, Wang et al. (2012) clearly deduced the GM domain based on the annual varying rainfall and suggested that various monsoons in the globe are closely connected with adjacent semi-arid climate through the dynamical heat-induced response to the intensified condensation heating caused by the monsoon rainfall. The GM concept allows us to understand consistently the formation and variation of wet and dry climate. The other merit of this system is that we can combine spatially distributed various climatic elements such as local proxy-data into the GM, creating an opportunity to discuss different science community.

Keywords: global monsoon, mid-Pliocene, mid-Holocene, Last Glacial Maximum, Global warming, Millenium experiment