



## **Influence of orbital forcing on the ENSO-East Asia winter monsoon relationship**

Hyo-Jeong Kim (1), Soon-Il An (1), and Wonsun Park (2)

(1) Department of Atmospheric Sciences, Yonsei University, Seoul, Korea, Republic Of, (2) GEOMAR, Helmholtz Centre for Ocean Research Kiel, Kiel, Germany.

Two latest interglacial periods, Holocene and Eemian went through similar evolution of orbital forcing. Presently, the earth's obliquity decreases and precessional index ( $\omega$ ) increases. Such changes in orbital configurations lead to increase in the incoming insolation over the tropical and mid-latitude area during wintertime. Here, the relationship between El Niño-Southern Oscillation (ENSO) and East Asia winter monsoon (EAWM) was examined using Kiel Climate Model (KCM) simulations with fixed orbital forcing at the Eemian (126kyr, 122kyr, 115kyr before present) and the Holocene (9.5kyr, 6kyr before present and preindustrial time). Model results showed that orbital forcing modulates the influence of ENSO on EAWM through changes in the mean state. With decreased obliquity and increased precessional index, the tropical mean state becomes warmer and ENSO variability grows so that its influence is enhanced. Atmospheric sensitivity to the SST forcing also increases because of nonlinear relationship represented by Clausius-Clapeyron equation. In addition, the intensity of winter monsoon over East Asia is reduced since there is less seasonal contrast and it becomes relatively vulnerable state. Overall, such changes in the mean field can enhance the leverage of ENSO and make its relationship with EAWM tight.