IBS Center for Multidimensional Carbon Materials

Special Seminar

Prof. Axel Timmermann

IBS Center for Climate Physics
Pusan National University
Busan, Korea

Reconstructing, simulating and understanding abrupt climate change

October 4th Wednesday, 2 PM	Bldg. **103** Seminar Room **113**

As our planet is experiencing unprecedented anthropogenic warming, sea level rise and ocean acidification the question arises whether the continuation of any of these trends could lead to threshold behavior either in physical or biological systems. Earth system computer models used to project future planetary warming still have difficulties in capturing the extremely variable climate during the last glacial period (~80-15 thousand years ago), which was characterized by abrupt warming transitions, unpredictable ice-sheet instabilities, and large-scale centennial to millennial shifts in ocean circulation. To elucidate the underlying physical processes and improve earth system models' capabilities to simulate spontaneous climatic transitions, climate scientists rely on accurate reconstructions and improved physical understanding of abrupt past climate changes on regional to global scales.

In this presentation I will take you take you on a journey that begins in the caves of Gangwon-do in the northeastern part of South Korea and ends in the discovery of a remarkable abrupt climate transition that occurred around 16 thousand years. This event was characterized by one of the most abrupt large-scale cooling periods recorded to date. Within 5-10 years the entire northern hemisphere plunged into a cold state, which lasted for about 100 years. To identify the causes of this event, we combined new geochemical and isotopic proxies from Korean stalagmites with isotope-enabled climate model simulations. The most likely explanation, which is consistent with the global fingerprint of the recorded event, is that a huge glacial meltwater lake burst into the northern North Atlantic, leading to increased ocean stratification, massive sea ice formation and large-scale reorganizations of the atmospheric circulation, which impacted even remote regions such as the Korean Peninsula and Australia.

Such events are not explicitly resolved in the current generation of climate models, which lack icesheet dynamics and complex hydrology. In the last part of my presentation, I will report on our center's progress in coupling dynamical ice-sheet models with a state-of-the-art earth system model. The new modeling system can simulate glacial/interglacial cycles realistically and some level of millennial-scale variability. Future concerted modeling efforts need to be launched to improve the representation of abrupt and internally generated low-frequency climate transitions.

You are cordially invited to attend!