Geophysical Research Abstracts
Vol. 15, EGU2013-7019, 2013
EGU General Assembly 2013

Future Change of the Indian Ocean Basin-Wide and Dipole Modes

Byeong-Hee Kim (1), Jung-Eun Chu (1), Kyung-Ja Ha (1), June-Yi Lee (2), Bin Wang (2,3), and Chung Eddy Chul (4)

(1) Global Research Laboratory (GRL) between Korea and USA, Division of Earth Environmental System, Pusan National University, Busan, Republic of Korea (kbhee@pusan.ac.kr), (2) International Pacific Research Center, University of Hawaii, Honolulu, HI 96822, USA, (3) Department of Meteorology, University of Hawaii, Honolulu, HI 96833, USA, (4) Gwangju Institute of Science and Technology (GIST), Gwanju, 500-712, Korea

This study focuses on future change of the Indian Ocean basin-wide (IOBW) and dipole (IOD) modes together with a long-term trend under anthropogenic global warming. That has been investigated using 20 coupled models that participated in Coupled Model Intercomparison Project Phase 5 (CMIP 5) by comparing two runs: the historical run under changing solar-volcanic forcing and anthropogenic influences from 1950 to 2005 and the Representative Concentration Pathway (RCP) 4.5 run from 2050 to 2099 assuming that radiative forcing will stabilize at about 4.5 Wm-2 after 2100. For the 20 models, the five best models are chosen based on the evaluation of individual models' performances in simulating the two modes for latest 56 years. They are competent of capturing the two modes with high precision but they tend to overestimate the IOBW mode, underestimate the IOD mode.
In the future, the annual mean climatological SST will increase 1.67 ˚C over the entire Indian Ocean and it is larger than the Pacific Ocean. The monthly SST variance will increase considerably over the central-western Pacific Ocean and slightly decrease in the far-east Pacific Ocean. The warming trend of annual mean SST will also increase. The area averaged linear coefficient is 0.81 ˚C/100yr in the present and 0.97 ˚C/100yr in the future. The distribution of warming pattern is homogeneous with relatively strong warming signal over the northwestern and southeastern Indian Ocean. On the contrary to all models' tendency, IOD enhancement and the spatial pattern are more solid than that of IOBW. The IOBW mode will weaken considerably from 34.5% to 28.6% and the IOD mode will slightly enhance from 14.4% to 15.9%. The weakening of IOBW in the future is not accompanied by reduction in ENSO-IOBW relationship but may be related to the horizontal inhomogeneous characteristics induced by local decoupling of the western Indian Ocean SST. The reason of local decoupling is not addressed in this study but it may be a consequence of a combination of a number of processes that contribute to the change of the interactive air-sea coupling rather than change in ENSO-Indian Ocean relationship.