## Coupling coefficients around the mid-latitude SST fronts in a coupled atmosphere-ocean and a stand-alone atmospheric GCMs

<u>Nobumasa Komori</u><sup>†</sup>; Bunmei Taguchi; Akira Kuwano-Yoshida; Masami Nonaka; Koutarou Takaya; Wataru Ohfuchi; Hisashi Nakamura

<sup>+</sup> Japan Agency for Marine-Earth Science and Technology, Japan

Leading author: <u>komori@jamstec.go.jp</u>

Recent high-resolution satellite observation have revealed positive correlation between spatially highpass filtered surface winds and sea surface temperature (SST) around the SST fronts, indicating that the ocean affects the atmosphere at small scales. It has been also found that divergence (curl) of wind stress correlates with downwind (crosswind) SST gradient as expected from the surface wind--SST relationship. Their regression coefficients are often regarded as a measure of the strength of their coupling and called "coupling coefficients." In this study, coupling coefficients as simulated in a coupled atmosphere--ocean and a stand-alone atmospheric general circulation models (CFES and AFES, respectively) are examined. High-resolution simulations using CFES and AFES are conducted more than 20 years with their horizontal resolution of T239 (~50 km). The oceanic component of CFES has a resolution of 1/4° (~25 km) and is coupled with the atmospheric component every 20 minutes, and AFES is driven by daily OISST with a resolution of 1/4° based on AVHRR observation. To examine its spatial distributions, we calculate local coupling coefficients at each grid point rather than area-averaged ones often focused in the previous studies. While wind stress positively correlates with SST only around the SST fronts such as the mid-latitude western boundary current (WBC) regions in CFES, both CFES and AFES well reproduced positive correlation between wind stress derivatives and SST gradients all over the world ocean. It is found that coupling coefficients between wind stress derivatives and SST gradients do not have their maxima over the WBCs including the Agulhas Return Current and their spatial patterns strongly reflect large-scale wind field in both CFES and AFES. While previous studies have focused on static stability effects on spatial and seasonal variability of area-averaged coupling coefficients, this study suggests that the variability of the coupling coefficients can also be attributed to large-scale variability of wind, and we need to distinguish the contributions to coupling coefficients from the local efficiency of vertical momentum transfer and from the large-scale available momentum.