**Japan Geoscience Union Meeting 2012**
(May 20-25 2012 at Makuhari, Chiba, Japan)


AAS03-05 Room:101A Time:May 23 09:55-10:10

# A numerical study of the climatological dependence of westerly jets and storm tracks on the latitude of a SST front

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Major ”storm tracks”, where migratory cyclones and anticyclones recurrently develop, are observed around midlatitude oceanic frontal zones characterized by strong meridional gradient of sea-surface temperature (SST). A set of atmospheric general circulation model experiments is performed with zonally uniform SST prescribed at the model lower boundary. The SST profile for each hemisphere is characterized by a single front whose latitude is varied systematically from one experiment to another, while the intensity of the frontal gradient is kept unchanged. Though idealized, the experiments reveal an obvious tendency in the climatological-mean low-level storm track to be organized along or slightly poleward of the SST front if located in the subtropics or midlatitudes. As a surface manifestation of an eddy-driven polar-front jet (PFJ), the climatological-mean axis of surface westerlies tends to be situted on the poleward flank of the front. This anchoring effect of the SST front is also hinted at upper levels, but the positions of the storm track and PFJ are less sensitive to the frontal latitude. For the SST front at subpolar latitude, the joint primary axes of the upper-level storm track and PFJ are located in midlatitudes away from the front. Their positions correspond to those simulated with a particular SST profile from which frontal gradient has been removed (NF experiment). This result suggests that the anchoring effect of a subpolar SST front on the storm track and PFJ is overshadowed by atmospheric internal dynamics, namely self-maintenance mechanisms of a midlatitude storm track and PFJ through their interactions. As the SST front is placed more equatorward, the climatological amplitude of upper-level transient eddies tends to increase, which is presumably caused by enhanced moisture supply to individual disturbances from the warmer ocean surface, a contribution of eddy development in the mid-tropospheric baroclinic zone associated with STJ, and weaker decay of eddies during their propagation toward STJ. At the same time, the climatological core velocities of PFJ and STJ tends to increase and decrease, respectively, due to the stronger eddy transport of westerly momentum from STJ to PFJ.

Keywords: SST front, storm track, westerly jet, atmospheric general circulation, baroclinic zone