# The role of the cold Okhotsk Sea in the strengthening the Pacific subtropical high and Baiu precipitation

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It is commonly known that the formation of a stationery precipitation zone in association with the Baiu front is influenced by the existence of the warm Tibetan Plateau. Some GCM studies in which the Tibetan Plateau is removed pointed out that without the Tibetan Plateau, the Baiu front wound not appear. The cold Okhotsk Sea, which is located to the north of Japan, is also important in forming cold air for the Bai front. This study focused on the role of the Okhotsk Sea in the formation of the Baiu front by using an atmospheric GCM. One GCM is executed without the Okhotsk Sea, in which was changed to an eastern part of the Eurasian continent as if the Okhotsk Sea was totally landfilled (land run). The other (sea run) is a control run under the boundary condition of climatic seasonal changes of the SST over the globe. The comparison of the land run with the sea run showed that precipitation over Japan would weaken in the Baiu season without the Okhotsk Sea, indicating that the existence of the Okhotsk Sea has an impact on the increase in precipitation (Fig.1). The precipitation increase in the sea run is directly accounted by the strengthening of southeast wind in association with the strengthening of the subtropical high located over the Pacific Ocean (Fig. 2). The westerly jet, which is located at the northern part of the subtropical high, was also accelerated in the sea run. The subtropical high in association with the accelerated jet was strengthened by meridional atmospheric thermal gradient caused by underlying cold Okhotsk Sea and the warm Pacific Ocean. The strengthened thermal gradient also activated the storm track that extends zonally over the Okhotsk Sea, and the activated storm track further strengthened the jet and subtropical high by wave-mean flow feedback. This feedback loop could further strengthen the Baiu precipitation. In consequence, the Okhotsk plays a significant role in the strengthening the subtropical high and its associated Baiu precipitation.

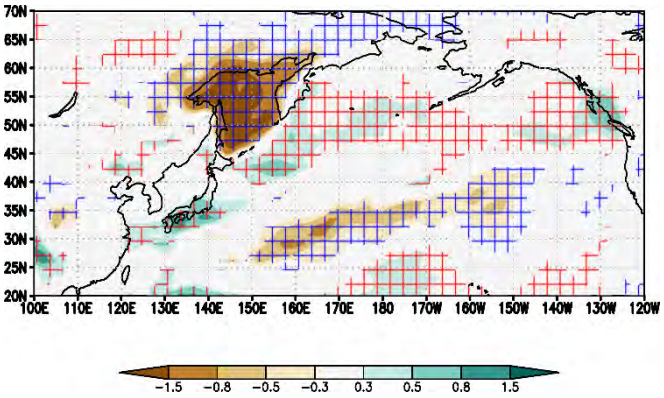


**Figure 1.** Difference in May-June mean in precipitation [mm/day] between sea-run and land-run (color shading). Significance levels above 90% based on t-test are hatched.

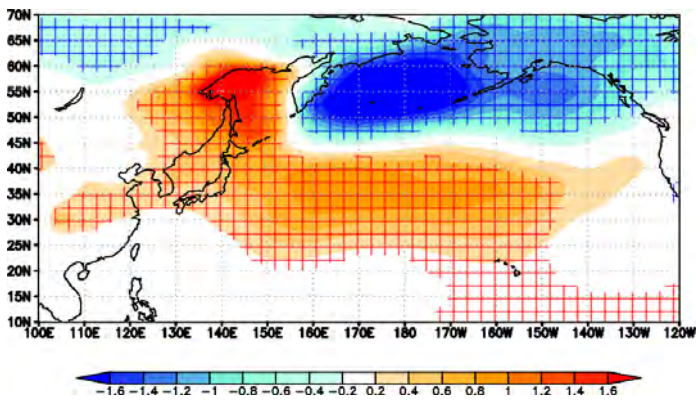


**Figure 2.** Difference in May-June mean in Sea level pressure [hPa] between sea-run and land-run (color shading). Significance levels above 90% based on t-test are hatched.