Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

ACG033-P07 Room:Convention Hall Time:May 25 10:30-13:00

Roles of Mountain Ranges on Water Field in Eastern Siberia

Ryuhei Yoshida[1*], Masahiro Sawada[1], Takeshi Yamazaki[1], Ayumi Kotani[2], Takeshi Ohta[2], Tetsuya Hiyama[3], Gen Inoue[3]

[1]Grad. Sci. Tohoku Univ., [2]Grad. Sci. Nagoya Univ., [3]RIHN

In Eastern Siberia, 40% of precipitation is maintained by water supply from ocean. Water vapor transport is affected by mountain range and it also affects to precipitation distribution. There were a few previous studies focusing on precipitation distribution and factors that decides distribution. To make clear water field in Eastern Siberia, we conducted forest survey at first because it was thought tree size was affected by precipitation amount. Then, we investigated precipitation distribution and water vapor transport. At last, roles of three mountain ranges (Verkhoyansk, Dzhudgzhur and Stanovoy mountain range) in Eastern Siberia are analyzed using three-dimensional atmospheric model.

Starting point of this study was forest survey in Elgeeii site (relatively south in Lena basin) and its comparison with Spasskaya Pad site (350km northwest from Elgeeii). Averaged tree height and maximum tree height took larger value in Elgeeii site, thus it was thought that southern Siberia was favorable environment for tree growth, such as much precipitation. According to routine station data, much precipitation in southern Siberia was found not only relation between Elgeeii and Spasskaya Pad but also overall Eastern Siberia.

Precipitation and water vapor flux have strong relationship each other, thus water vapor flux budget was investigated for Eastern Siberia. Taking budget box encircled with line of 59-71N and 116-138E, mainstream of vertical integrated water vapor flux was inflow through west-side and outflow through east-side. This trend became different when net flux separated into incoming and outgoing component; incoming and outgoing water vapor flux through south-side was large as much as water vapor flux through west-side. There is Stanovoy mountain range in just south of the budget box, therefore water vapor flux and precipitation may be affected by the mountain range. Not only Stanovoy mountain range but also other two mountain ranges, Verkhoyansk and Dzhugdzhur mountain ranges, are located in Eastern Siberia. Therefore sensitivity experiment of mountain range disappearance was conducted to make clear roles of mountain ranges in Eastern Siberia.

Averaging from 110-140E, it was found that Verkhoyansk mountain range had little effect on precipitation. Precipitation decrease was 0.2 mm day-1 with 200-400 m topography excavation, it was around half of other two mountain ranges. This small precipitation change was caused by lower specific humidity. However, when we focused on 133E cross-section, relatively higher specific humidity could not keep in Lena basin without Verkhoyansk mountain range.

Dzhugdzhur mountain range had larger precipitation decrease than Verkhoyansk mountain range with its disappearance. Precipitation decreased area was good agreement with elevation decrease area, therefore precipitation over Dzhugdzhur mountain range was maintained by orographical effect.

Stanovoy mountain range had similar precipitation decrease with its disappearance. Both eastern and western edges of precipitation decrease area had corresponded to elevation decrease area, however, precipitation of saddle part did not decrease even if the saddle part had been removed. In control run, there were two precipitation patterns associated with Stanovoy mountain range: low pressure pattern and frontal precipitation pattern. Low pressure pattern passed over the saddle part in control run, however, it did not disappear in no Stanovoy mountain range run. Thus eastern and western part of Stanovoy mountain range is orographical effect precipitation area and the saddle part is non-orographical precipitation area such as low pressure pattern.

Keywords: Eastern Siberia, Mountain Range, Precipitation