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Epoch difference of water cycles in eastern and western Siberia

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Among all the rivers flowing into the Arctic Ocean, the three great Siberian rivers; Lena, Yenisei and Ob, are the three largest in terms of water discharge (R), and they are a large source of freshwater. We examined the relationship of long-term water cycle variability between eastern and western Siberia on the basis of net precipitation (P-E) estimated from an atmospheric reanalysis, and Rs from observations at the river months and from a reconstruction based on tree rings.

The relationship of summer (P-E)s between the Lena and Ob Rivers is different in the first half and the second half of the past three decades. During 1980s to mid-90s, the (P-E)s have a strong negative correlation. These variations were affected by the east-west seesaw pattern of moisture flux. These results are consistent with Fukutomi et al. (2003). The decomposition analysis revealed that the stationary component of moisture flux dominates the seesaw pattern during the period. After mid-1990s, the correlation of the (P-E)s between the Lena and Ob becomes weak. During mid-1990s to 2000s, the P-E over the Lena was affected by cyclonic moisture flux over the basin. In addition to the stationary component, the transient component of moisture flux also affects the P-E variation in this period.

Long-term records revealed that the Rs of the Lena and Ob Rivers have moderate or weak positive correlations and strong negative correlations before the 1980s. Interestingly, the correlations tend to be distributed in the negative side. It implies that the east-west seesaw pattern frequently appear over Siberia. In conclusion, the moisture transport processes over Siberia are different in each era and they result in the different variability of the Rs and (P-E)s of the Lena and Ob Rivers.

Keywords: Siberian rivers, moisture transport process, net precipitation, river discharge, interannual variation, long-term variability