Introduction
Fresh water is one of the most important resources. Precipitation is the main source of fresh water. Latent heat is one of the most important sources of global energy transfers. Accurate global precipitation maps are important for science and human activities. However, ground observation areas are not uniform. Space-borne passive microwave radiometers (PMRs) observation is globally uniform. PMR observes emission signals from liquid hydrometeors and scattering signals from ice particles. Precipitation retrieval algorithms for PMRs are based on emission and scattering signals.

Land is radiometrically hot and variable temperature surfaces. PMR algorithm is dependent on scattering signals over land. Therefore, PMR precipitation over land is underestimated. However, land precipitation is the most important for practical uses of precipitation maps.

Aim of the study
The aim is to improve reliability of land rain retrieved by PMR to that of ground based observations. We are developing an adjustment algorithm using rain-gauge data for "Global Satellite Mapping of Precipitation with moving vector with Kalman filter" (GSMaP-MVK). The algorithm is named "GSMaP Gauge".

Results
Figure 1 shows the relation between CPC and PMR of GSMaP Gauge is very sharp and linear. The GSMaP Gauge algorithm improves correlation from 0.53-0.54 to 0.98. Figure 2 shows that GSMaP Gauge improves underestimation of GSMaP-MVK precipitation from 40N to 15N and from 20S to 40S.

Summary
• New gauge adjustment algorithm for global precipitation map has been developed.
• We adopt the new algorithm for GSMaP-MVK (GSMaP Gauge).
• The GSMaP Gauge improves correlation coefficient between GSMaP and CPC from 0.53-0.54 to 0.98.
• Underestimation of precipitation over land GSMaP-MVK precipitation is improved.
• Monthly rainfall of GSMaP Gauge is similar pattern to CPC.
• The GSMaP Gauge improve PMR-based precipitation map equivalent to CPC.