QUANTITATIVE EVALUATION OF LOADING EFFECTS ON SEASONAL VARIATION IN GEONET GPS DATA

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Murakami and Miyazaki [1999] reported that seasonal variation could be seen in the daily solutions of GEONET (the GPS Earth Observation NETwork) GPS site coordinates. Since then, several scientists tried to interpret the seasonal variation (e.g. Hayashi et al. [2000], Heki [2001, 2002] and Hatanaka [2001, 2002]). We also investigated seasonal variation in the baseline length changes and reported most of the baselines expand in summer and contract in winter (Takiguchi and Fukuda[2000, 2001]). From these studies, we could summarize that the seasonal variation does not depend on the strength of plate coupling nor analysis software/strategy, and it is manly caused by the systematic scale changes suggested by Hatanaka (2001) and the loading effects due to local or broad mass changes, i.e., snowfall, ocean tide, non-tidal ocean load and atmospheric pressure. Using the globally network data, D. Dong [2002] showed that 40% of the observed annual vertical variations can be explained by the joint contribution of pole tide, ocean tide, atmospheric pressure, non-tidal ocean, and groundwater loading. Other contributions were some modeling errors (wet troposphere effect and orbit etc) and bedrock thermal expansion.

In this study, we investigate the seasonal variation in GEONET GPS sites to confirm whether the above estimations are valid for the GEONET data. For this purpose, we employed surface vertical variation and area strain which calculated from annual baseline changes of three baselines shaping a triangle. And then we compared the vertical variation and area strain with seasonal variation of snowfall load calculated from 1997 to 1999 AMeDAS data sets and atmospheric load calculated from atmospheric pressure data at the Japan Local Metrological Observatory. We found that the seasonal variation of GPS data could not be explained by snowfall load nor atmospheric load. We will search for other load sources and discuss the joint contribution of them.