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Recovery of Interannual Terrestrial Water Storage Variations over the Indochina Peninsula and the Relationship with Decadal-Scale Climate Variations

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The Indochina peninsula is located in an area affected by the Southeast Asian monsoon system, and substantial seasonal variation in terrestrial water storage is observed in this area. In addition to the seasonal effect of the monsoon system, the Indochina peninsula is also affected by the changes from interannual climate system over the Pacific and Indian Oceans, which causes precipitation and temperature anomalies over this area directly, or coupling with a monsoon event. As a result, terrestrial water storage variations over the Indochina peninsula are closely related to such global-scale events. In this study, using GRACE temporal mass variation data, we investigated the inteannual components of the terrestrial water storage variations over the Indochina peninsula. Currently, the GRACE mission offers nearly 10-year datasets for research since its launch. Thus, it has become possible to discuss interannual mass changes on the scale of several years to decades. We firstly recovered mass variations over the Indochina peninsula using version 2 of the CNES/GRGS GRACE every 10-day satellite gravity field solutions from 2002 to 2009, and extracted interannual terrestrial water storage mass variation components. Next, the dominant water mass variation modes over a large area including the Indochina peninsula were investigated by applying EOF analysis to the obtained interannual components. For the analysis, we included the Indian Ocean in addition to the surrounding land region for the analyzed areas because meteorological terrestrial water storage variations generally are closely related to ocean variations. The obtained each EOF modes were compared with the climate oscillation indices and with the typical spatial patterns to specify the dominant climate system that causes the variation. The result showed that the Indian Ocean Dipole, which is the dipole oscillation mode of the sea surface temperature anomalies between the east and west Indian Ocean, gives the most dominant effect on the interannual terrestrial water storage over the Indochina peninsula during the data time span used in this study. The Effect is about 20 % of the total interannual terrestrial water storage mass variation. The result also showed that El Nino/Southern Oscillation events gives some effects as well, but the effect is about 4 % of the total interannual components, which is smaller than the effect of Indian Ocean Dipole.