Comparison of global seasonal deformation induced by GPS and loading models

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Obvious seasonal deformation related to mass redistribution on the Earth's surface can be recorded by continuous Global Positioning System (GPS), and simulated by surface loading models. The seasonal deformation time series at 1220 GPS stations derived from International GNSS (Global Navigation Satellite System) Service (IGS) second reprocessed residuals are compared with time series obtained by geophysical models to investigating the consistency of seasonal deformation obtained by different techniques. The results show that about 43% of GPS-derived vertical seasonal deformation can be explained by the surface loading, while in horizontals it is less than 20%. The discrepancies of the annual variations of horizontal displacements observed by GPS and loading are much larger than in the verticals, particular over Europe. Some of the discrepancies are attributed to GPS related errors due to the technique uncertainty in the GPS data processing, especially in horizontals. Moreover, the horizontals are more sensitive to the region-scale loadings and the unmodeled components in loading models should be considered in some regions, such as Europe. And the effect of loading itself uncertainty cannot be ignored. However, the draconitic year which is one of the GPS systematic errors doesn't fill the gap between GPS and loading probably because the current limited time span.