

EGU2020-2504

<https://doi.org/10.5194/egusphere-egu2020-2504>

EGU General Assembly 2020

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The Estimation and Prediction of Geocenter Motion Based on GNSS Weekly Solutions

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The development of satellite space geodesy technology makes the establishment of global terrestrial reference frame based on the Earth's center of mass become reality. Precise and stable terrestrial reference frame is the foundation of the Earth science research, while determination and analysis of the position of the Earth's center of mass and its change is an important part to build high precision terrestrial reference frame. Based on GNSS weekly solutions provided by IGS, the geocenter motion (GM) time series between 2007 and 2017 are obtained by means of net translation method. Then the amplitude of the annual term of geocentric motion is 2.27mm, 1.84mm and 2.13mm in the direction of X, Y and Z respectively, and the amplitude of the half-year term is 0.1mm, 0.20mm and 0.15mm respectively. In addition, some other inter-annual changes with relatively small contribution rate are found. Finally, in order to get reliable GM prediction, two kinds of methods are used, which are ARMA and SSA+ARMA. In the short-term prediction, the accuracy of the two methods is the same, both can reach the millimeter level of prediction accuracy, but SSA+ARMA is more stable. SSA+ARMA algorithm is much better in the medium and long-term scale, and it can provide 1mm medium term prediction accuracy and 1.5mm long term prediction accuracy.