New, precise, consistent orbits (VER11) of altimetry satellites ERS-1, ERS-2, TOPEX/Poseidon, Envisat, Jason-1, and Jason-2 have been recently derived at the GFZ German Research Centre for Geosciences in the extended ITRF2008 terrestrial reference frame using improved models and covering the time span 1991-2015. These orbits show improved quality, as compared with GFZ previous (VER6) orbits derived in 2013. Improved macromodels reduce root mean square (RMS) fits of satellite laser ranging (SLR) observations by 2.6%, 6.9%, and 7% for TOPEX/Poseidon, Jason-1, and Jason-2, respectively. Applying Vienna Mapping Functions 1 instead of Hopfield model for tropospheric correction of Doppler Orbitography and Radiopositioning Integrated by Satellite (DORIS) observations reduces RMS fits of SLR observations by 2%-2.4% and those of DORIS observations by 2.6% for Envisat and Jason satellites. Using satellite true attitude instead of models improves Jason-1 SLR RMS fits by 41% from July 2012 until July 2013. The VER11 orbits indicate the mean values of the SLR RMS fits between 1.2 and 2.1 cm for the different missions. The internal orbit consistency in the radial direction is between 0.5 and 1.9 cm. The global mean sea level
trend for the period 1993-2014 from TOPEX, Jason-1, and Jason-2 is 2.8 and 3.0 mm/year using GFZ VER6 and VER11 orbits, respectively. Regionally, the decadal trends from GFZ VER11 and external orbits vary in the order of 1 mm/year.