The multi-mission altimeter scenario of the past decades is a challenge for the high resolution mapping of the mean sea surface and the monitoring of mesoscale sea surface variability. Combining altimeter missions with different sampling capabilities requires however a careful pre-processing and calibrations of all altimeter systems. For the absolute calibration of altimeter missions dedicated in-situ sites have been established directly beneath the satellite ground tracks (e.g. Harvest, Bass Strait, Corsica, Gavdos). All these sites estimate the altimeter range biases as the altimeter sensor passes overhead. Unfortunately, the range biases of in-situ calibration sites differ by a few centimetres. This may be caused by site-specific equipment, specific local conditions for geophysical corrections, or geographically correlated orbit errors. Global relative cross-calibration is based on crossover analysis. We take advantage of the multi-mission scenario and compute crossover differences between all altimeter systems operating simultaneously. Then a least squares adjustment estimates time series of radial errors relative to a reference mission. The radial errors are subsequently used to derive mean relative range biases, to estimate empirical auto-covariance functions, to detect differences in the geocentric realization of the satellite orbits, and to identify geographically correlated errors. The global cross-calibration has the potential to explain to some extent the discrepancies between the in-situ range biases. A combination of local in-situ and global relative calibration methods is therefore desirable. We investigate such a combination and consider possibilities to extend the cross-calibration by estimating additional systematic errors like time tag and electromagnetic biases.