

Combinations of Earth Orientation Observations: SPACE94, COMB94, and POLE94

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A Kalman filter has been used to combine all publicly available, independently determined measurements of the Earth's orientation taken by the modern, space-geodetic techniques of very long baseline interferometry, satellite laser ranging, lunar laser ranging, and the global positioning system. Prior to combining the data, tidal terms were removed from the UT1 measurements, outlying data points were deleted, series-specific corrections were applied for bias and rate, and the stated uncertainties of the measurements were adjusted by multiplying them by series-specific scale factors. Values for these bias-rate corrections and uncertainty scale factors were determined by an iterative, round-robin procedure wherein each data set is compared, in turn, to a combination of all other data sets. When applied to the measurements, the bias-rate corrections thus determined make the data sets agree with each other in bias and rate, and the uncertainty scale factors thus determined make the residual of each series (when differenced with a combination of all others) have a reduced chi-square of one. The corrected and adjusted series are then placed within an IERS reference frame by aligning them with the IERS Earth orientation series EOP(IERS)90C04. The result of combining these corrected, adjusted and aligned series is designated SPACE94 and spans October 6.0, 1976 to January 27.0, 1995 at daily intervals.

Two additional series of combined Earth orientation observations have also been generated by additionally incorporating optical astrometric measurements. COMB94, incorporating BHI optical astrometric measurements in addition to the space-geodetic measurements used to generate SPACE94, spans January 20.0, 1962 to January 27.0, 1995 at 5-day intervals. POLE94, additionally incorporating the IERS polar motion observations, consists of just the polar motion components of the Earth's orientation and spans 1899-1994 at monthly intervals.