# Observations of Decadal-Scale Variations in the Earth's Rotation

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Torques acting at the core-mantle boundary are thought to cause decadal-scale changes in the Earth's rotation. Comparing the inferred Earth rotation variations caused by these torques to observed variations requires Earth rotation observations spanning decades, if not centuries. During the past few decades many different measurement techniques have been used to observe the Earth's rotation, including the techniques of lunar occultation, optical astrometry, lunar laser ranging, satellite laser ranging, very long baseline interferometry, and the global positioning system. By combining the Earth rotation observations taken by these different measurement techniques, a series of observed Earth rotation variations can be generated that spans the greatest possible time interval, thereby facilitating the study of decadal-scale variations. However, in combining these disparate observations, care must be taken to account for differences in the individual series that arise from differences in the measurement techniques. Observations resulting from the different measurement techniques generally have different temporal resolution, are averaged over different time periods, and are given as different subsets and/or linear combinations of the usual Earth rotation parameters (UT1 and polar motion) . In this study, all available independent observations of the Earth's rotation are combined in a self-consistent manner that takes into account the diverse nature of the raw observations. The decadal-scale variations are isolated from the combined Earth rotation series, and the torques that must be acting on the solid Earth to generate these observed decadal-scale variations are computed.