

The Contribution of Laser Ranging to the Global Geodetic Observing System

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Abstract

The Global Geodetic Observing System (GGOS) provides measurements of the time varying gravity, rotation, and shape of the Earth using instruments located on the ground and in space. The key components of GGOS that provide these measurements are the IAG Services, including the ILRS. Earth orientation parameters have been routinely determined from laser ranging observations to the Moon since 1970 and to artificial satellites since 1976, making them the longest available space-geodetic series of Earth orientation parameters. Such long duration homogenous series of accurate Earth orientation parameters are needed for studying long-period changes in the Earth's orientation, such as those caused by climate change. Low-degree time varying spherical harmonic coefficients of the Earth's gravitational field have also been routinely determined from laser ranging measurements to artificial satellites since shortly after the launch of Lageos; the resulting degree-2 zonal coefficient agrees better with models of the gravitational effect of surface geophysical fluids than does that determined by GRACE. Laser ranging measurements also fundamentally contribute to the determination of the terrestrial reference frame by providing its origin and contributing to its scale. Thus, satellite laser ranging is a key component of GGOS. Without satellite laser ranging GGOS would not be able to meet its goal of providing geodetic products accurate to better than a part per billion.