SLR AND ALTIMETRY: A SUCCESS STORY AND A LASTING PARTNERSHIP. J.-P. Berthias, Centre National d'Etudes Spatiales, 18 avenue Edouard Belin, 31401 Toulouse Cedex 9, France, jean-paul.berthias@cnes.fr

Introduction: Satellite altimetry has revolutionized the field of oceanography at the turn of the 21st century. The radar echos collected by the short lived NASA SEASAT satellite in 1978 revealed the strength of altimetric measurements for the study of the ocean surface, however, it was only with the European ERS1 and the French-American TOPEX/POSEIDON missions that ocean altimetry came of age. These missions were the turning point for modern oceanography. They provided a global view of the oceans which was not available before, at a time when only few sparse measurements were collected from buoys, drifters and ships. Thanks to its high precision TOPEX/POSEIDON revealed the global scale dynamics of the ocean as well as smaller scale features such as eddy transport. It offered a good view of complex phenomena such as El Nino, leading to the well-publicized success of the early prediction and timely monitoring of the 1997 El Nino.

Satellite altimetry is an unusual measurement type as the key instrument, the altimeter, only does half the job: in order to derive the ocean height from the measurement of the altitude of the satellite above the ocean, the absolute altitude of the satellite must be known. Thus the satellite bus and its orbit determination system are part of the science measurement system. For TOPEX/POSEIDON, SLR was the nominal tracking for precise orbit determination, along with a new radiometric system, DORIS, and an experimental GPS receiver. On ERS-1,

SLR was also supplemented by a new bidirectional radio tracking system, PRARE. As SLR was central to achieving the mission performance, JPL equipped TOPEX/POSEIDON with a very unusual circular LRA which turned out to be a nuisance. Despite this fact, SLR data proved very valuable for the precise orbit determination of TOPEX/POSEIDON and ERS, in addition to the other sensor and as the sole contributor in the end when the others had failed.

SLR has remained a key contributor to the precise orbit determination of the next generation of European and American altimetry satellites, ERS2, GFO, Jason-1, ENVISAT and Jason-2, as well as for the newer French-Indian SARAL and the Chinese HY-2. Even with the advent of high quality GPS receivers, capable of reliably producing dual frequency data supporting precise orbit determination, SLR remains particularly valuable because it is the only technique which physically links the position of the instrument to the Earth. As such high elevation SLR residuals provides the best estimate of the precision of the orbit in the radial direction. SLR also provides a strong tie to the reference system which is crucial when estimating long term trends in sea level height. Monitoring the sea level rise at the millimeter per year from space requires a very good understanding of all the potential drifts in the measurement system. SLR plays a key role in ensuring this function for the precise orbit determination.

The presentation will cover these historical aspects as well as current results and plans for new missions.