# Impact of atmospheric loading corrections on SLR solutions and on the consistency between GNSS and SLR results

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Tidal and non-tidal surface loading plays a crucial role in high-precision space geodesy. Some of the corrections are well established and recommended by the IERS Conventions to be applied at the observation level: solid earth tides, ocean tidal loading, Atmospheric Tidal Loading (ATL), whereas Atmospheric Non-Tidal Loading (ANTL), oceanic, and hydrological corrections are not recommended for inclusion in operational solutions for generating IERS products and services. The omission of Atmospheric Pressure Loading (APL) may in particular lead to inconsistencies between optical (SLR) and microwave (GNSS, VLBI, DORIS) techniques. SLR observations require a cloudless sky, whereas microwave observations are weather-independent. Weather dependence of optical observations causes the so-called blue-sky-effect, which can be partly compensated by applying APL corrections, because cloudless skies usually occur during high pressure atmospheric conditions over the SLR stations. It is the key issue of surface load modeling to improve the consistency of the results obtained from different space geodetic techniques.

We will illustrate the improvement of SLR solutions when applying ATL and ANTL corrections. We will furthermore demonstrate the impact of loading models on the geocenter coordinates, Earth Orientation Parameters (EOPs), LAGEOS orbits, and on the long-term stability of SLR station coordinates. Finally, we will assess the possible improvement of the consistency between microwave (GNSS) and optical (SLR) techniques by comparing GNSS and SLR multi-year solutions with and without applying ANTL corrections. This kind of comparison is very reliable, because the same set of models and the same software, namely the Bernese Software Version 5.1, are used for both, SLR and GNSS analyses.