

## Ray-traced tropospheric total slant delays for precise point positioning

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Numerical weather models have undergone an improvement of spatial and temporal resolution in the recent years, which made their use for GNSS applications feasible. Ray-tracing through such models permits the computation of total troposphere delays and ray-bending angles. At the National Institute of Information and Communications Technology (NICT), Japan the so-called KAshima RAY-tracing Tools (KARAT) have been developed which allow to obtain troposphere delay corrections in real-time. Together with fine-mesh weather models from the Japanese Meteorological Agency (JMA) huge parts of the East Asian region, including Japan, Korea, Taiwan and East China, can be covered.

Thus a short overview about the capabilities and functions of KARAT will be given and computation performance issues will be discussed. The ray-traced total troposphere slant delays can be used as a correction of GNSS data on the observation level or introduced within geodetic analysis. Thus it will be shown how the ray-traced delays effect the position estimates of precise point positioning (PPP) and it will be discussed which modifications of the software are needed in order to account properly for the modified observations. Additionally, the accuracy and practicability of numerical weather models for the correction of atmosphere path delays will be reviewed.