

# **Influence of the thermosphere on electromagnetic waves propagation ; application to GPS signal**

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The influence of the thermosphere on electromagnetic waves, in particular GPS waves, was always regarded as negligible. The model developed here makes it possible to test the legitimacy of this assumption, by evaluating the impact of the collisions between the neutrals of the thermosphere and electrons of the ionosphere on the GPS signal. This modelling takes into account the part of the thermosphere ranging between 50 and 1000 kilometres of altitude, which is responsible for most of the influence on the signal. We calculate the frequencies of electron-neutrals collisions and their influence on several characteristics of GPS wave: ionospheric delay, de-phasing and variation of amplitude. The validity of the model is confirmed by the comparison of TEC calculated by an international model of ionosphere with TEC calculated with GPS perturbations, which leads to a difference smaller than 1%. These results prove that thermosphere influence is negligible -about  $10^{-9}$  metre on ionospheric delay - whatever parameter is studied. They fit well with the reliance of the GPS system and reinforce it by eliminating one possible error source.