Giomo: A robust modeling approach of ionospheric delays for GNSS real-time positioning applications

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The upper part of the atmosphere, which affects electromagnetic waves by its concentration of electrons is called ionosphere. It extends from about 50 km up to 1500 km height above the Earth's surface and is divided up into several layers (D, E and F). The ionization mainly depends on the activity of the Sun and the electromagnetic field, so at noon the ionization normally reaches its maximum, whereas at night it is low.
The ionosphere is a dispersive medium, so electromagnetic waves with diverse frequencies get influenced in different ways. For this reason, the ionospheric delay can be extracted out of dual-frequency measurements by using the so called ionosphere-free linear combination. Contrary, accurate ionospheric model information has to be introduced in Global Navigation Satellite System (GNSS) data processing in case of single-frequency measurements.
In this doctoral thesis a new model of the ionosphere electron content called Giomo Model is established and tested for its applicability for single-frequency users and in GNSS point positioning. The model is based on very few parameters in order to keep it simple. The parameters are gained out of the data of a network of globally distributed GNSS reference stations. For the calculation, phase-smoothed code measurements are used in a least-squares adjustment. As these parameters are not changing rapidly, they are also used for prediction and can be implemented in real-time applications.
Furthermore, the Giomo Model gets compared to other existing ionosphere models concerning its quality and availability.

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