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A new approach for precise orbit determination based on raw GNSS measurements

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Kinematic orbit determination based on GNSS measurements is a core element for gravity field determination from Low Earth Orbiting Satellites as for example GRACE and GOCE. Presently used algorithms for kinematic orbit determination are based on observation combinations, like for example the ionosphere-free combination or double differences.
In this presentation we will introduce a new approach which is based on raw measurements. The method uses all available observations directly without forming any kind of differences or linear combinations. This includes phase as well as code observations. Every observation is represented by a separate observation equation in a least squares adjustment. All errors and influences which are known with sufficient accuracy are corrected beforehand, otherwise they are added to the estimation as additional parameters. This enables a very flexible handling of the different errors included in the observations. For example antenna center variations can be simply added to the estimation as additional parameters. This method is also well suited for future developments, as new observation types can be included by just adding a new observation equation to the design matrix. Due to the fact that the observations are used directly, the integer ambiguities are accessible even when processing a single receiver. Results based on GRACE and GOCE data will be presented.